

ABB INDUSTRIAL DRIVES

# ACS880 IGBT based SPRS control program (option +N5850) Supplement



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# List of related manuals

## Drive firmware manuals and guides

|                                                                  | Code (English)  |
|------------------------------------------------------------------|-----------------|
| ACS880 primary control program firmware manual                   | 3AUA0000085967  |
| ACS880 drives with primary control program, quick start-up guide | 3AUA0000098062  |
| ACS880 diode supply control program                              | 3AUA0000103295  |
| ACS880 IGBT supply control program firmware manual               | 3AUA0000131562  |
| ACS880 SPRS control program (option +N5850) firmware manual      | 3AXD50000192854 |

## Option manuals and guides

|                                                               |                |
|---------------------------------------------------------------|----------------|
| ACX-AP-x assistant control panels user's manual               | 3AUA0000085685 |
| Drive composer Start-up and maintenance PC tool User's manual | 3AUA0000094606 |

Manuals and quick guides for I/O extension modules, fieldbus adapter, etc.

You can find manuals and other product documents in PDF format on the Internet. See section Document library on the Internet on the inside of the back cover. For manuals not available in the Document library, contact your local ABB representative.

# Firmware manual

## ACS880 IGBT based SPRS control program (option +N5850)

Table of contents



2. Quick start-up guide





# Table of contents

---

## 1. Introduction to the manual

|                                |    |
|--------------------------------|----|
| Contents of this chapter ..... | 7  |
| Purpose of this guide .....    | 7  |
| Compatibility .....            | 7  |
| Safety .....                   | 8  |
| Licensing .....                | 8  |
| Target audience .....          | 9  |
| Contents .....                 | 9  |
| Related documents .....        | 10 |
| Terms and abbreviations .....  | 11 |

## 2. Quick start-up guide

|                                |    |
|--------------------------------|----|
| Contents of this chapter ..... | 13 |
| Before you start .....         | 13 |
| Safety .....                   | 13 |
| Start-up procedure .....       | 14 |



## 3. Default control connections

|                                                                 |    |
|-----------------------------------------------------------------|----|
| Contents of this chapter .....                                  | 15 |
| Default control connections of SPRS control program (ZCU) ..... | 16 |

## 4. Program features

|                                                                                |    |
|--------------------------------------------------------------------------------|----|
| Contents of this chapter .....                                                 | 17 |
| Overview of IGBT based SPRS control program .....                              | 17 |
| SPRS operation .....                                                           | 18 |
| SPRS connection diagram .....                                                  | 19 |
| Benefits of using SPRS system .....                                            | 20 |
| Liquid Resistance Starter (LRS) tracking .....                                 | 20 |
| Programmable analog inputs .....                                               | 21 |
| Communication tools .....                                                      | 22 |
| Drive composer .....                                                           | 22 |
| Control panel .....                                                            | 22 |
| Setting up communication to SPRS .....                                         | 22 |
| Connecting to a drive with an Assistant control panel for the first time ..... | 25 |
| Ethernet network connection .....                                              | 28 |
| Communication profile .....                                                    | 29 |
| State diagram (ABB Drives profile) .....                                       | 29 |
| Programmable analog outputs .....                                              | 31 |
| Programmable digital inputs .....                                              | 31 |
| Update cycles in the Standard Control Program .....                            | 31 |
| Run enable .....                                                               | 31 |
| Programmable relay outputs .....                                               | 32 |

---

## 6 Table of contents

|                                                     |    |
|-----------------------------------------------------|----|
| Update cycles in the Standard Control Program ..... | 32 |
| SPRS actual signals .....                           | 32 |
| Data storage parameters .....                       | 33 |

### 5. Parameters

|                                                            |    |
|------------------------------------------------------------|----|
| Contents of this chapter .....                             | 35 |
| Terms and abbreviations .....                              | 36 |
| Summary of parameter groups .....                          | 36 |
| Parameter listing .....                                    | 37 |
| 09 SPRS actual signals .....                               | 37 |
| 14 I/O extension module 1 .....                            | 40 |
| 15 I/O extension module 2 .....                            | 40 |
| 74 SPRS DI .....                                           | 40 |
| 75 SPRS User values .....                                  | 42 |
| 76 SPRS relay outputs .....                                | 43 |
| 77 Speed and Feedback SEL .....                            | 44 |
| 78 SPRS Limits .....                                       | 46 |
| 79 LRS tracking .....                                      | 46 |
| 99 Motor data .....                                        | 47 |
| Changed firmware default values for SPRS application ..... | 49 |



### 6. Fault tracing

|                                |    |
|--------------------------------|----|
| Contents of this chapter ..... | 51 |
| Indications .....              | 51 |
| Warnings and faults .....      | 51 |
| Warning messages .....         | 52 |
| Fault messages .....           | 53 |

### Further information

|                                                |    |
|------------------------------------------------|----|
| Product and service inquiries .....            | 57 |
| Product training .....                         | 57 |
| Providing feedback on ABB Drives manuals ..... | 57 |
| Document library on the Internet .....         | 57 |

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# Introduction to the manual

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## Contents of this chapter

The chapter describes the contents of this manual. It also contains information on the compatibility, safety and intended audience.

## Purpose of this guide

This supplement manual describes the parameter settings and program features required to control and program the ACS880 IGBT based Slip Power Recovery System (SPRS) control program.

Use this supplement manual along with the *ACS880 primary control program firmware manual* [3AUA0000085967 (English)] for general instructions on installation and maintenance.

## Compatibility

This supplement applies to the ACS880 IGBT based SPRS control program used as a part of ACS880 primary control program. See version details below.

| Control program                        | Version  |
|----------------------------------------|----------|
| ACS880 primary control program         | 3.10.0.0 |
| ACS880 IGBT based SPRS control program | 1.10.0.0 |

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## Safety

Follow all safety instructions delivered with the drive.

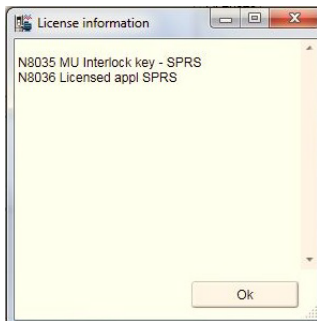
- Read the **complete safety instructions** before you install, commission, or use the drive. The complete safety instructions are given at the beginning of the hardware manual for the single drives, or in the *Safety instructions [3AUA0000102301 (English)]* for the multidrives and multidrives modules.
- 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.

## Licensing

The IGBT based SPRS control program (+N5850), version TBD comes with a license key on the ZMU-02 memory unit. The program activates only after recognizing the key and correspondingly registers itself with the crane software.

| Device                          | License key |
|---------------------------------|-------------|
| ZMU-02 memory unit license key  | N8035       |
| SPRS software (loading package) | N8036       |

You can see the license information in the Drive Composer PC tool or in the ACS-AP-x control panel from **System info** → **Licenses**.



After the program is downloaded to the memory unit with the license key, the program remains there unless you remove it. This makes it possible for you to upgrade the SPRS control program later on a separate SPRS loading package.

If the program was loaded to the memory unit without the license key, then the drive indicates a fault [64A5 Licensing fault](#). See the auxiliary fault code in the Event logger to know the plus code of the missing license, in this case N8035. For further assistance, contact your local ABB representative.



## Target audience

This supplement is intended for personnel who install, commission, operate and service slip ring induction motors. The reader of this manual is expected to know the standard electrical wiring practices, electronic components, and electrical schematic symbols.

## Contents

This manual consists of following chapters:

*Introduction to the manual* contains information on compatibility, safety and intended audience. It also includes a list of terms and abbreviations used in this manual.

*Quick start-up guide* provides the basic start-up procedure of the ACS880 IGBT based slip power recovery system.

*Default control connections* provides default control connections of the SPRS.

*Program features* contains descriptions of features specific to the SPRS such as low line harmonics and dedicated synchronization unit (RSYC) for bump less transfer.

*Parameters* describes the parameters used for SPRS control program.

*Fault tracing* lists the SPRS program specific faults and warning messages with possible cause and remedy.

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## Cybersecurity disclaimer

This product is designed to be connected to and to communicate information and data via a network interface. It is Customer's sole responsibility to provide and continuously ensure a secure connection between the product and Customer network or any other network (as the case may be). Customer shall establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information. ABB and its affiliates are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

## Related documents

See the [List of related manuals](#) on the inside of the front cover.

## Terms and abbreviations

| Term/abbreviation | Definition                                                                                                                                                                                                                          |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ACS880            | A product family of ABB drives                                                                                                                                                                                                      |
| ACS-AP-I          | Types of control panel used with ACS880 drives                                                                                                                                                                                      |
| ACS-AP-W          |                                                                                                                                                                                                                                     |
| BCU               | Type of control unit used in ACS880 drives.                                                                                                                                                                                         |
| CCR               | Central control room.                                                                                                                                                                                                               |
| DDCS              | Distributed drives communication system; a protocol used in communication between ABB drive equipment                                                                                                                               |
| FCB               | Function Chart Builder; Programming language to program RMIO board.                                                                                                                                                                 |
| GRR               | Grid rotor resistance; Connected to rotor and used for controlling the speed of slip ring induction motor.                                                                                                                          |
| ID run            | Motor identification run. During the identification run, the drive will identify the characteristics of the motor for optimum motor control.                                                                                        |
| IGBT              | Insulated gate bipolar transistor; a voltage-controlled semiconductor type widely used in inverters and IGBT supply units due to their easy controllability and high switching frequency                                            |
| ISU               | An IGBT supply unit; type of supply unit implemented using IGBT switching components, used in regenerative and low-harmonic drives.                                                                                                 |
| LCL               | Line filter. Inductor-capacitor-inductor filter for attenuating high order harmonics in IGBT supply units.                                                                                                                          |
| LRS               | Resistance Starter. It is connected to the rotor for controlling the speed of slip ring induction motor. The resistance is achieved through movement of contacts kept in an electrolyte.                                            |
| MSW               | Main status word; Indicates the status of converter/inverter.                                                                                                                                                                       |
| RSYNC             | Synchronization unit for bump less transfer. The RSYNC ensures smooth and automated changeover from GRR to SPRS.                                                                                                                    |
| RMIO              | Motor control and I/O board. Drive control unit.                                                                                                                                                                                    |
| RDCO-0x           | DDCS communication module.                                                                                                                                                                                                          |
| SPRS              | Slip power recovery system; An external system connected to the rotor circuit, which provides excellent torque and speed control. Also recovers the power from rotor and feeds back to the power system avoiding wastage of energy. |
| ZCU               | Type of control unit used in ACS880 drives.<br>The control unit may be fitted onto the power module, or installed separately.                                                                                                       |



# 2

## Quick start-up guide

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### Contents of this chapter

This chapter contains the basic start-up procedure of the ACS880 IGBT based SPRS control program.

### Before you start

Make sure the drive is mechanically and electrically installed as described in the appropriate *Quick installation guide* and/or *Hardware manual*.

### Safety

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**WARNING!** All electrical installation and maintenance work on the drive must be carried out by qualified electricians only.

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Never work on the drive, the brake chopper circuit, the motor cable or the motor when power is applied to the drive. Always make sure by measuring that no voltage is actually present.



**WARNING!** Make sure that the machinery into which the drive with the Override control program is integrated fulfills the personnel safety regulations. Note that the frequency converter (a Complete Drive Module or a Basic Drive Module, as defined in IEC 61800-2 with the Override control program), is not considered as a safety device mentioned in the European Machinery Directive and related harmonized standards. Thus, the personnel safety of the complete machinery must not be based on a specific frequency converter feature (such as the Override control program), but it has to be implemented as defined in the application specific regulations.

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## Start-up procedure

You can operate the drive locally from Drive composer or from the ACS880 control panel.

The following steps describe the actions that is necessary when powering up the drive for the first time in a new installation (for example, entering the motor data). After the start-up, the drive can be powered up without using these start-up functions. You can repeat the start-up procedure when you change the data.

In there is a fault, refer to chapter [Fault tracing](#) on page 47.

| Safety                   |                                                                                                                                                                                                                                                                                                                                             |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/> |  <b>WARNING!</b> Obey all safety instructions for the drive. Only qualified electricians are allowed to start up the drive.                                                                                                                                |
| Settings                 |                                                                                                                                                                                                                                                                                                                                             |
| <input type="checkbox"/> | Switch on the HT isolator and the charge feedback transformer.<br>See <a href="#">SPRS connection diagram</a> on page 19.                                                                                                                                                                                                                   |
| <input type="checkbox"/> | Check the voltage at the incoming panel.<br>The voltage should be equal to the secondary voltage of feedback transformer.                                                                                                                                                                                                                   |
| <input type="checkbox"/> | Switch on the ISU and check the DC bar voltage in ISU CDP.<br>The DC bus voltage should be $1.1 \cdot \sqrt{2} \cdot V_{ac}$ (secondary voltage).                                                                                                                                                                                           |
| <input type="checkbox"/> | Check the DI status of the inverter and SPRS RMIO as per the configuration.<br>See <a href="#">SPRS connection diagram</a> on page 19.                                                                                                                                                                                                      |
| <input type="checkbox"/> | Check the rotor speed.<br>The rotor speed should be within the specified limit.<br>See parameters <a href="#">78.01 SPRS max speed %</a> and <a href="#">78.02 SPRS min speed %</a> .                                                                                                                                                       |
| <input type="checkbox"/> | Release the emergency stop button on the panel and check if inverter and SPRS are ready for operation. Using selector, switch from GRR to SPRS mode.<br>After SPRS RMIO receives synchronization acknowledgment from RSYNC card the changeover takes place from GRR/LRS to SPRS.<br>See <a href="#">SPRS connection diagram</a> on page 19. |
| <input type="checkbox"/> | Make sure the SPRS is aligned with the connection diagram.<br>See <a href="#">SPRS connection diagram</a> on page 19.                                                                                                                                                                                                                       |





# Default control connections

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## Contents of this chapter

This chapter describes the default control connections of ACS880 IGBT based SPRS control program for ZCU control unit used with ACS880 drive.

