ABB machinery drives

Supplement
ACS355 Solar pump inverter (+N827)



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List of related manuals

Drive manuals and guides	Code (English)
ACS355 user's manual	*3AUA0000066143*
ACS355 drives with IP66/67/UL Type 4x enclosure supplement	*3AUA0000066066*

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.

Supplement
ACS355

Solar pump inverter (+N827)

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1

Safety

About this chapter

This chapter contains safety instructions which you must follow when installing, operating and servicing the ACS355 solar pump inverter. If ignored, physical injury or death may follow, or damage may occur to the inverter, motor or driven equipment.

Before installing, commissioning or using the inverter, read the safety instructions chapter in the *ACS355 user's manual (3AUA0000066143 [English]*).

Before changing any default settings of a function, read the warnings and notes for specific software function. For each function, the warnings and notes are given in the subsection describing the related user-adjustable parameters.

Use of warnings

Warnings caution you about conditions which can result in serious injury or death and/or damage to the equipment, and advise on how to avoid the danger. The following warning symbols are used in this manual:



Electricity warning warns of hazards from electricity which can cause physical injury and/or damage to the equipment.



General warning warns about conditions, other than those caused by electricity, which can result in physical injury and/or damage to the equipment.

Safety in installation and maintenance

These warnings are intended for all who work on the inverter, motor cable or motor.

Electrical safety

WARNING! Ignoring the following instructions can cause physical injury or death, or damage to the equipment.

Only qualified electricians are allowed to install and maintain the inverter!

- Never work on the photovoltaic generator or inverter and its input/output cables when the inverter is connected to the power system or to the photovoltaic generator.
- Before working inside the inverter cabinet, switch off or isolate the auxiliary voltage supply to the inverter.
- Isolate the inverter from the photovoltaic generator using the safety switch of the generator or by using the isolation switch.
- Do not touch the input of the isolation switch that has high DC voltage.
- After disconnecting the inverter from the power system or the DC input supply, wait for at least 5 minutes to discharge the intermediate circuit capacitors.
- Measure with a multimeter to ensure that no voltage is present.
  - Impedance should be at least 1 MΩ.
  - Voltage should be close to 0 V between inverter phases L1, L2, L3 and frame, and between module terminals Brk+ and Brk-.
- Do not make any insulation or voltage withstand tests on the inverter or on the inverter modules.

Note:

- The DC connection terminals Brk+ and Brk- carry a dangerous DC voltage of up to 800 V.
- Depending on the external and internal wiring, dangerous voltages of 115 V to 230 V may be present at the different terminals in the auxiliary circuit.
- At the inverter input, the photovoltaic cells generate DC voltage even at low intensity of sunlight.

Grounding

These instructions are intended for all who are responsible for the grounding of the inverter.

WARNING! Ignoring the following instructions can cause physical injury or death, increased electromagnetic interference and equipment malfunction.

- Ground the inverter, motor and adjoining equipment to ensure personnel safety in all circumstances, and to reduce electromagnetic emission and interference.
- Make sure that grounding conductors are adequately sized as required by safety regulations.
- When shielded cables are used, make a 360° high frequency grounding of cable entries at the cabinet lead-through to suppress electromagnetic disturbances. In addition, connect the cable shields to protective earth (PE) to meet safety regulations.

Note:

- The power cable shields are suitable for equipment grounding conductors only when adequately sized to meet safety regulations.
- Standard IEC/EN 62109, 5.2.5 requires that as the normal touch current of the inverter is higher than 3.5 mA AC or 10 mA DC, you must use a fixed protective earth connection.
- A four-conductor system is allowed for input cabling, but shielded symmetrical cable is recommended. To operate as a protective conductor, the shield conductivity must be as follows when the protective conductor is made of the same metal a the phase conductors.

Cross-sectional area of the phase conductors **S (mm^2)**	**Minimum cross-sectional area of the corresponding protective conductor** **S_p (mm^2)**
$S \leq 16$	S
$16 \leq S \leq 35$	16
$35 < S$	S/2

- Automatic disconnection of the supply must be provided in case of discontinuity of the protective earthing conductor.
- A second protective earthing conductor of the same cross-sectional area as the original protective earthing conductor must be provided.



2

Introduction

About this chapter

This chapter provides an overview of the contents, purpose, compatibility, and the intended audience of this manual. This chapter also includes the quick start steps to operate the ACS355 solar pump inverter.

Purpose

The solar pump inverter is an enhancement of the ACS355 firmware. This supplement manual intends to serve as a quick start guide for installing, commissioning and operating the ACS355 solar pump inverter. This manual includes all the required parameter settings and program features specific to the solar pump inverter.

Use this supplement manual along with the *ACS355 User's manual (3AUA0000066143 [English])* for general instructions on installation and maintenance.

Compatibility

You can use this manual with the ACS355 solar pump inverter of both single phase and three phase type.

Target audience

This manual is intended for personnel who install, commission, operate and service the solar pump inverter. 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 the following chapters:

- *Safety* (page *7*) provides an overview of the safety instruction to follow when using the solar pump inverter.
- *Introduction* (page *11*) provides an overview of this manual.
- *Operating principle and hardware description* (page *15*) includes the overview of the solar pump inverter and its hardware connections.
- *Quick start-up* (page *19*) provides the basic information about mechanical and electrical installation and also includes instructions to quickly operate the solar pump inverter.
- *Start-up and controls* (page *25*) provides an overview of the solar pump inverter and describes the inverter controls to operate the solar pump inverter.
- *Program features* (page *31*) provides an overview of all the solar pump inverter core features such as MPPT function, dual supply mode, dry run function, and so on.
- *Actual signals and parameters* (page *37*) describes the user adjustable settings of the required groups for operating the solar pump inverter.
- *Fault tracing* (page *67*) lists all the alarm and fault messages related to the solar pump inverter and describes the possible cause and corrective actions.
- *Technical data* (page *71*) provides the technical specifications of the solar pump inverter and also the solar status word list.

Related documents

See *List of related manuals* on page *2* (inside the front cover).

Terms and abbreviations

This manual uses the following terms and abbreviations:

Term/Abbreviation	Expansion	Explanation
AM	Asynchronous motor	Three-phase AC voltage induction motor with squirrel cage rotor.
B	Boolean	Data type boolean
Def	Default	Parameter default value.
E	European	Refers to types 01E- and 03E- with European parameterization. EMC filter connected, 50 Hz frequency.
FbEq	Fieldbus equivalent	The scaling between the value and the integer used in serial communication.
I	Integer	Data type integer

Term/Abbreviation	Expansion	Explanation
MPPT	Maximum power point tracking	An algorithm to derive maximum power from PV cells.
P	Power in kW	Power input to determine flow output on the PQ performance curve
Pb	Packed boolean	Data type packer boolean
PMSM	Permanent magnet synchronous motor	Three-phase AC voltage synchronous motor with permanent magnet rotor and sinusoidal back emf voltage.
PV	Photovoltaic	A device that converts light directly into electricity by the photovoltaic effect.
Q	Flow rate in m^3/h	Flow rate to determine the flow output on the PQ performance curve.
R	Real	Data type real
S	String	Data type string
Type	Data type	Data type
U	United States	Refers to types 01U- and 03U- with US parameterization. EMC filter disconnected, 60 Hz frequency.

3

Operating principle and hardware description

About this chapter

This chapter provides an overview, operation principle and hardware description of the ACS355 Solar pump inverter.

Solar pump inverter overview

The ACS355 solar pump inverter is a low voltage AC drive of 0.3 to 18.5 KW rating designed to operate with energy drawn from photovoltaic cells (PV). The inverter is customized to operate in dual supply mode, so the grid connected supply is used in the absence of energy from PV cells. The inverter functions with the latest in technology maximum power point tracking (MPPT) algorithm to derive maximum power from the PV cells at any instant.

The inverter is specifically designed to meet the requirements of pump manufacturers and the original equipment manufacturers (OEM). For more details of the solar pump inverter features, see section *Program features*, page *31*.

Control modes

The solar pump inverter operates in local control mode and in remote control mode identical to the ordinary ACS355 drive.