## Default control connections of SPRS control program (ZCU)

| Terminal X21                                   |        | ZCU/BCU board                                                                                        |
|------------------------------------------------|--------|------------------------------------------------------------------------------------------------------|
| 1                                              | +24VI  | 24 V DC, 2 A                                                                                         |
| 2                                              | GND    |                                                                                                      |
| <b>XAI</b> Reference voltage and analog inputs |        |                                                                                                      |
| 1                                              | +VREF  | 10 V DC, $R_L$ 1...10 kohm                                                                           |
| 2                                              | -VREF  | -10 V DC, $R_L$ 1...10 kohm                                                                          |
| 3                                              | AGND   | Ground                                                                                               |
| 4                                              | AI1+   | <b>Speed reference</b>                                                                               |
| 5                                              | AI1-   | 0(2)...10 V, $R_{in}$ > 200 kohm                                                                     |
| 6                                              | AI2+   | By default not in use.                                                                               |
| 7                                              | AI2-   | 0(4)...20 mA, $R_{in}$ > 100 ohm                                                                     |
| <b>XAO</b> Analog outputs                      |        |                                                                                                      |
| 1                                              | AO1    | <b>Motor speed rpm</b>                                                                               |
| 2                                              | AGND   | 0...20 mA, $R_L$ < 500 ohm                                                                           |
| 3                                              | AO2    | <b>Motor current</b>                                                                                 |
| 4                                              | AGND   | 0...20 mA, $R_L$ < 500 ohm                                                                           |
| <b>XD2D</b> Drive-to-drive link                |        |                                                                                                      |
| 1                                              | B      | Drive-to-drive link                                                                                  |
| 2                                              | A      |                                                                                                      |
| 3                                              | BGND   |                                                                                                      |
| <b>XRO1, XRO2, XRO3</b> Relay outputs          |        |                                                                                                      |
| 1                                              | NC     | <b>SPRS contactor ON</b>                                                                             |
| 2                                              | COM    |                                                                                                      |
| 3                                              | NO     |                                                                                                      |
| 1                                              | NC     | <b>GRR contactor OFF</b>                                                                             |
| 2                                              | COM    |                                                                                                      |
| 3                                              | NO     |                                                                                                      |
| 1                                              | NC     | <b>Sync contactor ON</b>                                                                             |
| 2                                              | COM    |                                                                                                      |
| 3                                              | NO     |                                                                                                      |
| <b>XD24</b> Digital interlock                  |        |                                                                                                      |
| 1                                              | DIIL   | Emergency stop select.                                                                               |
| 2                                              | +24VD  | +24 V DC 200 mA                                                                                      |
| 3                                              | DICOM  | Digital input ground                                                                                 |
| 4                                              | +24VD  | +24 V DC 200 mA                                                                                      |
| 5                                              | DIOGND | Digital input/output ground                                                                          |
| <b>XDIO</b> Digital input/outputs              |        |                                                                                                      |
| 1                                              | DIO1   | Input: Deactivate override control (0-->1 = Off)                                                     |
| 2                                              | DIO2   | Output: Running                                                                                      |
| <b>XDI</b> Digital inputs                      |        |                                                                                                      |
| 1                                              | DI1    | ACK SPRS contactor on                                                                                |
| 2                                              | DI2    | ACK GRR contactor on                                                                                 |
| 3                                              | DI3    | ACK Sync contactor on                                                                                |
| 4                                              | DI4    | HT isolator on feedback                                                                              |
| 5                                              | DI5    | Sync input select                                                                                    |
| 6                                              | DI6    | SPRS GRR select                                                                                      |
| <b>XSTO</b>                                    |        | Safe torque off circuits must be closed for the drive to start. See <i>Hardware manual</i> of drive. |
| <b>X12</b>                                     |        | Safety options connection                                                                            |
| <b>X13</b>                                     |        | Control panel connection                                                                             |
| <b>X205</b>                                    |        | Memory unit connection                                                                               |





# Program features

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## Contents of this chapter

This chapter describes the additional features of IGBT based SPRS control program used with the ACS880 primary control program.

## Overview of IGBT based SPRS control program

Slip Power Recovery System (SPRS) is an external system connected to the rotor circuit for controlling speed and torque. The system also recovers power from the rotor and feeds it back to the power system, avoiding wastage of energy.

This system is suitable for any new installation as well as retrofits. It offers optimum solution for speed adjustable applications with limited speed range. The power range is 500 to 5000 kW. See the [SPRS connection diagram](#) on page 19 to understand the operating principle of the complete system.

The IGBT based SPRS application is designed by programming the motor and I/O control (ZCU) board of ACS880 drive using an application software. The software is customized using the CODESYS tool for:

- integrating I/O control extension
- configuring application parameters and signals
- establishing communication between the control boards.

Other SPRS specific parameters can be programmed at the time of commissioning using the Drive composer PC tool or the ACS-AP-I control panel. You can easily program the SPRS parameters using the logical groups of ACS880 drive parameters. See section [Parameters](#) on page 35.

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The parameter group 99 *START-UP DATA* includes all the basic settings required for matching the ACS880 drive with the motor and to set the control panel display language. You can set these parameters at the time of start-up. ABB recommends not to change these settings at any time. See *ACS880 primary control program firmware manual* [3AUA0000085967 (English)].

## **SPRS operation**

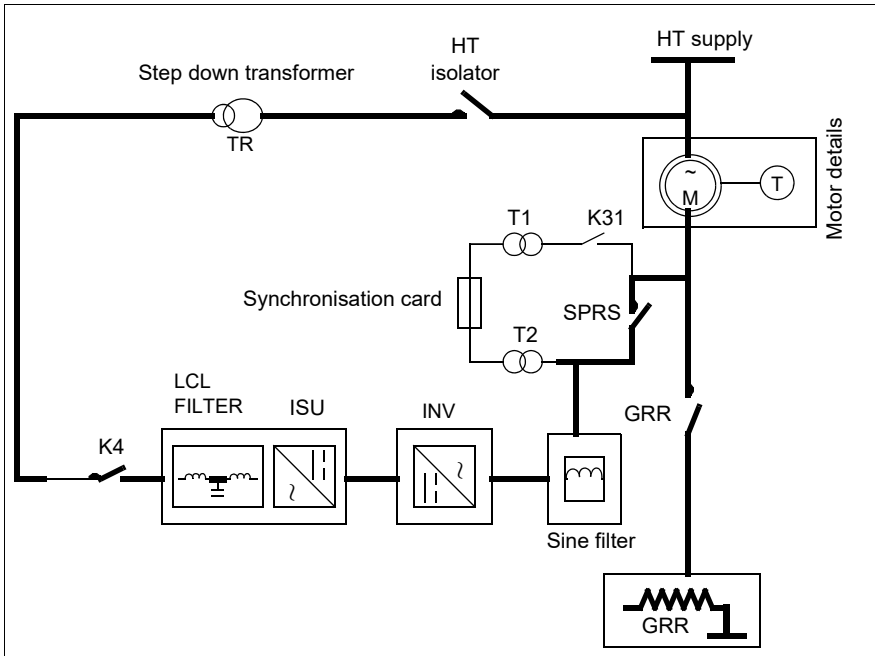
The SPRS system synchronizes with the motor during the motor start-up and is available for process control. You can start the motor using either grid rotor resistor or liquid rotor resistor, based on the requirements of the user and the load torque.

The system integrates start-up functions and speed control functions into one drive system. You can retrofit the system to an existing motor and retain the existing start-up functions. The system determines how SPRS coordinates with the motor startup functions.

The ACS880 Multidrive converter with dedicated control board and customized SPRS control program facilitates optimum performance of the connected slip ring induction motor. If there is no tachometer feedback, the control program provides system performance by using special transducers for voltage reference.

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■ **SPRS connection diagram**



| Component            | Function                                                                                                                                                                                                                                              |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Inverter (INV)       | Connected to rotor winding. Modulates the amount of power fed back into the power system and controls motor speed.                                                                                                                                    |
| Converter (ISU)      | Connected to power system.                                                                                                                                                                                                                            |
| Transformer          | Matches system voltages.                                                                                                                                                                                                                              |
| Synchronization unit | Uses zero crossing transformer for bumpless transfer to <i>SPRS</i> and <i>GRR</i> . Q-control offers reactive power compensation by changing the flux length for system power factor correction, which eliminates the requirement of capacitor bank. |

## ■ Benefits of using SPRS system

The IGBT based SPRS system offers following benefits in the power system compared to the previous methods:

- unity power factor
- low harmonics
- saves energy that is wasted as heat loss.

## Liquid Resistance Starter (LRS) operation

The LRS is used to control the starting torque of a slip ring induction motor. With LRS, the resistance of the motor is controlled by adjusting the distance between the electrodes (one fixed and one movable electrode) which are kept in a liquid electrolyte (see in below connection diagram). The resistance is achieved by moving the movable electrode as necessary. The resistance is zero when the electrodes are in contact.

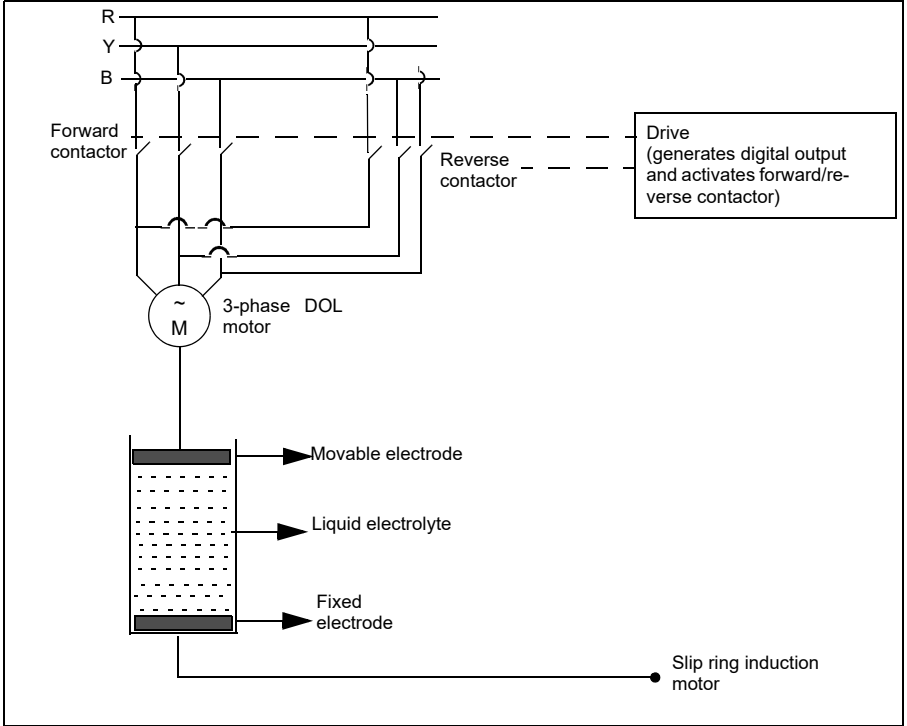
The LRS tracking function tracks the movement of the movable electrode inside the liquid electrolyte. The function can be activated with parameter [79.01 LRS tracking enable](#). Parameter [79.02 LRS speed deviation percentage](#) defines the percentage of speed deviation to enable the LRS.

A motor running in the Direct Online (DOL) mode is used for the movement of electrode. When the forward contactor activates, DOL motor runs in forward direction and electrode moves towards the fixed electrode. When the reverse contactor is activated, DOL motor moves in reverse direction and the electrode moves in away from the fixed electrode.

The LRS activates the forward and reverse contractors automatically based on the difference in speed references from parameters [79.03 CCR speed reference](#) and [79.04 Actual speed feedback](#). Parameter [79.07 LRS contactor command status](#) shows the status of forward/reverse movement of the contactors. This status can be used for the smooth transition between SPRS mode and LRS mode.

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## LRS connection diagram



### Settings

Parameter group [79 LRS tracking](#) (page 46)

## Programmable analog inputs

The drive has two programmable analog inputs: one voltage input (0/2 to 10 V or -10 to 10 V) and one current input (0/4 to 20 mA). Three extra analog inputs are available to scale the input values of the SPRS RMIO in counts.

### Settings

| Parameter                                       | Additional information                                              |
|-------------------------------------------------|---------------------------------------------------------------------|
| Group 12 Standard AI                            | Standard outputs for selecting and processing analog output values. |
| Group <a href="#">77 Speed and Feedback SEL</a> | AI as a reference source                                            |

## Communication tools

### ■ Drive composer

Drive composer PC tool is a 32-bit Windows application for commissioning and maintaining ABB common architecture drives.

The full version is called Drive composer pro and the limited version is called Drive composer entry. Both versions include a demo that allows testing user interface functionality, edit parameter files offline (pro) or open and analyze saved monitored files without connecting to a physical drive.

### ■ Control panel

The ACS880 drive uses ACS-AP-I control panel for programming and locally controlling the drive. For more details, see chapter Control Panel in the *ACS880 primary control program firmware manual* [3AUA0000085967 (English)].

## Setting up communication to SPRS

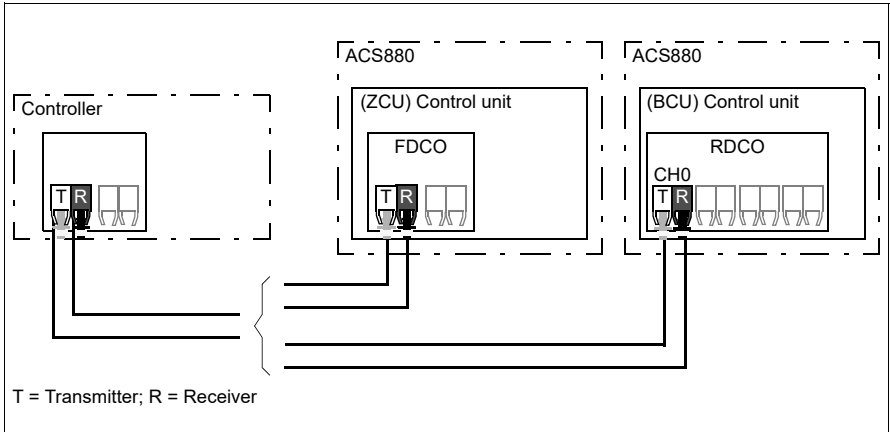
The control program uses DDCS protocol to exchange data between the RDCO boards. The SPRS RDCO fetches data from INV RDCO and ISU RDCO at intervals of 10 ms.

An example connection with either a ZCU-based or BCU-based IGBT supply unit using fiber optic cables is shown below.

IGBT supply units with a **ZCU** control unit require an additional FDCO DDCS communication module; IGBT supply units with a BCU control unit require RDCO or FDCO module. The **BCU** has a dedicated slot for the RDCO – FDCO module can also be used with a BCU control unit but it will reserve one of the three universal option module slots. Ring and star configurations are also possible much in the same way as with the master/follower link; the notable difference is that the external

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controller connects to channel CH0 on the RDCO module instead of CH2. The channel on the FDCO communication module can be freely selected.

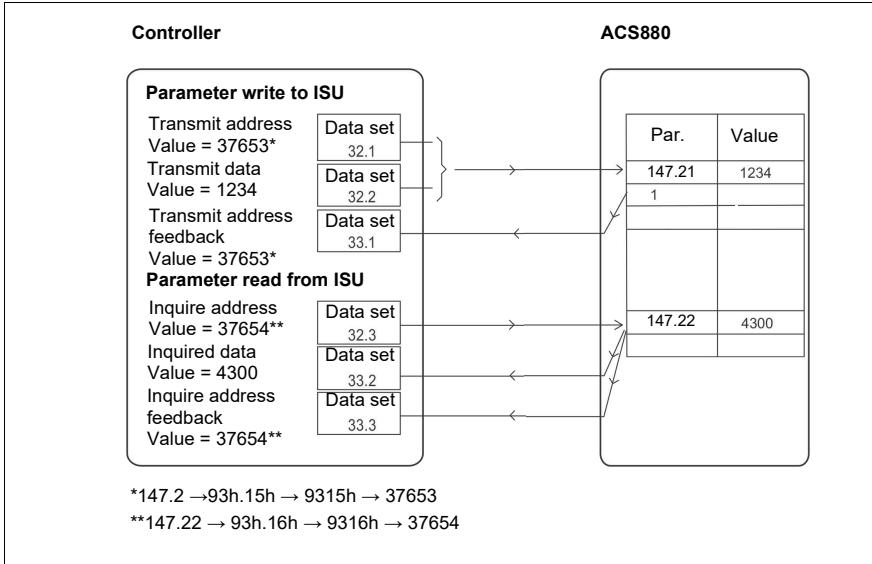


## Communication

The communication between the controller and the IGBT supply unit consists of data sets of three 16-bit words each. The controller sends a data set to the IGBT supply unit, which returns the next data set to the controller.

The communication uses data sets 10...33. The contents of the data sets are freely configurable, but data set 10 typically contains the control word, while data set 11 returns the status word and selected actual values.

By default, data sets 32 and 33 are dedicated for the mailbox service, which enables the setting or inquiry of parameter values as follows:



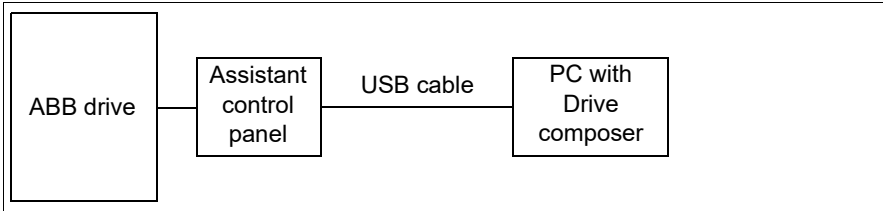


## ■ Connecting to a drive with an Assistant control panel for the first time

To establish a connection between Drive composer and drive, connect a USB type A (PC) type mini B (panel) cable to the USB port of the computer and the USB port of the Assistant control panel (ACS-AP-x panel). The maximum length of the USB cable should be three meters.