- Local control—interfaces through the panel.
- Remote control—interfaces through external control signal. For the external control through digital input, refer the *Default I/O connections*, page *22*.

To switch between local and remote control modes use the LOC/REM key on the control panel. For more information, see section *How to start, stop and switch between local and remote control* in *ACS355 user's manual (3AUA0000066143[English])*.

Note: Ensure that the inverter is in local control before starting or stopping the inverter using the control panel.

Control panels

The solar pump inverter works with either of the two different control panel types:

- Basic control panel—provides basic tools for manual entry of parameter values.
- Assistant control panel—includes pre-programmed assistants to automate the most common parameter setups and provides language support.

For more information, see section *Control panels* in *ACS355 User's manual (3AUA0000066143 [English])*.

See *Start-up procedure* section for information on Viewing or Editing parameter values using control panel.

MPPT overview

Theory

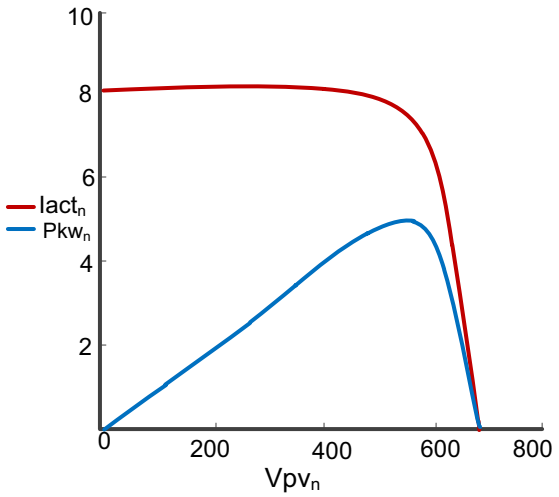
The solar pump inverter uses the maximum power point tracking (MPPT) control program to improve the efficiency of solar energy systems. The output of the photovoltaic (PV) cell is proportional to its area and intensity, while the output voltage is limited by p-n junction from 0.6 to 0.7 V. Therefore when the output voltage is constant, output power is proportional to intensity and surface area. The current and voltage at which the PV cell generates maximum power is known as the maximum power point.

Operation

The MPPT controller follows different strategies to derive the maximum power from the PV array. The internal MPPT algorithm is used to derive maximum power from the PV cell at any instant. This is achieved by modifying the operating voltage or current in the PV cell until the maximum power is obtained.

When the output voltage is zero, the PV cells create short circuit current. If the PV cells are not connected to any load, the output voltage is equal to the open circuit voltage. The maximum power point is obtained at the knee of the I-V curve. See the I-V characteristics shown below.

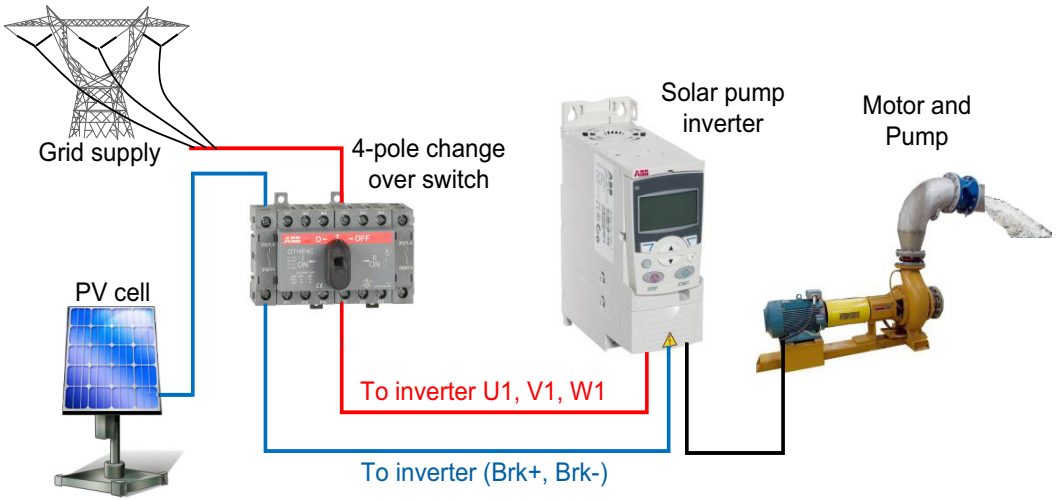
I-V characteristics



The I-V curve is not constant since intensity and temperature changes during day time. Under constant temperature, current changes linearly with intensity and voltage changes logarithmically with intensity. Since the voltage variation is small with respect to intensity changes, maximum power varies proportionally with intensity.

Dual supply mode

The solar pump inverter operates in dual supply mode either with a three phase input supply from the grid or with DC input supply from PV cells. A four-pole changeover switch enables switching between the two supply modes. At a given time only one supply (PV cell or grid) will be connected to the drive.



Note: Use two poles of the changeover switch in series to ensure that the voltage applied across each pole is half of the full DC voltage.

4

Quick start-up

About this chapter

This chapter includes the basic information about the mechanical and electrical installation of solar pump inverter and also provides steps to quickly operate the inverter.

For general instructions on installation and maintenance of ACS355 Drives, see *ACS355 User's manual (3AUA0000066143 [English])*.

Safety instructions

WARNING! All electrical installation and maintenance work on the inverter must be carried out by qualified electricians only. Follow the safety instructions listed below.

- Never work on the inverter, the braking chopper circuit, the motor cable or the motor when input power is applied to the inverter.
- After disconnecting the input power, always wait for 5 minutes to let the intermediate circuit capacitors discharge. Always ensure by measuring that no voltage is actually present.
- A rotating permanent magnet motor generates a dangerous voltage. Always ensure to lock the motor shaft mechanically before connecting a permanent magnet motor to the inverter, and before doing any work on an inverter system connected to a permanent magnet motor.

Mechanical installation

In back mounting, fasten the inverter to the wall with screws using four mounting holes. In side mounting with frame sizes R0…R2, fasten the inverter to the wall with screws using three mounting holes. The inverter can also be mounted onto a DIN rail.

Fasten the clamping plate to the plate at the bottom of the inverter with the provided screws. For frame sizes R0…R2, fasten the I/O clamping plate to the clamping plate with the provided screws.

Free space requirements

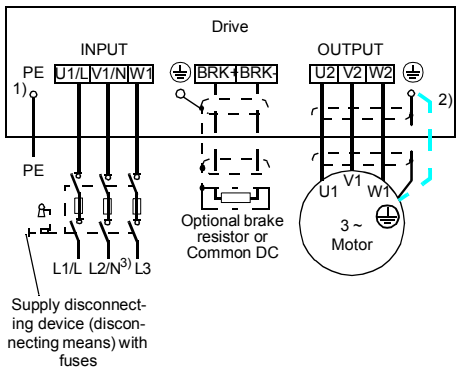
Frame size	Free space required					
	Above		Below		On the sides	
	mm	in	mm	in	mm	in
R0…R4	75	3	75	3	0	0

Note:

- When placing inverters on top of each other in the panel or cabinet, make sure that the hot air from the inverters below do not enter directly to the inverter above.
- The maximum ambient air temperature is 50°C (122°F) at the rated current. The current is derated for 40 to 50°C (104 to 131°F).

Installing power cables

Connection diagram



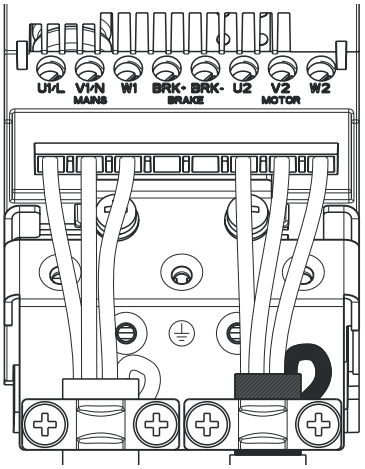
1) Ground the other end of the PE conductor at the distribution board.
2) Use a separate grounding cable if the conductivity of the cable shield is insufficient (smaller than the conductivity of the phase conductor) and there is no symmetrically constructed grounding conductor in the cable.
3) In one-phase installations, connect the neutral cable here.