**Note:** If the drive is used without an Assistant control panel or with a Basic control panel, use separate USB/485 adapter to establish connection between Drive composer and drive.

1. Connect your PC to the Assistant control panel with a USB cable.



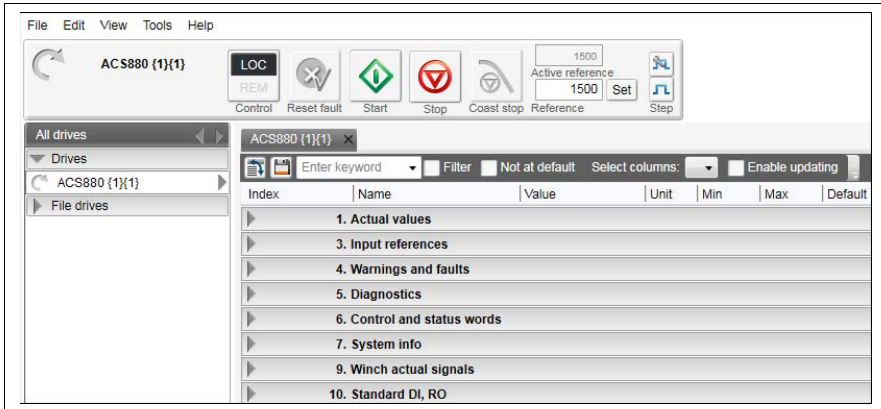
The "USB connected" message appears on the control panel screen.

**Note:** You cannot use the Assistant control panel when it is connected to the PC.

2. Double click **Drive composer entry/pro.exe** to launch Drive composer.
3. Click **Connect** if you want to connect to the drive or click **Demo** if you want to choose the Offline mode.



Drive composer loads the parameters and displays the following window.



You can also select the dedicated connections to the drive:

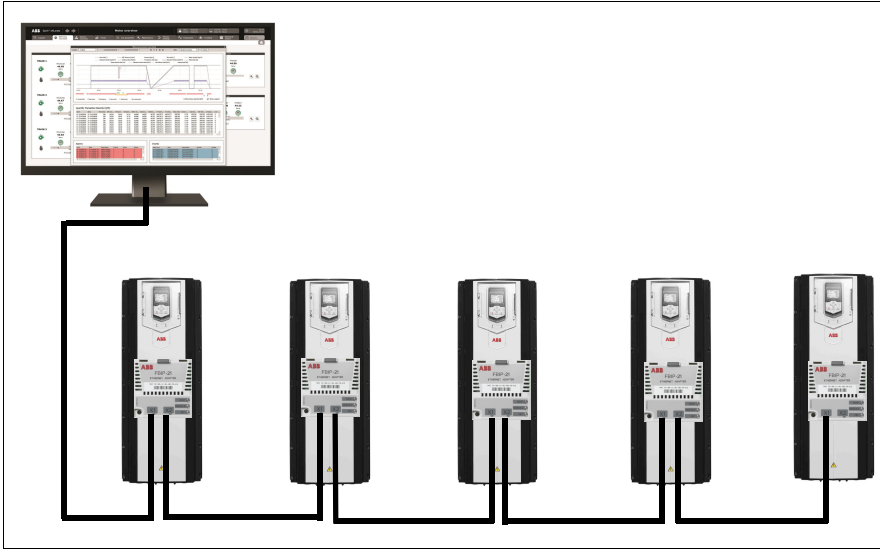
| Connection         | Result                                                                                                                                                                    |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DDCS (ACS800 only) | Connects to the drive through DDCS (fiber optic) communication.                                                                                                           |
| USB/COM            | Connects to the drive through USB connection. Use this option only when you want to connect to the drive through serial connection, example, USB cable to ACS-AP-x panel. |
| Ethernet           | Connects to the drive through Ethernet network                                                                                                                            |
| Virtual drive      | Connects to the Virtual drive smart component. This option is applicable only when you have Automation Builder installed in the PC.                                       |
| Comm settings      | Opens another dialog box where you can configure the connections in more detail other than the above three options.                                                       |

Observe the following actions in the Assistant control panel:

- Status LED start flickering, to indicate that data is transferring between the drive and PC.
  - Status LED keeps blinking, as long as the Drive composer PC tool is connected to the drive.
  - The welcome dialog box displays on the screen to indicate that the application is initialized.
  - On first time connection, parameter texts are loaded from the drive and this might take few minutes depending on the drive type.
4. If the drive composer fails to connect online with the drive, go to **View ® Settings** to check the COM settings and click **View ® Refresh** (Ctrl + R) to reconnect Drive composer to the drive.
-

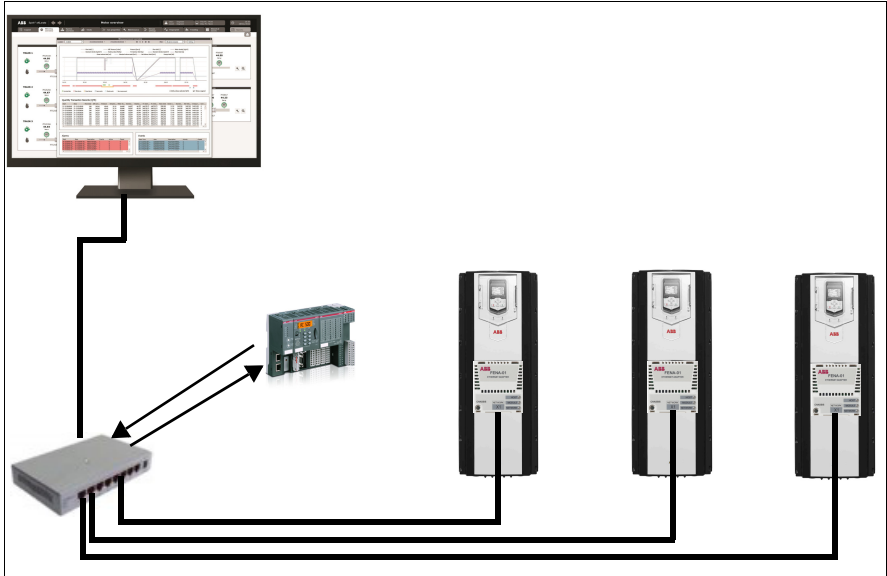
## ■ Ethernet network connection

The figure below shows the Drive composer PC tool communication set up through Ethernet cables.



## Connection through Ethernet fieldbus

The below figure shows the Drive composer PC tool communication set up through the Ethernet fieldbus.



For more information on Ethernet network connection, refer *Drive composer Start-up and maintenance PC tool user's manual* [3AUA0000094606 (English)].

## Communication profile

### ■ State diagram (ABB Drives profile)

The block diagram below illustrates AC drive communication profile with different control and states.



## Programmable analog outputs

Two programmable current outputs (0/4 to 20 mA) are available as standard. The analog output signals can be proportional to motor speed, process speed (scaled motor speed), output frequency, output current, motor torque, motor power, etc.

You can write a value to an analog output through a serial communication link.

### Settings

| Parameter            | Additional information                                              |
|----------------------|---------------------------------------------------------------------|
| Group 13 Standard AO | Standard outputs for selecting and processing analog output values. |

## Programmable digital inputs

The drive consists of six programmable digital inputs as a standard. Six extra inputs are available if optional digital I/O extension modules are used.

### ■ Update cycles in the Standard Control Program

| Input        | Cycle |
|--------------|-------|
| DI/standard  | 6 ms  |
| DI/extension | 12 ms |

### Settings

| Group/Parameter         | Additional information       |
|-------------------------|------------------------------|
| Group <i>74 SPRS DI</i> | DI as start, stop, direction |

## Run enable

The drive run can be prevented using the run enable function. If the run enable signal is switched off, the drive will not start. If already running, the drive will stop according to the setting of parameter *20.11 Run enable stop mode*.

## Programmable relay outputs

The drive consists of three programmable relay outputs as a standard. Six outputs can be added by using optional digital I/O extension modules. You can set the parameter in the relay outputs to indicate the following information: ready, running, fault, warning, motor stall and so on.

You can write a value to a relay output through a serial communication link.

### ■ Update cycles in the Standard Control Program

| Input        | Cycle  |
|--------------|--------|
| RO/standard  | 100 ms |
| RO/extension | 100 ms |

#### Settings

| Group/Parameter                             | Additional information                  |
|---------------------------------------------|-----------------------------------------|
| Group <a href="#">76 SPRS relay outputs</a> | RO value selections and operation times |

## SPRS actual signals

Several SPRS actual signals are available:

- Sync correction
- CCR speed ref
- Actual speed
- SPRS and INV DI Status
- AI and AO Values
- SPRS Status word 1, 2, 3, 5
- Fault word 1
- Warning word 1
- Drive reference percentage
- Actual speed feedback
- Motor potentiometer reference

#### Settings

| Parameter                                    | Additional information                       |
|----------------------------------------------|----------------------------------------------|
| Group <a href="#">09 SPRS actual signals</a> | Lists signals for monitoring SPRS operation. |

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## Data storage parameters

Data storage relates to parameters used for receiving information from or sending to an external control system. For data storage parameters, see *ACS880 primary control program firmware manual* [3AUA0000085967 (English)].

### Settings

| Parameter                    | Additional information                                                                                      |
|------------------------------|-------------------------------------------------------------------------------------------------------------|
| Group 47 <i>Data storage</i> | This group defines parameters used for receiving information from or sending to an external control system. |

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5

# Parameters

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## Contents of this chapter

This chapter lists the actual signals and parameters of the ACS880 IGBT based SPRS application and also gives the fieldbus equivalent values for each signal/parameter. Refer these parameters in addition to the actual signals and parameters described in the *ACS880 primary control program firmware manual* [3AUA0000085967 (English)].

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## Terms and abbreviations

| Term          | Definition                                                                                                                                                                                                                                                                                                                                                                 |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Actual signal | Type of <i>Parameter</i> that is the result of a measurement or calculation by the drive, or contains status information. Most actual signals are read-only, but some (especially counter-type actual signals) can be reset.                                                                                                                                               |
| Def           | (In the following table, shown on the same row as the parameter name)<br>The default value of a <i>Parameter</i> .<br><b>Note:</b> Certain drive hardware or optional equipment may require different default values.                                                                                                                                                      |
| FbEq16        | (In the following table, shown on the same row as the parameter range, or for each selection)<br>16-bit fieldbus equivalent: The scaling between the value shown on the panel and the integer used in communication when a 16-bit value is selected for transmission to an external system.<br>A dash (-) indicates that the parameter is not accessible in 16-bit format. |
| Other         | The value is taken from another parameter.<br>Choosing "Other" displays a parameter list in which the user can specify the source parameter.                                                                                                                                                                                                                               |
| Other [bit]   | The value is taken from a specific bit in another parameter.<br>Choosing "Other" displays a parameter list in which the user can specify the source parameter and bit.                                                                                                                                                                                                     |
| Parameter     | Either a user-adjustable operating instruction for the drive, or an <i>Actual signal</i> .                                                                                                                                                                                                                                                                                 |
| p.u.          | Per unit                                                                                                                                                                                                                                                                                                                                                                   |

## Summary of parameter groups

| Group                                     | Contents                                                                                        | Page               |
|-------------------------------------------|-------------------------------------------------------------------------------------------------|--------------------|
| <a href="#">09 SPRS actual signals</a>    | Signals for monitoring SPRS operation.                                                          | <a href="#">37</a> |
| <a href="#">14 I/O extension module 1</a> | Configuration of I/O extension module 1 for SPRS.                                               | <a href="#">40</a> |
| <a href="#">15 I/O extension module 2</a> | Configuration of I/O extension module 2 for SPRS.                                               | <a href="#">40</a> |
| <a href="#">74 SPRS DI</a>                | Defines SPRS digital inputs.                                                                    | <a href="#">40</a> |
| <a href="#">75 SPRS User values</a>       | User values for SPRS.                                                                           | <a href="#">42</a> |
| <a href="#">76 SPRS relay outputs</a>     | Status information indicated through the relay outputs and the relay operating delays for SPRS. | <a href="#">43</a> |
| <a href="#">77 Speed and Feedback SEL</a> | Analog inputs for SPRS.                                                                         | <a href="#">44</a> |
| <a href="#">78 SPRS Limits</a>            | Speed limits for SPRS.                                                                          | <a href="#">46</a> |
| <a href="#">79 LRS tracking</a>           | Tracking of electrode movement in Liquid Resistance Starter (LRS).                              | <a href="#">46</a> |
| <a href="#">99 Motor data</a>             | Motor configuration settings.                                                                   | <a href="#">47</a> |

## Parameter listing

| No.                           | Name/Value                          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Def/<br>FbEq16/32 |      |             |   |                           |                                                   |   |                            |                                                       |   |                          |                                                  |   |                                |                                                           |   |                        |                                                |   |                        |                                                |   |                       |                                               |   |                                     |                                                                 |        |          |  |
|-------------------------------|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------|-------------|---|---------------------------|---------------------------------------------------|---|----------------------------|-------------------------------------------------------|---|--------------------------|--------------------------------------------------|---|--------------------------------|-----------------------------------------------------------|---|------------------------|------------------------------------------------|---|------------------------|------------------------------------------------|---|-----------------------|-----------------------------------------------|---|-------------------------------------|-----------------------------------------------------------------|--------|----------|--|
| <b>09 SPRS actual signals</b> |                                     | Signals for monitoring SPRS operation. These parameters are read-only.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                   |      |             |   |                           |                                                   |   |                            |                                                       |   |                          |                                                  |   |                                |                                                           |   |                        |                                                |   |                        |                                                |   |                       |                                               |   |                                     |                                                                 |        |          |  |
| 09.01                         | Sync correction                     | Shows the value of the speed correction done by Rsync card during Sync operation, for changeover from GRR to SPRS mode. This value is provided by parameter 40.05 Process PID trim output Actual.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | -                 |      |             |   |                           |                                                   |   |                            |                                                       |   |                          |                                                  |   |                                |                                                           |   |                        |                                                |   |                        |                                                |   |                       |                                               |   |                                     |                                                                 |        |          |  |
|                               | 0...3000rpm                         | Correction factor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1 = 1rpm          |      |             |   |                           |                                                   |   |                            |                                                       |   |                          |                                                  |   |                                |                                                           |   |                        |                                                |   |                        |                                                |   |                       |                                               |   |                                     |                                                                 |        |          |  |
| 09.02                         | Modified Sync reference [%]         | Shows modified synchronization reference of the drive.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | -                 |      |             |   |                           |                                                   |   |                            |                                                       |   |                          |                                                  |   |                                |                                                           |   |                        |                                                |   |                        |                                                |   |                       |                                               |   |                                     |                                                                 |        |          |  |
|                               | 0...3000%                           | Value in percent.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1 = 1%            |      |             |   |                           |                                                   |   |                            |                                                       |   |                          |                                                  |   |                                |                                                           |   |                        |                                                |   |                        |                                                |   |                       |                                               |   |                                     |                                                                 |        |          |  |
| 09.03                         | Speed actual [%]                    | Shows output of the speed measurement block.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | -                 |      |             |   |                           |                                                   |   |                            |                                                       |   |                          |                                                  |   |                                |                                                           |   |                        |                                                |   |                        |                                                |   |                       |                                               |   |                                     |                                                                 |        |          |  |
|                               | 0...1000%                           | Value in percent.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1 = 1%            |      |             |   |                           |                                                   |   |                            |                                                       |   |                          |                                                  |   |                                |                                                           |   |                        |                                                |   |                        |                                                |   |                       |                                               |   |                                     |                                                                 |        |          |  |
| 09.04                         | CCR speed reference [%]             | Shows speed reference from Central Control Room (CCR).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | -                 |      |             |   |                           |                                                   |   |                            |                                                       |   |                          |                                                  |   |                                |                                                           |   |                        |                                                |   |                        |                                                |   |                       |                                               |   |                                     |                                                                 |        |          |  |
|                               | 0...100%                            | Value in percent.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1 = 1%            |      |             |   |                           |                                                   |   |                            |                                                       |   |                          |                                                  |   |                                |                                                           |   |                        |                                                |   |                        |                                                |   |                       |                                               |   |                                     |                                                                 |        |          |  |
| 09.05                         | Inverter Speed reference [%]        | Shows the internally calculated and modified speed reference from CCR.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | -                 |      |             |   |                           |                                                   |   |                            |                                                       |   |                          |                                                  |   |                                |                                                           |   |                        |                                                |   |                        |                                                |   |                       |                                               |   |                                     |                                                                 |        |          |  |
|                               | 0...100%                            | Value in percent.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1 = 1%            |      |             |   |                           |                                                   |   |                            |                                                       |   |                          |                                                  |   |                                |                                                           |   |                        |                                                |   |                        |                                                |   |                       |                                               |   |                                     |                                                                 |        |          |  |
| 09.06                         | SPRS Status word 1                  | Shows 15-bit data word for monitoring the output of speed measurement block. This parameter is read-only.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | -                 |      |             |   |                           |                                                   |   |                            |                                                       |   |                          |                                                  |   |                                |                                                           |   |                        |                                                |   |                        |                                                |   |                       |                                               |   |                                     |                                                                 |        |          |  |
|                               |                                     | <table border="1"> <thead> <tr> <th>Bit</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Ack for SPRS contactor ON</td> <td>1 = DI of SPRS contactor received / acknowledged.</td> </tr> <tr> <td>1</td> <td>Ack for synchronized input</td> <td>1 = DI of synchronized input received / acknowledged.</td> </tr> <tr> <td>2</td> <td>Ack for GRR contactor ON</td> <td>1 = DI of GRR contactor received / acknowledged.</td> </tr> <tr> <td>3</td> <td>Ack for synchronized contactor</td> <td>1 = DI of synchronized contactor received / acknowledged.</td> </tr> <tr> <td>4</td> <td>Ack for HT isolator ON</td> <td>1 = DI of HT isolator received / acknowledged.</td> </tr> <tr> <td>5</td> <td>Ack for LT isolator ON</td> <td>1 = DI of LT isolator received / acknowledged.</td> </tr> <tr> <td>6</td> <td>Ack for HT breaker ON</td> <td>1 = DI of HT breaker received / acknowledged.</td> </tr> <tr> <td>7</td> <td>Transformer healthy feedback signal</td> <td>1 = DI of transformer healthy feedback received / acknowledged.</td> </tr> <tr> <td>8...15</td> <td>Reserved</td> <td></td> </tr> </tbody> </table> | Bit               | Name | Description | 0 | Ack for SPRS contactor ON | 1 = DI of SPRS contactor received / acknowledged. | 1 | Ack for synchronized input | 1 = DI of synchronized input received / acknowledged. | 2 | Ack for GRR contactor ON | 1 = DI of GRR contactor received / acknowledged. | 3 | Ack for synchronized contactor | 1 = DI of synchronized contactor received / acknowledged. | 4 | Ack for HT isolator ON | 1 = DI of HT isolator received / acknowledged. | 5 | Ack for LT isolator ON | 1 = DI of LT isolator received / acknowledged. | 6 | Ack for HT breaker ON | 1 = DI of HT breaker received / acknowledged. | 7 | Transformer healthy feedback signal | 1 = DI of transformer healthy feedback received / acknowledged. | 8...15 | Reserved |  |
| Bit                           | Name                                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                   |      |             |   |                           |                                                   |   |                            |                                                       |   |                          |                                                  |   |                                |                                                           |   |                        |                                                |   |                        |                                                |   |                       |                                               |   |                                     |                                                                 |        |          |  |
| 0                             | Ack for SPRS contactor ON           | 1 = DI of SPRS contactor received / acknowledged.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                   |      |             |   |                           |                                                   |   |                            |                                                       |   |                          |                                                  |   |                                |                                                           |   |                        |                                                |   |                        |                                                |   |                       |                                               |   |                                     |                                                                 |        |          |  |
| 1                             | Ack for synchronized input          | 1 = DI of synchronized input received / acknowledged.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                   |      |             |   |                           |                                                   |   |                            |                                                       |   |                          |                                                  |   |                                |                                                           |   |                        |                                                |   |                        |                                                |   |                       |                                               |   |                                     |                                                                 |        |          |  |
| 2                             | Ack for GRR contactor ON            | 1 = DI of GRR contactor received / acknowledged.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                   |      |             |   |                           |                                                   |   |                            |                                                       |   |                          |                                                  |   |                                |                                                           |   |                        |                                                |   |                        |                                                |   |                       |                                               |   |                                     |                                                                 |        |          |  |
| 3                             | Ack for synchronized contactor      | 1 = DI of synchronized contactor received / acknowledged.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                   |      |             |   |                           |                                                   |   |                            |                                                       |   |                          |                                                  |   |                                |                                                           |   |                        |                                                |   |                        |                                                |   |                       |                                               |   |                                     |                                                                 |        |          |  |
| 4                             | Ack for HT isolator ON              | 1 = DI of HT isolator received / acknowledged.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                   |      |             |   |                           |                                                   |   |                            |                                                       |   |                          |                                                  |   |                                |                                                           |   |                        |                                                |   |                        |                                                |   |                       |                                               |   |                                     |                                                                 |        |          |  |
| 5                             | Ack for LT isolator ON              | 1 = DI of LT isolator received / acknowledged.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                   |      |             |   |                           |                                                   |   |                            |                                                       |   |                          |                                                  |   |                                |                                                           |   |                        |                                                |   |                        |                                                |   |                       |                                               |   |                                     |                                                                 |        |          |  |
| 6                             | Ack for HT breaker ON               | 1 = DI of HT breaker received / acknowledged.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                   |      |             |   |                           |                                                   |   |                            |                                                       |   |                          |                                                  |   |                                |                                                           |   |                        |                                                |   |                        |                                                |   |                       |                                               |   |                                     |                                                                 |        |          |  |
| 7                             | Transformer healthy feedback signal | 1 = DI of transformer healthy feedback received / acknowledged.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |      |             |   |                           |                                                   |   |                            |                                                       |   |                          |                                                  |   |                                |                                                           |   |                        |                                                |   |                        |                                                |   |                       |                                               |   |                                     |                                                                 |        |          |  |
| 8...15                        | Reserved                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |      |             |   |                           |                                                   |   |                            |                                                       |   |                          |                                                  |   |                                |                                                           |   |                        |                                                |   |                        |                                                |   |                       |                                               |   |                                     |                                                                 |        |          |  |

## 38 Parameters

| No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Name/Value                   | Description                                                                                                   | Def/<br>FbEq16/32 |     |      |             |   |                |                                   |   |                   |                                                                |   |                           |                                                                    |   |                            |                                                                     |        |                       |                                                            |   |                              |                                                                                                  |   |                          |                                                 |   |                    |                                |        |          |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------------------------------|-------------------|-----|------|-------------|---|----------------|-----------------------------------|---|-------------------|----------------------------------------------------------------|---|---------------------------|--------------------------------------------------------------------|---|----------------------------|---------------------------------------------------------------------|--------|-----------------------|------------------------------------------------------------|---|------------------------------|--------------------------------------------------------------------------------------------------|---|--------------------------|-------------------------------------------------|---|--------------------|--------------------------------|--------|----------|--|
| 09.07                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | SPRS Status word<br>2        | Shows 15-bit data word for monitoring the output of speed measurement block. This parameter is read-only.     | -                 |     |      |             |   |                |                                   |   |                   |                                                                |   |                           |                                                                    |   |                            |                                                                     |        |                       |                                                            |   |                              |                                                                                                  |   |                          |                                                 |   |                    |                                |        |          |  |
| <table border="1"> <thead> <tr> <th>Bit</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Reset</td> <td>1 = Reset command active.</td> </tr> <tr> <td>1</td> <td>SPRS selected</td> <td>1 = SPRS selected.</td> </tr> <tr> <td>2</td> <td>Low synchronized feedback</td> <td>1 = Output low command of the synchronized feedback signal active.</td> </tr> <tr> <td>3</td> <td>High synchronized feedback</td> <td>1 = Output high command of the synchronized feedback signal active.</td> </tr> <tr> <td>4...15</td> <td>Reserved</td> <td></td> </tr> </tbody> </table>                                                                                                                                                                                                                                                                                                                                                                                                                         |                              |                                                                                                               |                   | Bit | Name | Description | 0 | Reset          | 1 = Reset command active.         | 1 | SPRS selected     | 1 = SPRS selected.                                             | 2 | Low synchronized feedback | 1 = Output low command of the synchronized feedback signal active. | 3 | High synchronized feedback | 1 = Output high command of the synchronized feedback signal active. | 4...15 | Reserved              |                                                            |   |                              |                                                                                                  |   |                          |                                                 |   |                    |                                |        |          |  |
| Bit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Name                         | Description                                                                                                   |                   |     |      |             |   |                |                                   |   |                   |                                                                |   |                           |                                                                    |   |                            |                                                                     |        |                       |                                                            |   |                              |                                                                                                  |   |                          |                                                 |   |                    |                                |        |          |  |
| 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Reset                        | 1 = Reset command active.                                                                                     |                   |     |      |             |   |                |                                   |   |                   |                                                                |   |                           |                                                                    |   |                            |                                                                     |        |                       |                                                            |   |                              |                                                                                                  |   |                          |                                                 |   |                    |                                |        |          |  |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | SPRS selected                | 1 = SPRS selected.                                                                                            |                   |     |      |             |   |                |                                   |   |                   |                                                                |   |                           |                                                                    |   |                            |                                                                     |        |                       |                                                            |   |                              |                                                                                                  |   |                          |                                                 |   |                    |                                |        |          |  |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Low synchronized feedback    | 1 = Output low command of the synchronized feedback signal active.                                            |                   |     |      |             |   |                |                                   |   |                   |                                                                |   |                           |                                                                    |   |                            |                                                                     |        |                       |                                                            |   |                              |                                                                                                  |   |                          |                                                 |   |                    |                                |        |          |  |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | High synchronized feedback   | 1 = Output high command of the synchronized feedback signal active.                                           |                   |     |      |             |   |                |                                   |   |                   |                                                                |   |                           |                                                                    |   |                            |                                                                     |        |                       |                                                            |   |                              |                                                                                                  |   |                          |                                                 |   |                    |                                |        |          |  |
| 4...15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Reserved                     |                                                                                                               |                   |     |      |             |   |                |                                   |   |                   |                                                                |   |                           |                                                                    |   |                            |                                                                     |        |                       |                                                            |   |                              |                                                                                                  |   |                          |                                                 |   |                    |                                |        |          |  |
| 09.08                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | SPRS Status word<br>3        | Shows the 15-bit data word for monitoring the output of speed measurement block. This parameter is read-only. | -                 |     |      |             |   |                |                                   |   |                   |                                                                |   |                           |                                                                    |   |                            |                                                                     |        |                       |                                                            |   |                              |                                                                                                  |   |                          |                                                 |   |                    |                                |        |          |  |
| <table border="1"> <thead> <tr> <th>Bit</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Inverter ready</td> <td>1 = Inverter ready for operation.</td> </tr> <tr> <td>1</td> <td>SPRS ready to CCR</td> <td>1 = SPRS is ready to take reference from central control room.</td> </tr> <tr> <td>2</td> <td>SPRS running</td> <td>1 = SPRS running with normal operation.</td> </tr> <tr> <td>3</td> <td>SPRS tripped</td> <td>1 = SPRS tripped.</td> </tr> <tr> <td>4</td> <td>SPRS contactor ON cmd</td> <td>1 = SPRS contactor close command active from relay output.</td> </tr> <tr> <td>5</td> <td>Rotor contactor ON cmd</td> <td>1 = Rotor contactor close command active from relay output.</td> </tr> <tr> <td>6</td> <td>Sync process running ack</td> <td>1 = Sync process running acknowledgment active.</td> </tr> <tr> <td>7</td> <td>Synchronized delay</td> <td>1 = Synchronized delay active.</td> </tr> <tr> <td>8...15</td> <td>Reserved</td> <td></td> </tr> </tbody> </table> |                              |                                                                                                               |                   | Bit | Name | Description | 0 | Inverter ready | 1 = Inverter ready for operation. | 1 | SPRS ready to CCR | 1 = SPRS is ready to take reference from central control room. | 2 | SPRS running              | 1 = SPRS running with normal operation.                            | 3 | SPRS tripped               | 1 = SPRS tripped.                                                   | 4      | SPRS contactor ON cmd | 1 = SPRS contactor close command active from relay output. | 5 | Rotor contactor ON cmd       | 1 = Rotor contactor close command active from relay output.                                      | 6 | Sync process running ack | 1 = Sync process running acknowledgment active. | 7 | Synchronized delay | 1 = Synchronized delay active. | 8...15 | Reserved |  |
| Bit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Name                         | Description                                                                                                   |                   |     |      |             |   |                |                                   |   |                   |                                                                |   |                           |                                                                    |   |                            |                                                                     |        |                       |                                                            |   |                              |                                                                                                  |   |                          |                                                 |   |                    |                                |        |          |  |
| 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Inverter ready               | 1 = Inverter ready for operation.                                                                             |                   |     |      |             |   |                |                                   |   |                   |                                                                |   |                           |                                                                    |   |                            |                                                                     |        |                       |                                                            |   |                              |                                                                                                  |   |                          |                                                 |   |                    |                                |        |          |  |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | SPRS ready to CCR            | 1 = SPRS is ready to take reference from central control room.                                                |                   |     |      |             |   |                |                                   |   |                   |                                                                |   |                           |                                                                    |   |                            |                                                                     |        |                       |                                                            |   |                              |                                                                                                  |   |                          |                                                 |   |                    |                                |        |          |  |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | SPRS running                 | 1 = SPRS running with normal operation.                                                                       |                   |     |      |             |   |                |                                   |   |                   |                                                                |   |                           |                                                                    |   |                            |                                                                     |        |                       |                                                            |   |                              |                                                                                                  |   |                          |                                                 |   |                    |                                |        |          |  |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | SPRS tripped                 | 1 = SPRS tripped.                                                                                             |                   |     |      |             |   |                |                                   |   |                   |                                                                |   |                           |                                                                    |   |                            |                                                                     |        |                       |                                                            |   |                              |                                                                                                  |   |                          |                                                 |   |                    |                                |        |          |  |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | SPRS contactor ON cmd        | 1 = SPRS contactor close command active from relay output.                                                    |                   |     |      |             |   |                |                                   |   |                   |                                                                |   |                           |                                                                    |   |                            |                                                                     |        |                       |                                                            |   |                              |                                                                                                  |   |                          |                                                 |   |                    |                                |        |          |  |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Rotor contactor ON cmd       | 1 = Rotor contactor close command active from relay output.                                                   |                   |     |      |             |   |                |                                   |   |                   |                                                                |   |                           |                                                                    |   |                            |                                                                     |        |                       |                                                            |   |                              |                                                                                                  |   |                          |                                                 |   |                    |                                |        |          |  |
| 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Sync process running ack     | 1 = Sync process running acknowledgment active.                                                               |                   |     |      |             |   |                |                                   |   |                   |                                                                |   |                           |                                                                    |   |                            |                                                                     |        |                       |                                                            |   |                              |                                                                                                  |   |                          |                                                 |   |                    |                                |        |          |  |
| 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Synchronized delay           | 1 = Synchronized delay active.                                                                                |                   |     |      |             |   |                |                                   |   |                   |                                                                |   |                           |                                                                    |   |                            |                                                                     |        |                       |                                                            |   |                              |                                                                                                  |   |                          |                                                 |   |                    |                                |        |          |  |
| 8...15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Reserved                     |                                                                                                               |                   |     |      |             |   |                |                                   |   |                   |                                                                |   |                           |                                                                    |   |                            |                                                                     |        |                       |                                                            |   |                              |                                                                                                  |   |                          |                                                 |   |                    |                                |        |          |  |
| 09.10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | SPRS Status word<br>5        | Shows the 15-bit data word for monitoring the output of speed measurement block. This parameter is read-only. | -                 |     |      |             |   |                |                                   |   |                   |                                                                |   |                           |                                                                    |   |                            |                                                                     |        |                       |                                                            |   |                              |                                                                                                  |   |                          |                                                 |   |                    |                                |        |          |  |
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| Bit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Name                         | Description                                                                                                   |                   |     |      |             |   |                |                                   |   |                   |                                                                |   |                           |                                                                    |   |                            |                                                                     |        |                       |                                                            |   |                              |                                                                                                  |   |                          |                                                 |   |                    |                                |        |          |  |
| 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | GRR selected                 | 1 = GRR Selected.                                                                                             |                   |     |      |             |   |                |                                   |   |                   |                                                                |   |                           |                                                                    |   |                            |                                                                     |        |                       |                                                            |   |                              |                                                                                                  |   |                          |                                                 |   |                    |                                |        |          |  |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Reserved                     |                                                                                                               |                   |     |      |             |   |                |                                   |   |                   |                                                                |   |                           |                                                                    |   |                            |                                                                     |        |                       |                                                            |   |                              |                                                                                                  |   |                          |                                                 |   |                    |                                |        |          |  |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Speed more than min limit    | 1 = Operation speed is greater than the minimum limit.                                                        |                   |     |      |             |   |                |                                   |   |                   |                                                                |   |                           |                                                                    |   |                            |                                                                     |        |                       |                                                            |   |                              |                                                                                                  |   |                          |                                                 |   |                    |                                |        |          |  |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Max speed operation          | 1 = Operation speed greater than the maximum limit.                                                           |                   |     |      |             |   |                |                                   |   |                   |                                                                |   |                           |                                                                    |   |                            |                                                                     |        |                       |                                                            |   |                              |                                                                                                  |   |                          |                                                 |   |                    |                                |        |          |  |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Ready for SPRS               | 1 = Ready for SPRS operation.                                                                                 |                   |     |      |             |   |                |                                   |   |                   |                                                                |   |                           |                                                                    |   |                            |                                                                     |        |                       |                                                            |   |                              |                                                                                                  |   |                          |                                                 |   |                    |                                |        |          |  |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Synchronized process running | 1 = Synchronization process running to make the output of inverter match with the rotor voltage.              |                   |     |      |             |   |                |                                   |   |                   |                                                                |   |                           |                                                                    |   |                            |                                                                     |        |                       |                                                            |   |                              |                                                                                                  |   |                          |                                                 |   |                    |                                |        |          |  |
| 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Reserved                     |                                                                                                               |                   |     |      |             |   |                |                                   |   |                   |                                                                |   |                           |                                                                    |   |                            |                                                                     |        |                       |                                                            |   |                              |                                                                                                  |   |                          |                                                 |   |                    |                                |        |          |  |
| 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Emergency stop               | 1 = Emergency stop active.                                                                                    |                   |     |      |             |   |                |                                   |   |                   |                                                                |   |                           |                                                                    |   |                            |                                                                     |        |                       |                                                            |   |                              |                                                                                                  |   |                          |                                                 |   |                    |                                |        |          |  |
| 8...15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Reserved                     |                                                                                                               |                   |     |      |             |   |                |                                   |   |                   |                                                                |   |                           |                                                                    |   |                            |                                                                     |        |                       |                                                            |   |                              |                                                                                                  |   |                          |                                                 |   |                    |                                |        |          |  |

| No.     | Name/Value                          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Def/<br>FbEq16/32 |      |             |   |                        |                                                                                        |   |                          |                                                                                           |   |                     |                                                                                   |   |                    |                                                      |        |              |                                |   |                  |                                                                        |   |                             |                                                                                   |   |             |                                                             |   |                      |                                                                      |   |                      |                                                                      |    |             |                         |    |                  |                                                                  |         |          |  |  |
|---------|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------|-------------|---|------------------------|----------------------------------------------------------------------------------------|---|--------------------------|-------------------------------------------------------------------------------------------|---|---------------------|-----------------------------------------------------------------------------------|---|--------------------|------------------------------------------------------|--------|--------------|--------------------------------|---|------------------|------------------------------------------------------------------------|---|-----------------------------|-----------------------------------------------------------------------------------|---|-------------|-------------------------------------------------------------|---|----------------------|----------------------------------------------------------------------|---|----------------------|----------------------------------------------------------------------|----|-------------|-------------------------|----|------------------|------------------------------------------------------------------|---------|----------|--|--|
| 09.14   | Fault word 1                        | Defines SPRS fault word 1. This parameter is read-only.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -                 |      |             |   |                        |                                                                                        |   |                          |                                                                                           |   |                     |                                                                                   |   |                    |                                                      |        |              |                                |   |                  |                                                                        |   |                             |                                                                                   |   |             |                                                             |   |                      |                                                                      |   |                      |                                                                      |    |             |                         |    |                  |                                                                  |         |          |  |  |
|         |                                     | <table border="1"> <thead> <tr> <th>Bit</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Emergency stop</td> <td>1 = Emergency stop fault active.</td> </tr> <tr> <td>1</td> <td>Max speed operation</td> <td>1 = Max speed operation fault active.</td> </tr> <tr> <td>2</td> <td>Min speed operation</td> <td>1 = Min speed operation fault active.</td> </tr> <tr> <td>3</td> <td>Rotor over voltage</td> <td>1 = Rotor over voltage fault active.</td> </tr> <tr> <td>4</td> <td>Over current</td> <td>1 = Over current fault active.</td> </tr> <tr> <td>5</td> <td>HT isolator trip</td> <td>1 = HT isolator trip fault active due to non availability of feedback.</td> </tr> <tr> <td>6</td> <td>Rotor circuit isolator trip</td> <td>1 = Rotor circuit isolator trip fault active due to non availability of feedback.</td> </tr> <tr> <td>7</td> <td>Trafo fault</td> <td>1 = Trafo fault active due to non availability of feedback.</td> </tr> <tr> <td>8</td> <td>App External fault 1</td> <td>1 = App External fault 1 active due to non availability of feedback.</td> </tr> <tr> <td>9</td> <td>App External fault 2</td> <td>1 = App External fault 2 active due to non availability of feedback.</td> </tr> <tr> <td>10</td> <td>Earth fault</td> <td>1 = Earth fault active.</td> </tr> <tr> <td>11</td> <td>HT Breaker Fault</td> <td>1 = HT Breaker Fault active due to non availability of feedback.</td> </tr> <tr> <td>12...15</td> <td>Reserved</td> <td></td> </tr> </tbody> </table> | Bit               | Name | Description | 0 | Emergency stop         | 1 = Emergency stop fault active.                                                       | 1 | Max speed operation      | 1 = Max speed operation fault active.                                                     | 2 | Min speed operation | 1 = Min speed operation fault active.                                             | 3 | Rotor over voltage | 1 = Rotor over voltage fault active.                 | 4      | Over current | 1 = Over current fault active. | 5 | HT isolator trip | 1 = HT isolator trip fault active due to non availability of feedback. | 6 | Rotor circuit isolator trip | 1 = Rotor circuit isolator trip fault active due to non availability of feedback. | 7 | Trafo fault | 1 = Trafo fault active due to non availability of feedback. | 8 | App External fault 1 | 1 = App External fault 1 active due to non availability of feedback. | 9 | App External fault 2 | 1 = App External fault 2 active due to non availability of feedback. | 10 | Earth fault | 1 = Earth fault active. | 11 | HT Breaker Fault | 1 = HT Breaker Fault active due to non availability of feedback. | 12...15 | Reserved |  |  |
| Bit     | Name                                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                   |      |             |   |                        |                                                                                        |   |                          |                                                                                           |   |                     |                                                                                   |   |                    |                                                      |        |              |                                |   |                  |                                                                        |   |                             |                                                                                   |   |             |                                                             |   |                      |                                                                      |   |                      |                                                                      |    |             |                         |    |                  |                                                                  |         |          |  |  |
| 0       | Emergency stop                      | 1 = Emergency stop fault active.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                   |      |             |   |                        |                                                                                        |   |                          |                                                                                           |   |                     |                                                                                   |   |                    |                                                      |        |              |                                |   |                  |                                                                        |   |                             |                                                                                   |   |             |                                                             |   |                      |                                                                      |   |                      |                                                                      |    |             |                         |    |                  |                                                                  |         |          |  |  |
| 1       | Max speed operation                 | 1 = Max speed operation fault active.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                   |      |             |   |                        |                                                                                        |   |                          |                                                                                           |   |                     |                                                                                   |   |                    |                                                      |        |              |                                |   |                  |                                                                        |   |                             |                                                                                   |   |             |                                                             |   |                      |                                                                      |   |                      |                                                                      |    |             |                         |    |                  |                                                                  |         |          |  |  |
| 2       | Min speed operation                 | 1 = Min speed operation fault active.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                   |      |             |   |                        |                                                                                        |   |                          |                                                                                           |   |                     |                                                                                   |   |                    |                                                      |        |              |                                |   |                  |                                                                        |   |                             |                                                                                   |   |             |                                                             |   |                      |                                                                      |   |                      |                                                                      |    |             |                         |    |                  |                                                                  |         |          |  |  |
| 3       | Rotor over voltage                  | 1 = Rotor over voltage fault active.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                   |      |             |   |                        |                                                                                        |   |                          |                                                                                           |   |                     |                                                                                   |   |                    |                                                      |        |              |                                |   |                  |                                                                        |   |                             |                                                                                   |   |             |                                                             |   |                      |                                                                      |   |                      |                                                                      |    |             |                         |    |                  |                                                                  |         |          |  |  |
| 4       | Over current                        | 1 = Over current fault active.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |      |             |   |                        |                                                                                        |   |                          |                                                                                           |   |                     |                                                                                   |   |                    |                                                      |        |              |                                |   |                  |                                                                        |   |                             |                                                                                   |   |             |                                                             |   |                      |                                                                      |   |                      |                                                                      |    |             |                         |    |                  |                                                                  |         |          |  |  |
| 5       | HT isolator trip                    | 1 = HT isolator trip fault active due to non availability of feedback.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                   |      |             |   |                        |                                                                                        |   |                          |                                                                                           |   |                     |                                                                                   |   |                    |                                                      |        |              |                                |   |                  |                                                                        |   |                             |                                                                                   |   |             |                                                             |   |                      |                                                                      |   |                      |                                                                      |    |             |                         |    |                  |                                                                  |         |          |  |  |
| 6       | Rotor circuit isolator trip         | 1 = Rotor circuit isolator trip fault active due to non availability of feedback.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                   |      |             |   |                        |                                                                                        |   |                          |                                                                                           |   |                     |                                                                                   |   |                    |                                                      |        |              |                                |   |                  |                                                                        |   |                             |                                                                                   |   |             |                                                             |   |                      |                                                                      |   |                      |                                                                      |    |             |                         |    |                  |                                                                  |         |          |  |  |
| 7       | Trafo fault                         | 1 = Trafo fault active due to non availability of feedback.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                   |      |             |   |                        |                                                                                        |   |                          |                                                                                           |   |                     |                                                                                   |   |                    |                                                      |        |              |                                |   |                  |                                                                        |   |                             |                                                                                   |   |             |                                                             |   |                      |                                                                      |   |                      |                                                                      |    |             |                         |    |                  |                                                                  |         |          |  |  |
| 8       | App External fault 1                | 1 = App External fault 1 active due to non availability of feedback.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                   |      |             |   |                        |                                                                                        |   |                          |                                                                                           |   |                     |                                                                                   |   |                    |                                                      |        |              |                                |   |                  |                                                                        |   |                             |                                                                                   |   |             |                                                             |   |                      |                                                                      |   |                      |                                                                      |    |             |                         |    |                  |                                                                  |         |          |  |  |
| 9       | App External fault 2                | 1 = App External fault 2 active due to non availability of feedback.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                   |      |             |   |                        |                                                                                        |   |                          |                                                                                           |   |                     |                                                                                   |   |                    |                                                      |        |              |                                |   |                  |                                                                        |   |                             |                                                                                   |   |             |                                                             |   |                      |                                                                      |   |                      |                                                                      |    |             |                         |    |                  |                                                                  |         |          |  |  |
| 10      | Earth fault                         | 1 = Earth fault active.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                   |      |             |   |                        |                                                                                        |   |                          |                                                                                           |   |                     |                                                                                   |   |                    |                                                      |        |              |                                |   |                  |                                                                        |   |                             |                                                                                   |   |             |                                                             |   |                      |                                                                      |   |                      |                                                                      |    |             |                         |    |                  |                                                                  |         |          |  |  |
| 11      | HT Breaker Fault                    | 1 = HT Breaker Fault active due to non availability of feedback.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                   |      |             |   |                        |                                                                                        |   |                          |                                                                                           |   |                     |                                                                                   |   |                    |                                                      |        |              |                                |   |                  |                                                                        |   |                             |                                                                                   |   |             |                                                             |   |                      |                                                                      |   |                      |                                                                      |    |             |                         |    |                  |                                                                  |         |          |  |  |
| 12...15 | Reserved                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                   |      |             |   |                        |                                                                                        |   |                          |                                                                                           |   |                     |                                                                                   |   |                    |                                                      |        |              |                                |   |                  |                                                                        |   |                             |                                                                                   |   |             |                                                             |   |                      |                                                                      |   |                      |                                                                      |    |             |                         |    |                  |                                                                  |         |          |  |  |
| 09.15   | Warning word 1                      | Defines SPRS warning word 1. This parameter is read-only.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | -                 |      |             |   |                        |                                                                                        |   |                          |                                                                                           |   |                     |                                                                                   |   |                    |                                                      |        |              |                                |   |                  |                                                                        |   |                             |                                                                                   |   |             |                                                             |   |                      |                                                                      |   |                      |                                                                      |    |             |                         |    |                  |                                                                  |         |          |  |  |
|         |                                     | <table border="1"> <thead> <tr> <th>Bit</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>GRR contactor not open</td> <td>1 = GRR contactor not open warning command active due to non availability of feedback.</td> </tr> <tr> <td>1</td> <td>SPRS contactor not close</td> <td>1 = SPRS contactor not closed warning command active due to non availability of feedback.</td> </tr> <tr> <td>2</td> <td>Tacho feedback fail</td> <td>1 = No tacho feedback warning command active due to non availability of feedback.</td> </tr> <tr> <td>3</td> <td>SPRS ready</td> <td>1 = SPRS ready for operation warning command active.</td> </tr> <tr> <td>4...15</td> <td>Reserved</td> <td></td> </tr> </tbody> </table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Bit               | Name | Description | 0 | GRR contactor not open | 1 = GRR contactor not open warning command active due to non availability of feedback. | 1 | SPRS contactor not close | 1 = SPRS contactor not closed warning command active due to non availability of feedback. | 2 | Tacho feedback fail | 1 = No tacho feedback warning command active due to non availability of feedback. | 3 | SPRS ready         | 1 = SPRS ready for operation warning command active. | 4...15 | Reserved     |                                |   |                  |                                                                        |   |                             |                                                                                   |   |             |                                                             |   |                      |                                                                      |   |                      |                                                                      |    |             |                         |    |                  |                                                                  |         |          |  |  |
| Bit     | Name                                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                   |      |             |   |                        |                                                                                        |   |                          |                                                                                           |   |                     |                                                                                   |   |                    |                                                      |        |              |                                |   |                  |                                                                        |   |                             |                                                                                   |   |             |                                                             |   |                      |                                                                      |   |                      |                                                                      |    |             |                         |    |                  |                                                                  |         |          |  |  |
| 0       | GRR contactor not open              | 1 = GRR contactor not open warning command active due to non availability of feedback.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                   |      |             |   |                        |                                                                                        |   |                          |                                                                                           |   |                     |                                                                                   |   |                    |                                                      |        |              |                                |   |                  |                                                                        |   |                             |                                                                                   |   |             |                                                             |   |                      |                                                                      |   |                      |                                                                      |    |             |                         |    |                  |                                                                  |         |          |  |  |
| 1       | SPRS contactor not close            | 1 = SPRS contactor not closed warning command active due to non availability of feedback.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |      |             |   |                        |                                                                                        |   |                          |                                                                                           |   |                     |                                                                                   |   |                    |                                                      |        |              |                                |   |                  |                                                                        |   |                             |                                                                                   |   |             |                                                             |   |                      |                                                                      |   |                      |                                                                      |    |             |                         |    |                  |                                                                  |         |          |  |  |
| 2       | Tacho feedback fail                 | 1 = No tacho feedback warning command active due to non availability of feedback.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                   |      |             |   |                        |                                                                                        |   |                          |                                                                                           |   |                     |                                                                                   |   |                    |                                                      |        |              |                                |   |                  |                                                                        |   |                             |                                                                                   |   |             |                                                             |   |                      |                                                                      |   |                      |                                                                      |    |             |                         |    |                  |                                                                  |         |          |  |  |
| 3       | SPRS ready                          | 1 = SPRS ready for operation warning command active.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                   |      |             |   |                        |                                                                                        |   |                          |                                                                                           |   |                     |                                                                                   |   |                    |                                                      |        |              |                                |   |                  |                                                                        |   |                             |                                                                                   |   |             |                                                             |   |                      |                                                                      |   |                      |                                                                      |    |             |                         |    |                  |                                                                  |         |          |  |  |
| 4...15  | Reserved                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                   |      |             |   |                        |                                                                                        |   |                          |                                                                                           |   |                     |                                                                                   |   |                    |                                                      |        |              |                                |   |                  |                                                                        |   |                             |                                                                                   |   |             |                                                             |   |                      |                                                                      |   |                      |                                                                      |    |             |                         |    |                  |                                                                  |         |          |  |  |
| 09.28   | Drive reference percentage [%]      | Shows inverter reference before converting to equivalent frequency.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0.0               |      |             |   |                        |                                                                                        |   |                          |                                                                                           |   |                     |                                                                                   |   |                    |                                                      |        |              |                                |   |                  |                                                                        |   |                             |                                                                                   |   |             |                                                             |   |                      |                                                                      |   |                      |                                                                      |    |             |                         |    |                  |                                                                  |         |          |  |  |
|         | 0.0...300.0%                        | Inverter reference.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1 = 1%            |      |             |   |                        |                                                                                        |   |                          |                                                                                           |   |                     |                                                                                   |   |                    |                                                      |        |              |                                |   |                  |                                                                        |   |                             |                                                                                   |   |             |                                                             |   |                      |                                                                      |   |                      |                                                                      |    |             |                         |    |                  |                                                                  |         |          |  |  |
| 09.32   | Actual speed feedback               | Shows actual speed measured by tachometer in counts. During tachometer failure, the drive calculates actual speed feedback by converting measured rotor voltage feedback (77.03) into corresponding rpm.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 0.0               |      |             |   |                        |                                                                                        |   |                          |                                                                                           |   |                     |                                                                                   |   |                    |                                                      |        |              |                                |   |                  |                                                                        |   |                             |                                                                                   |   |             |                                                             |   |                      |                                                                      |   |                      |                                                                      |    |             |                         |    |                  |                                                                  |         |          |  |  |
|         | 0.0...10000.0 rpm                   | Counter value.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1 = 1rpm          |      |             |   |                        |                                                                                        |   |                          |                                                                                           |   |                     |                                                                                   |   |                    |                                                      |        |              |                                |   |                  |                                                                        |   |                             |                                                                                   |   |             |                                                             |   |                      |                                                                      |   |                      |                                                                      |    |             |                         |    |                  |                                                                  |         |          |  |  |
| 09.33   | Speed calculated from rotor voltage | Shows the actual speed based on the corresponding rotor voltage feedback received.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | -                 |      |             |   |                        |                                                                                        |   |                          |                                                                                           |   |                     |                                                                                   |   |                    |                                                      |        |              |                                |   |                  |                                                                        |   |                             |                                                                                   |   |             |                                                             |   |                      |                                                                      |   |                      |                                                                      |    |             |                         |    |                  |                                                                  |         |          |  |  |
|         | 0...10000 rpm                       | Actual speed calculated using rotor voltage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1 = 1 rpm         |      |             |   |                        |                                                                                        |   |                          |                                                                                           |   |                     |                                                                                   |   |                    |                                                      |        |              |                                |   |                  |                                                                        |   |                             |                                                                                   |   |             |                                                             |   |                      |                                                                      |   |                      |                                                                      |    |             |                         |    |                  |                                                                  |         |          |  |  |

## 40 Parameters

| No.                              | Name/Value                             | Description                                                                                                                                                                                                                                                          | Def/<br>FbEq16/32   |
|----------------------------------|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| 09.42                            | Mot pot reference value                | Shows speed reference value given as increase/decrease push button for SPRS.                                                                                                                                                                                         | 0                   |
|                                  | 0...30000%                             | Counts                                                                                                                                                                                                                                                               | 1 = 1%              |
| 09.43                            | CCR speed reference for GRR correction | Shows the speed reference to the drive based on parameter <a href="#">75.12 GRR reference error correction</a> . When you enable parameter <a href="#">75.12 GRR reference error correction</a> , the actual feedback value in % is used as the GRR speed reference. | -                   |
|                                  | 0...100%                               | GRR speed reference correction.                                                                                                                                                                                                                                      | 1 = 1%              |
| <b>14 I/O extension module 1</b> |                                        | Configuration of I/O extension module 1 for SPRS. For the SPRS application, Slot 2 must be used for the module type FIO-01. See parameters 14.01 and 14.02. All the other configurations are similar to the ACS880 primary control program.                          |                     |
| <b>15 I/O extension module 2</b> |                                        | Configuration of I/O extension module 2 for SPRS. For the SPRS application, slot 3 must be used for the module type FIO-11. See parameters 15.01 and 15.02. All the other configurations are similar to the ACS880 primary control program.                          |                     |
| <b>74 SPRS DI</b>                |                                        | Defines SPRS digital inputs.                                                                                                                                                                                                                                         |                     |
| 74.01                            | ACK SPRS contactor on                  | Defines the source from which DI SPRS contactor is acknowledged.                                                                                                                                                                                                     | <a href="#">DI1</a> |
|                                  | Not selected                           | 0                                                                                                                                                                                                                                                                    | 0                   |
|                                  | Selected                               | 1                                                                                                                                                                                                                                                                    | 1                   |
|                                  | DI1                                    | Digital input DI1.                                                                                                                                                                                                                                                   | 2                   |
|                                  | DI2                                    | Digital input DI2.                                                                                                                                                                                                                                                   | 3                   |
|                                  | DI3                                    | Digital input DI3.                                                                                                                                                                                                                                                   | 4                   |
|                                  | DI4                                    | Digital input DI4.                                                                                                                                                                                                                                                   | 5                   |
|                                  | DI5                                    | Digital input DI5.                                                                                                                                                                                                                                                   | 6                   |
|                                  | DI6                                    | Digital input DI6.                                                                                                                                                                                                                                                   | 7                   |
|                                  | DI7                                    | Digital input DI7. Used with FDIO-01.                                                                                                                                                                                                                                | 8                   |
|                                  | DI8                                    | Digital input DI8. Used with FDIO-01.                                                                                                                                                                                                                                | 9                   |
|                                  | DI9                                    | Digital input DI9. Used with FDIO-01.                                                                                                                                                                                                                                | 10                  |
|                                  | DIO1                                   | Digital input/output DIO1.                                                                                                                                                                                                                                           | 11                  |
|                                  | DIO2                                   | Digital input/output DIO2.                                                                                                                                                                                                                                           | 12                  |
|                                  | DIIL                                   | Digital inputs DIIL.                                                                                                                                                                                                                                                 | 13                  |
|                                  | Other                                  | Source selection (see <a href="#">Terms and abbreviations</a> on page 36).                                                                                                                                                                                           | -                   |
| 74.02                            | ACK G/LRR contactor on                 | Defines the source from which DI ROTOR contactor is acknowledged. For the available selections, see parameter <a href="#">74.01 ACK SPRS contactor on</a> .                                                                                                          | <a href="#">DI2</a> |
| 74.03                            | ACK Sync contactor on                  | Defines the source from which DI SYNC contactor is acknowledged. For the available selections, see parameter <a href="#">74.01 ACK SPRS contactor on</a> .                                                                                                           | <a href="#">DI3</a> |



| No.   | Name/Value                 | Description                                                                                                                                                             | Def/<br>FbEq16/32            |
|-------|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| 74.04 | Sync input select          | Defines the source from which DI synchronized input is acknowledged.<br>For the available selections, see parameter <a href="#">74.01 ACK SPRS contactor on.</a>        | <a href="#">DI5</a>          |
| 74.05 | SPRS/G(L) RR select        | Defines the source from which DI SPRS/GRR SEL done.<br>For the available selections, see parameter <a href="#">74.01 ACK SPRS contactor on.</a>                         | <a href="#">DI6</a>          |
| 74.06 | HT isolator on feedback    | Defines the source from which DI HT Isolator on is acknowledged.<br>For the available selections, see parameter <a href="#">74.01 ACK SPRS contactor on.</a>            | <a href="#">DI4</a>          |
| 74.07 | LT isolator on feedback    | Defines the source from which DI LT Isolator on is acknowledged.<br>For the available selections, see parameter <a href="#">74.01 ACK SPRS contactor on.</a>            | <a href="#">DI9</a>          |
| 74.08 | Emergency stop select      | Defines the source from which DI emergency stop is selected.<br>For the available selections, see parameter <a href="#">74.01 ACK SPRS contactor on.</a>                | <a href="#">DI1L</a>         |
| 74.09 | Transformer healthy select | Defines the source from which DI feed back transformer healthy is selected.<br>For the available selections, see parameter <a href="#">74.01 ACK SPRS contactor on.</a> | <a href="#">Not selected</a> |
| 74.11 | Fault reset                | Defines the source from which DI reset for SPRS is selected.<br>For the available selections, see parameter <a href="#">74.01 ACK SPRS contactor on.</a>                | <a href="#">Not selected</a> |
| 74.12 | ACK HT breaker select      | Defines the source from which DI HT breaker on is acknowledged.<br>For the available selections, see parameter <a href="#">74.01 ACK SPRS contactor on.</a>             | <a href="#">Not selected</a> |
| 74.13 | Over current relay         | Defines the source from which DI over current relay input is selected.<br>For the available selections, see parameter <a href="#">74.01 ACK SPRS contactor on.</a>      | <a href="#">Not selected</a> |
| 74.14 | Speed increase             | Defines the source from which DI speed increase for SPRS is selected.<br>For the available selections, see parameter <a href="#">74.01 ACK SPRS contactor on.</a>       | <a href="#">Not selected</a> |
| 74.15 | Speed decrease             | Defines the source from which DI speed decrease for SPRS is selected.<br>For the available selections, see parameter <a href="#">74.01 ACK SPRS contactor on.</a>       | <a href="#">Not selected</a> |
| 74.16 | Rotor over voltage select  | Defines the source from which DI rotor over voltage for SPRS is selected.<br>For the available selections, see parameter <a href="#">74.01 ACK SPRS contactor on.</a>   | <a href="#">Not selected</a> |
| 74.17 | Earth fault select         | Defines the source from which DI earth fault for SPRS is selected.<br>For the available selections, see parameter <a href="#">74.01 ACK SPRS contactor on.</a>          | <a href="#">Not selected</a> |

## 42 Parameters

| No.                        | Name/Value                                     | Description                                                                                                                                                                                                                                                                        | Def/<br>FbEq16/32   |
|----------------------------|------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| 74.18                      | Control zone select                            | Defines the source from which the DI control zone for SPRS is selected.<br>If DI control zone = 1, the synchronization between inverter output and rotor terminal voltage is enabled.<br>For the available selections, see parameter <a href="#">74.01 ACK SPRS contactor on</a> . | <i>Not selected</i> |
| 74.19                      | Application external fault 1                   | Defines the source from which DI External Fault 1 for SPRS is selected.<br>For the available selections, see parameter <a href="#">74.01 ACK SPRS contactor on</a> .                                                                                                               | <i>Selected</i>     |
| 74.20                      | Application external fault 2                   | Defines the source from which DI External Fault 2 for SPRS is selected.<br>For the available selections, see parameter <a href="#">74.01 ACK SPRS contactor on</a> .                                                                                                               | <i>Selected</i>     |
| <b>75 SPRS User values</b> |                                                | User values for SPRS.                                                                                                                                                                                                                                                              |                     |
| 75.01                      | Sync delay [sec]                               | Defines the delay time desired after synchronization to open and close the respective contactors.                                                                                                                                                                                  | 0.50                |
|                            | 0.00...100.00s                                 | Delay time.                                                                                                                                                                                                                                                                        | 100 = 1s            |
| 75.02                      | CCR reference add value                        | Defines the weightage factor added to the CCR reference.                                                                                                                                                                                                                           | 0.0                 |
|                            | -10.0...10.0%                                  | Weightage factor.                                                                                                                                                                                                                                                                  | 10 = 1%             |
| 75.11                      | Rotor overvoltage fault                        | Enables/disables the Rotor overvoltage fault.                                                                                                                                                                                                                                      | <i>Disable</i>      |
|                            | Disable                                        | Rotor overvoltage fault is disabled.                                                                                                                                                                                                                                               | 0                   |
|                            | Enable                                         | Rotor overvoltage fault is enabled.                                                                                                                                                                                                                                                | 1                   |
| 75.12                      | GRR reference error correction                 | Enables/disables the GRR reference error correction feature. This should be enabled only when the speed reference from CCR is not matching with the actual feedback due to the non-functional GRR internal contactor logic.                                                        | <i>Disable</i>      |
|                            | Disable                                        | GRR reference error correction is disabled.                                                                                                                                                                                                                                        | 0                   |
|                            | Enable                                         | GRR reference error correction is enabled.                                                                                                                                                                                                                                         | 1                   |
| 75.14                      | CCR speed reference after GRR error correction | Shows the difference between CCR speed reference given to the drive and the actual feedback read from either from Tachometer or rotor voltage. This value is added to CCR Speed Reference ( <a href="#">79.03 CCR speed reference</a> ).                                           | 0.00                |
|                            | 0.00...100.00%                                 | Difference between CCR speed reference and actual feedback.                                                                                                                                                                                                                        | 1 = 1%              |
| 75.25                      | GRR off delay                                  | Defines delay time for switching off the GRR contactor. The rotor contactor is switched off immediately after the drive takes over from GRR mode to SPRS mode after the delay time is elapsed.                                                                                     | 1.00                |
|                            | 0.00...3.00s                                   | Delay time.                                                                                                                                                                                                                                                                        | 100 = 1s            |
| 75.26                      | Tacho fail limit                               | Defines the limit for AI feedback value, below which the Tacho is considered as failed.                                                                                                                                                                                            | 50                  |
|                            | 0...100%                                       | Tacho fail limit.                                                                                                                                                                                                                                                                  | 1 = 1%              |
| 75.27                      | Speed ready delay                              | Defines the delay before the drive is reset and after the drive trips on Speed Less Limit fault, provided speed actual is greater than the value mentioned in parameter <a href="#">78.02 SPRS min speed %</a> .                                                                   | 60                  |

| No.                          | Name/Value         | Description                                                                                                                                                                                                                   | Def/<br>FbEq16/32                                                                               |
|------------------------------|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
|                              | 0...1000s          | Time delay.                                                                                                                                                                                                                   | 1 = 1s                                                                                          |
| 75.28                        | MOT POT slope time | Defines the slope time of the motor potentiometer.                                                                                                                                                                            | 100                                                                                             |
|                              | 0...10000s         | Slope time.                                                                                                                                                                                                                   | 1 = 1s                                                                                          |
| <b>76 SPRS relay outputs</b> |                    |                                                                                                                                                                                                                               | Status information indicated through the relay outputs and the relay operating delays for SPRS. |
| 76.01                        | Relay output 1     | Selects the drive status indicated through Relay output 1 selection for SPRS.<br>The relay energizes when the status meets the setting.                                                                                       | <i>SPRS<br/>contactor ON</i>                                                                    |
|                              | Not used           | Not used.                                                                                                                                                                                                                     | 0                                                                                               |
|                              | SPRS contactor ON  | SPRS contactor is ON.                                                                                                                                                                                                         | 1                                                                                               |
|                              | GRR contactor OFF  | GRR contactor is OFF.                                                                                                                                                                                                         | 2                                                                                               |
|                              | Sync contactor ON  | Synchronizing contactor ON command.                                                                                                                                                                                           | 3                                                                                               |
|                              | SPRS Ready         | SPRS ready to function: Run enable signal is on, no fault.                                                                                                                                                                    | 4                                                                                               |
|                              | SPRS Run           | SPRS running: Start signal on, Run Enable signal is on, no active fault.                                                                                                                                                      | 5                                                                                               |
|                              | SPRS Trip          | SPRS tripped.                                                                                                                                                                                                                 | 6                                                                                               |
|                              | HT Iso Trip        | Feedback transformer HT isolator trip command.                                                                                                                                                                                | 7                                                                                               |
| 76.02                        | Relay output 2     | Selects the drive status indicated through Relay output 2 selection for SPRS.<br>The relay energizes when the status meets the setting.<br>For the available selections, see parameter <a href="#">76.01 Relay output 1</a> . | <i>GRR<br/>contactor<br/>OFF</i>                                                                |
| 76.03                        | Relay output 3     | Selects the drive status indicated through Relay output 3 selection for SPRS.<br>The relay energizes when the status meets the setting.<br>For the available selections, see parameter <a href="#">76.01 Relay output 1</a> . | <i>Sync<br/>contactor ON</i>                                                                    |
| 76.04                        | Relay output 4     | Selects the drive status indicated through Relay output 4 selection for SPRS.<br>The relay energizes when the status meets the setting.<br>For the available selections, see parameter <a href="#">76.01 Relay output 1</a> . | <i>SPRS Ready</i>                                                                               |
| 76.05                        | Relay output 5     | Selects the drive status indicated through Relay output 5 selection for SPRS.<br>The relay energizes when the status meets the setting.<br>For the available selections, see parameter <a href="#">76.01 Relay output 1</a> . | <i>SPRS Run</i>                                                                                 |
| 76.06                        | DIO output 1       | Selects the drive status indicated through Digital output 1 selection for SPRS.                                                                                                                                               | <i>Not used</i>                                                                                 |
|                              | Not used           | Not used                                                                                                                                                                                                                      | 0                                                                                               |
|                              | SPRS Ready         | SPRS ready to function: Run enable signal is on, no fault.                                                                                                                                                                    | 1                                                                                               |
|                              | SPRS Run           | SPRS running: Start signal on, Run Enable signal is on, no active fault.                                                                                                                                                      | 2                                                                                               |
|                              | SPRS Trip          | SPRS tripped.                                                                                                                                                                                                                 | 3                                                                                               |
|                              | Inverter trip      | Fault from Inverter control program except SPRS fault.                                                                                                                                                                        | 4                                                                                               |

## 44 Parameters

| No.                                       | Name/Value                                    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Def/<br>FbEq16/32                         |                                               |                                         |         |     |           |         |     |         |         |     |         |         |     |           |  |
|-------------------------------------------|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|-----------------------------------------------|-----------------------------------------|---------|-----|-----------|---------|-----|---------|---------|-----|---------|---------|-----|-----------|--|
| 76.07                                     | DIO output 2                                  | Selects the drive status indicated through Digital output 2 selection for SPRS.<br>For the available selections, see parameter <a href="#">76.06 DIO output 1</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <i>Not used</i>                           |                                               |                                         |         |     |           |         |     |         |         |     |         |         |     |           |  |
| 76.08                                     | DIO output 3                                  | Selects the drive status indicated through Digital output 3 selection for SPRS.<br>For the available selections, see parameter <a href="#">76.06 DIO output 1</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <i>SPRS Trip</i>                          |                                               |                                         |         |     |           |         |     |         |         |     |         |         |     |           |  |
| 76.09                                     | DIO output 4                                  | Selects the drive status indicated through Digital output 4 selection for SPRS.<br>For the available selections, see parameter <a href="#">76.06 DIO output 1</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <i>Not used</i>                           |                                               |                                         |         |     |           |         |     |         |         |     |         |         |     |           |  |
| <b>77 Speed and Feedback SEL</b>          |                                               | Analog inputs for SPRS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                           |                                               |                                         |         |     |           |         |     |         |         |     |         |         |     |           |  |
| 77.01                                     | Speed reference select                        | Defines the source from which the speed reference is given to the drive.<br>It can be the voltage input AI1 or current input AI2 or AI3 or AI4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <i>A12 Scaled</i>                         |                                               |                                         |         |     |           |         |     |         |         |     |         |         |     |           |  |
|                                           | A11 Scaled                                    | Analog input AI1 after scaling.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1                                         |                                               |                                         |         |     |           |         |     |         |         |     |         |         |     |           |  |
|                                           | A12 Scaled                                    | Analog input AI2 after scaling.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 2                                         |                                               |                                         |         |     |           |         |     |         |         |     |         |         |     |           |  |
|                                           | A13 Scaled                                    | Analog input AI3 after scaling.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 3                                         |                                               |                                         |         |     |           |         |     |         |         |     |         |         |     |           |  |
|                                           | A14 Scaled                                    | Analog input AI4 after scaling.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 4                                         |                                               |                                         |         |     |           |         |     |         |         |     |         |         |     |           |  |
|                                           | Motor Pot                                     | Activates and selects the mode of the motor potentiometer.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 5                                         |                                               |                                         |         |     |           |         |     |         |         |     |         |         |     |           |  |
| 77.02                                     | Tacho feedback selection                      | Defines the source from which the tacho feedback reference is given to the drive.<br>It can be the voltage input AI1 or current input AI2 or AI3 or AI4.<br><b>Example:</b> If,<br>77.02 Tacho feedback selection = AI3 Scaled,<br><a href="#">78.07 Motor nominal speed</a> = 992, and<br><a href="#">09.04 CCR speed reference [%]</a> = 80%, set<br>15.35 AI1 scaled at AI1 minimum to 0.000, and<br>15.36 AI1 scaled at AI1 maximum to 992.000 ( <a href="#">78.07</a> ).<br>Then, the corresponding speed feedback value in 15.27 AI1 scaled value is displayed as 794 rpm $[(1 - 0.20) * 992]$ . This is the corresponding value of the rotor speed at 80% CCR speed reference.<br>Below table shows tacho feedback values in parameter 15.27 AI scaled value at difference CCR speed reference. | <i>A13 Scaled</i>                         |                                               |                                         |         |     |           |         |     |         |         |     |         |         |     |           |  |
|                                           |                                               | <table border="1"> <thead> <tr> <th><a href="#">78.07 Motor nominal speed</a></th> <th><a href="#">09.04 CCR speed reference [%]</a></th> <th>Tacho feedback in 15.27 AI scaled value</th> </tr> </thead> <tbody> <tr> <td>992 rpm</td> <td>70%</td> <td>694.4 rpm</td> </tr> <tr> <td>992 rpm</td> <td>75%</td> <td>744 rpm</td> </tr> <tr> <td>992 rpm</td> <td>85%</td> <td>843 rpm</td> </tr> <tr> <td>992 rpm</td> <td>90%</td> <td>892.8 rpm</td> </tr> </tbody> </table>                                                                                                                                                                                                                                                                                                                        | <a href="#">78.07 Motor nominal speed</a> | <a href="#">09.04 CCR speed reference [%]</a> | Tacho feedback in 15.27 AI scaled value | 992 rpm | 70% | 694.4 rpm | 992 rpm | 75% | 744 rpm | 992 rpm | 85% | 843 rpm | 992 rpm | 90% | 892.8 rpm |  |
| <a href="#">78.07 Motor nominal speed</a> | <a href="#">09.04 CCR speed reference [%]</a> | Tacho feedback in 15.27 AI scaled value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                           |                                               |                                         |         |     |           |         |     |         |         |     |         |         |     |           |  |
| 992 rpm                                   | 70%                                           | 694.4 rpm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                           |                                               |                                         |         |     |           |         |     |         |         |     |         |         |     |           |  |
| 992 rpm                                   | 75%                                           | 744 rpm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                           |                                               |                                         |         |     |           |         |     |         |         |     |         |         |     |           |  |
| 992 rpm                                   | 85%                                           | 843 rpm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                           |                                               |                                         |         |     |           |         |     |         |         |     |         |         |     |           |  |
| 992 rpm                                   | 90%                                           | 892.8 rpm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                           |                                               |                                         |         |     |           |         |     |         |         |     |         |         |     |           |  |
|                                           | NULL                                          | Tacho feedback selection is not selected.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0                                         |                                               |                                         |         |     |           |         |     |         |         |     |         |         |     |           |  |
|                                           | A11 Scaled                                    | Analog input AI1 after scaling.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1                                         |                                               |                                         |         |     |           |         |     |         |         |     |         |         |     |           |  |

| No.                     | Name/Value                    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Def/<br>FbEq16/32       |                               |                                                  |        |     |       |        |     |         |        |     |         |        |    |       |            |
|-------------------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-------------------------------|--------------------------------------------------|--------|-----|-------|--------|-----|---------|--------|-----|---------|--------|----|-------|------------|
|                         | AI2 Scaled                    | Analog input AI2 after scaling.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 2                       |                               |                                                  |        |     |       |        |     |         |        |     |         |        |    |       |            |
|                         | AI3 Scaled                    | Analog input AI3 after scaling.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 3                       |                               |                                                  |        |     |       |        |     |         |        |     |         |        |    |       |            |
|                         | AI4 Scaled                    | Analog input AI4 after scaling.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 4                       |                               |                                                  |        |     |       |        |     |         |        |     |         |        |    |       |            |
|                         | AI5 Scaled                    | Analog input AI5 after scaling.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 5                       |                               |                                                  |        |     |       |        |     |         |        |     |         |        |    |       |            |
|                         | Other                         | Source selection (see <a href="#">Terms and abbreviations</a> on page 36).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | -                       |                               |                                                  |        |     |       |        |     |         |        |     |         |        |    |       |            |
| 77.03                   | Rotor voltage feedback        | <p>Defines the source from which the rotor voltage reference is given to the drive.<br/>It can be the voltage input AI1 or current input AI2 or AI3 or AI4.</p> <p><b>Example:</b> If,<br/>77.03 Rotor Voltage Feedback = AI2 Scaled value,<br/>78.04 Rotor max voltage = 2150 V,<br/>09.04 CCR speed reference [%] = 80%,<br/>then adjust 12.29 AI2 scaled at AI2 minimum and 12.30 AI2 scaled at AI2 maximum such that, 12.22 AI2 scaled value is displayed as 430 V [(1-0.80)*2150]. This is in correspondence with the rotor voltage value at 80% CCR Speed Reference.<br/>Below table shows the rotor voltage feedback value in parameter 12.22 AI scaled value at different CCR speed reference values.</p> <table border="1" data-bbox="393 703 902 911"> <thead> <tr> <th>78.04 Rotor max voltage</th> <th>09.04 CCR speed reference [%]</th> <th>Rotor voltage feedback in 12.22 AI2 scaled value</th> </tr> </thead> <tbody> <tr> <td>2150 V</td> <td>70%</td> <td>645 V</td> </tr> <tr> <td>2150 V</td> <td>75%</td> <td>537.5 V</td> </tr> <tr> <td>2150 V</td> <td>85%</td> <td>322.5 V</td> </tr> <tr> <td>2150 V</td> <td>90</td> <td>215 V</td> </tr> </tbody> </table> | 78.04 Rotor max voltage | 09.04 CCR speed reference [%] | Rotor voltage feedback in 12.22 AI2 scaled value | 2150 V | 70% | 645 V | 2150 V | 75% | 537.5 V | 2150 V | 85% | 322.5 V | 2150 V | 90 | 215 V | AI4 Scaled |
| 78.04 Rotor max voltage | 09.04 CCR speed reference [%] | Rotor voltage feedback in 12.22 AI2 scaled value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                         |                               |                                                  |        |     |       |        |     |         |        |     |         |        |    |       |            |
| 2150 V                  | 70%                           | 645 V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                         |                               |                                                  |        |     |       |        |     |         |        |     |         |        |    |       |            |
| 2150 V                  | 75%                           | 537.5 V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                         |                               |                                                  |        |     |       |        |     |         |        |     |         |        |    |       |            |
| 2150 V                  | 85%                           | 322.5 V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                         |                               |                                                  |        |     |       |        |     |         |        |     |         |        |    |       |            |
| 2150 V                  | 90                            | 215 V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                         |                               |                                                  |        |     |       |        |     |         |        |     |         |        |    |       |            |
|                         | NULL                          | Rotor voltage feedback is not selected.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0                       |                               |                                                  |        |     |       |        |     |         |        |     |         |        |    |       |            |
|                         | AI1 Scaled                    | Analog input AI1 after scaling.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1                       |                               |                                                  |        |     |       |        |     |         |        |     |         |        |    |       |            |
|                         | AI2 Scaled                    | Analog input AI2 after scaling.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 2                       |                               |                                                  |        |     |       |        |     |         |        |     |         |        |    |       |            |
|                         | AI3 Scaled                    | Analog input AI3 after scaling.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 3                       |                               |                                                  |        |     |       |        |     |         |        |     |         |        |    |       |            |
|                         | AI4 Scaled                    | Analog input AI4 after scaling.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 4                       |                               |                                                  |        |     |       |        |     |         |        |     |         |        |    |       |            |
|                         | AI5 Scaled                    | Analog input AI5 after scaling.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 5                       |                               |                                                  |        |     |       |        |     |         |        |     |         |        |    |       |            |
|                         | Other                         | Source selection (see <a href="#">Terms and abbreviations</a> on page 36).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | -                       |                               |                                                  |        |     |       |        |     |         |        |     |         |        |    |       |            |
| 77.04                   | Sync reference                | <p>Defines the source from which the Synchronization reference is given to the drive.<br/>It can be the voltage input AI1 or current input AI2 or AI3 or AI4.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | AI1 Scaled              |                               |                                                  |        |     |       |        |     |         |        |     |         |        |    |       |            |
|                         | NULL                          | Synchronization reference is not selected.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0                       |                               |                                                  |        |     |       |        |     |         |        |     |         |        |    |       |            |
|                         | AI1 Scaled                    | Analog input AI1 after scaling.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1                       |                               |                                                  |        |     |       |        |     |         |        |     |         |        |    |       |            |
|                         | AI2 Scaled                    | Analog input AI2 after scaling.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 2                       |                               |                                                  |        |     |       |        |     |         |        |     |         |        |    |       |            |
|                         | AI3 Scaled                    | Analog input AI3 after scaling.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 3                       |                               |                                                  |        |     |       |        |     |         |        |     |         |        |    |       |            |
|                         | AI4 Scaled                    | Analog input AI4 after scaling.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 4                       |                               |                                                  |        |     |       |        |     |         |        |     |         |        |    |       |            |
|                         | AI5 Scaled                    | Analog input AI5 after scaling.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 5                       |                               |                                                  |        |     |       |        |     |         |        |     |         |        |    |       |            |
|                         | Other                         | Source selection (see <a href="#">Terms and abbreviations</a> on page 36).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | -                       |                               |                                                  |        |     |       |        |     |         |        |     |         |        |    |       |            |

| No.                    | Name/Value                | Description                                                                                                                                                                                                                                                                                                                  | Def/<br>FbEq16/32 |
|------------------------|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| <b>78 SPRS Limits</b>  |                           | Speed limits for SPRS.                                                                                                                                                                                                                                                                                                       |                   |
| 78.01                  | SPRS max speed %          | Defines the maximum speed percentage for SPRS operation. SPRS trips if the speed is beyond this parameter value. The parameter <i>78.01 SPRS max speed %</i> along with parameter <i>78.05 SPRS Max Speed Hysteresis</i> gives the maximum speed% within which the SPRS system is operated based on the nominal motor speed. | 95.0              |
|                        | 20.0...100.0%             | SPRS maximum speed.                                                                                                                                                                                                                                                                                                          | 10 = 1%           |
| 78.02                  | SPRS min speed %          | Defines the minimum speed percentage to operate the SPRS. SPRS trips if the speed is below this parameter value. The parameter <i>78.02 SPRS min speed %</i> along with parameter <i>78.06 SPRS Min Speed Hysteresis</i> gives the minimum speed% within which the SPRS system is operated based on the nominal motor speed. | 65.0              |
|                        | 20.0...100.0%             | SPRS minimum speed.                                                                                                                                                                                                                                                                                                          | 10 = 1%           |
| 78.03                  | Rotor over voltage limit  | Defines the rotor overvoltage limit to operate the drive in SPRS Mode. This value is the maximum Rotor overvoltage limit at which the drive is operated.                                                                                                                                                                     | 710               |
|                        | 690...1000V               | Rotor overvoltage limit.                                                                                                                                                                                                                                                                                                     | 1 = 1V            |
| 78.04                  | Rotor max voltage         | Defines the Rotor maximum Voltage for operation of the drive. This voltage is the rotor maximum voltage at zero speed operation.                                                                                                                                                                                             | 3000              |
|                        | 1000...3000V              | Rotor maximum voltage.                                                                                                                                                                                                                                                                                                       | 1 = 1V            |
| 78.05                  | SPRS Max Speed Hysteresis | Defines the maximum Hysteresis value to SPRS Max Speed [%] speed set in parameter <i>78.01 SPRS max speed %</i> . This value with SPRS MAX SPEED [%] determines the maximum speed limit in SPRS Mode.                                                                                                                        | 1.00              |
|                        | 0.00...1.00%              | SPRS maximum speed hysteresis.                                                                                                                                                                                                                                                                                               | 100 = 1%          |
| 78.06                  | SPRS Min Speed Hysteresis | Defines the minimum Hysteresis value to SPRS Min Speed [%] speed set in parameter <i>78.02 SPRS min speed %</i> . This value along with SPRS Min Speed [%] determines the minimum speed limit in SPRS Mode.                                                                                                                  | 1.00              |
|                        | 0.00...1.00%              | SPRS minimum speed hysteresis.                                                                                                                                                                                                                                                                                               | 100 = 1%          |
| 78.07                  | Motor nominal speed       | Defines the nominal motor speed. The setting must match the value on the rating plate of the motor.<br><b>Note:</b> This is the value of the Slip Ring Induction Motor at Zero Voltage.                                                                                                                                      | 0 rpm             |
|                        | 0...30000rpm              | Nominal motor speed.                                                                                                                                                                                                                                                                                                         | 1 = 1rpm          |
| <b>79 LRS tracking</b> |                           | Tracking of electrode movement in Liquid Resistance Starter (LRS).                                                                                                                                                                                                                                                           |                   |
| 79.01                  | LRS tracking enable       | Enables/disables LRS tracking function.                                                                                                                                                                                                                                                                                      | <i>Disable</i>    |
|                        | Disable                   | LRS tracking is disabled.                                                                                                                                                                                                                                                                                                    | 0                 |
|                        | Enable                    | LRS tracking is enabled.                                                                                                                                                                                                                                                                                                     | 1                 |



## 48 Parameters

| No.   | Name/Value              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Def/<br>FbEq16/32 |
|-------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| 99.08 | Motor nominal frequency | <p>Defines the nominal motor frequency supplied to the motor at SPRS minimum operation speed%(78.02). This setting must match the value on the rating plate of the motor at SPRS minimum operation speed.</p> <p>Example:<br/>If nominal frequency on the motor name plate is 50 Hz and SPRS minimum operation speed% is 68% (78.02), then set parameter 99.08 <i>Motor nominal frequency</i> to 16 Hz [(1 - 0.68) * 50].</p> <p><b>Note:</b> This parameter cannot be changed while the drive is running.</p> | 50.00 Hz          |
|       | 0.00...1000.00 Hz       | Nominal motor frequency supplied to the motor at SPRS minimum operation speed%.                                                                                                                                                                                                                                                                                                                                                                                                                                | 10 = 1 Hz         |
| 99.09 | Motor nominal speed     | <p>Defines the nominal motor speed supplied to the motor at SPRS minimum operation speed%(78.02).</p> <p>Example:<br/>If nominal speed on the motor name plate is 990 rpm and SPRS minimum operation speed%(78.02) is 68%, then set parameter 99.09 <i>Motor nominal speed</i> to 317 rpm [(1 - 0.68) * 990].</p> <p><b>Note:</b> This parameter cannot be changed while the drive is running.</p>                                                                                                             | 0 rpm             |
|       | 0...30000 rpm           | Nominal motor speed supplied to the motor at SPRS minimum operation speed%.                                                                                                                                                                                                                                                                                                                                                                                                                                    | 1 = 1 rpm         |



## Changed firmware default values for SPRS application

The following default parameter settings of the ACS880 primary control program are changed for SPRS application.

**Note:** The changed default values does not appear in the Default column and appears only in the Value field. For example, by default, the value of parameter 40.07 Set 1 operation mode is set as On when drive running. See below figure.

| 40. Process PID set 1 |                             |                       |        |           |           |        |
|-----------------------|-----------------------------|-----------------------|--------|-----------|-----------|--------|
| 1                     | Process PID output actual   | -44.6                 | NoUnit | -32768.0  | 32767.0   | 0.0    |
| 2                     | Process PID feedback ac...  | 54.65                 | %      | -32768.00 | 32767.00  | 0.00   |
| 3                     | Process PID setpoint act... | 50.00                 | %      | -32768.00 | 32767.00  | 0.00   |
| 4                     | Process PID deviation ac... | 4.66                  | %      | -32768.00 | 32767.00  | 0.00   |
| 5                     | Process PID trim output...  | -335                  | NoUnit | -32768    | 32767     | 0      |
| 6                     | Process PID status word     | 0b0010 0001           | NoUnit | 0b0000    | 0b1111... | 0b0000 |
| 7                     | Set 1 PID operation mode    | On when drive running | NoUnit |           |           | Off    |

| No.                         | Name/Value                | Description                                                                  | Def/<br>FbEq16/32     |
|-----------------------------|---------------------------|------------------------------------------------------------------------------|-----------------------|
| <b>40 Process PID set 1</b> |                           |                                                                              |                       |
| 40.07                       | Set 1 PID operation mode  | Default value changed from Off to On when driving.                           | On when drive running |
| 40.15                       | Set 1 output scaling      | Default value changed from 1500.00 to 100.00.                                | 100.00                |
| 40.21                       | Set 1 internal setpoint 1 | Default value changed from 0.00 to 50.00.                                    | 50.00                 |
| 40.31                       | Set 1 deviation inversion | Default value changed from Not Inverted (Fbk - Ref) to Inverted (Fbk - Ref). | Inverted (Fbk - Ref)  |
| 40.33                       | Set 1 integration time    | Default value changed from 60.0 to 0.0.                                      | 0.0                   |
| 40.36                       | Set 1 output min          | Default value changed from 0.0 to -100.0.                                    | -100.0                |
| 40.37                       | Set 1 output max          | Default value changed from 1500.0 to 100.0.                                  | 100.0                 |
| 40.51                       | Set 1 trim mode           | Default value changed from Off to Direct.                                    | Direct                |
| 40.52                       | Set 1 trim selection      | Default value changed from Torque to Speed.                                  | Speed                 |
| 40.55                       | Set 1 trim adjust         | Default value changed from 1.000 to 0.500.                                   | 0.500                 |
| 40.56                       | Set 1 trim source         | Default value changed from PID ref to PID output.                            | PID output            |



# 6

## Fault tracing

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### Contents of this chapter

This chapter lists the warning and fault messages (including possible causes and corrective actions) which differ from ACS880 primary control program described in *ACS880 primary control program firmware manual [3AUA0000085967 (English)]*.



**WARNING!** Only qualified electricians are allowed to service the drive. Read the Safety instructions on the first pages of the hardware manual for the single drives, or in the *Safety instructions [3AUA0000102301 (English)]* for the multidrives and multidrives modules before working on the drive.

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### Indications

#### ■ Warnings and faults

A warning or fault message on the panel display indicates abnormal drive status. Most of the warnings and faults causes can be identified and corrected using this information. If not, contact your local ABB representative.

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## Warning messages

| Code | Warning                | Cause                                     | What to do                                                                                                                                                                                                                                         |
|------|------------------------|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| D200 | GRR contactor not open | GRR contactor failed to switch off.       | <ul style="list-style-type: none"> <li>• Monitor the parameter <a href="#">74.02 ACK G/LRR contactor on</a>, the DI assigned to detect feedback from GRR contactor.</li> <li>• Check the circuit connected to the chosen DI for faults.</li> </ul> |
| D202 | Tacho feedback fail    | Tachometer feedback failed.               | <ul style="list-style-type: none"> <li>• See parameters <a href="#">77.02 Tacho feedback selection</a> and <a href="#">77.04 Rotor voltage feedback</a>.</li> <li>• Check the connections for the chosen AI for both parameters.</li> </ul>        |
| D203 | SPRS Ready             | SPRS system indication while in GRR mode. | Can safely changeover from GRR to SPRS system without any problems.                                                                                                                                                                                |

## Fault messages

| Code | Fault               | Cause                                                                                                                           | What to do                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------|---------------------|---------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 64A5 | Licensing fault     | Running the control program is prevented either because a restrictive license exists, or because a required license is missing. | Record the auxiliary codes of all active licensing faults and contact your product vendor for further instructions.                                                                                                                                                                                                                                                                                                                                                                                  |
| D100 | Emergency stop      | Emergency activated.                                                                                                            | See parameter <a href="#">74.08 Emergency stop select</a> to activate or deactivate the emergency stop with any particular DI.                                                                                                                                                                                                                                                                                                                                                                       |
| D101 | Max operation speed | Speed actual is beyond the value set in <a href="#">78.01 SPRS max speed %</a> .                                                | <ul style="list-style-type: none"> <li>• Monitor the parameter <a href="#">09.03 Speed actual [%]</a>.</li> <li>• Compare it to the Max Speed limit set in parameter <a href="#">78.01 SPRS max speed %</a>.</li> <li>• Change the speed reference till the speed actual is below the limit and reset the drive.</li> </ul>                                                                                                                                                                          |
| D102 | Rotor over voltage  | Rotor voltage is greater than the value set in parameter <a href="#">78.03 Rotor over voltage limit</a> .                       | <ul style="list-style-type: none"> <li>• Monitor the parameter <a href="#">74.16 Rotor over voltage select</a>, the DI assigned to detect rotor over-voltage fault.</li> <li>• Check the circuit connected to the chosen DI for faults.</li> <li>• Check if value of parameter <a href="#">77.03 Rotor voltage feedback</a> is greater than <a href="#">78.03 Rotor over voltage limit</a>. During normal operation, rotor voltage feedback should be less than rotor over voltage limit.</li> </ul> |
| D103 | Earth fault         | Earth fault relay sensed earth fault in the converter.                                                                          | See parameter <a href="#">74.17 Earth fault select</a> , the DI assigned to detect earth fault. Also check the circuit connected to the chosen DI.                                                                                                                                                                                                                                                                                                                                                   |
| D104 | Over current fault  | Output current is beyond the trip current limit.                                                                                | See parameter <a href="#">74.13 Over current relay</a> , the DI assigned to detect Over Current Relay pick condition. Also check the circuit connected to the chosen DI.                                                                                                                                                                                                                                                                                                                             |

## 54 Fault tracing

| Code | Fault                       | Cause                                                                  | What to do                                                                                                                                                                                                                                                                                                                 |
|------|-----------------------------|------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| D105 | Min operation speed         | Speed actual is below the value set in <i>78.02 SPRS min speed %</i> . | <p>Monitor the parameter <i>09.03 Speed actual [%]</i>. Increase the speed limit to at least more than one value set in <i>78.02 SPRS min speed %</i>.</p> <p>Check if value of parameter <i>77.03 Rotor voltage feedback</i> is in correspondence with the CCR Speed Reference(<i>09.04 CCR speed reference [%]</i>).</p> |
| D106 | HT Isolator trip            | There is no feedback from HT Isolator.                                 | Monitor the parameter <i>74.06 HT isolator on feedback</i> . It has designated DI to detect fault in HT Isolator. Check the circuit connected to the chosen DI.                                                                                                                                                            |
| D107 | Transformer fault           | There is no feedback from Transformer.                                 | Monitor the parameter <i>74.09 Transformer healthy select</i> . It is an active low designated DI to detect transformer faults. Check the circuit connected to the chosen DI.                                                                                                                                              |
| D108 | App External fault 1        | Externally configured fault for a particular DI.                       | Monitor the parameter <i>74.19 Application external fault 1</i> . It has designated DI to detect fault assigned for this parameter. Check the circuit connected to the chosen DI.                                                                                                                                          |
| D109 | App External fault 2        | Externally configured fault for a particular DI.                       | Monitor the parameter <i>74.20 Application external fault 2</i> . It has designated DI to detect fault assigned for this parameter. Check the circuit connected to the chosen DI.                                                                                                                                          |
| D110 | Rotor circuit isolator trip | There is no feedback from LT Isolator.                                 | Monitor the parameter <i>74.07 LT isolator on feedback</i> . It has designated DI to detect fault in LT isolator. Check the circuit connected to the chosen DI.                                                                                                                                                            |
| E101 | HT Breaker Tripped          | There is no feedback from HT Breaker.                                  | Monitor the parameter <i>74.12 ACK HT breaker select</i> . It has designated DI to detect fault in HT Breaker. Check the circuit connected to the chosen DI.                                                                                                                                                               |
| E200 | SPRS Contactor not close    | SPRS contactor failed to switch on.                                    | <ul style="list-style-type: none"> <li>• Monitor the parameter <i>74.01 ACK SPRS contactor on</i>, the DI assigned to detect feedback from SPRS contactor.</li> <li>• Check the circuit connected to the chosen DI for faults</li> </ul>                                                                                   |









## **Further information**

### **Product and service inquiries**

Address any inquiries about the product to your local ABB representative, quoting the type designation and serial number of the unit in question. A listing of ABB sales, support and service contacts can be found by navigating to [abb.com/searchchannels](http://abb.com/searchchannels).

### **Product training**

For information on ABB product training, navigate to [new.abb.com/service/training](http://new.abb.com/service/training).

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### **Document library on the Internet**

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