Note:

- Do not use an asymmetrically constructed motor cable.
- Route the motor cable, input power cable and control cables separately.
- Make sure that the maximum cable lengths are not exceeded. For detailed information, see the user's manual.

Connection procedure

1. Strip the input power cable. Ground the bare shield of the cable (if any) 360 degrees under the grounding clamp. Fasten the grounding conductor (PE) of the input power cable under the screw of the grounding clamp. Connect the phase conductors to the U1, V1 and W1 terminals.
2. Strip the motor cable. Ground the bare shield of the cable 360 degrees under the grounding clamp. Twist the shield to form as short a pigtail as possible and fasten it under the screw of the grounding clamp. Connect the phase conductors to the U2, V2 and W2 terminals.
3. Connect DC input to the BRK+ and BRK- terminals with a shielded cable using the same procedure as for the motor cable.
4. Secure the cables outside the drive mechanically.

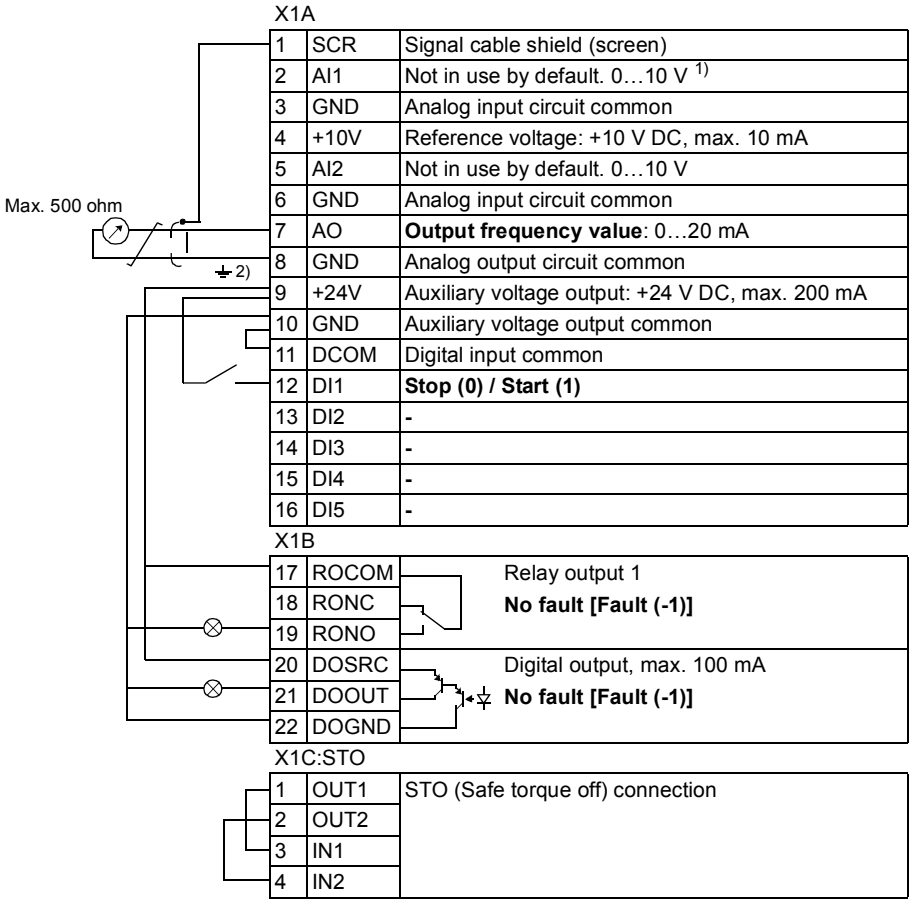


Frame size	Tightening torque	Max. wire size
	N·m (lbf·in)	
R0…R2	0.8 (7)	4.0/6.0 mm^2 (10 AWG)
R3	1.7 (15)	10.0/16.0 mm^2 (6 AWG)
R4	2.5 (22)	25.0/35.0 mm^2 (2 AWG)

To identify the frame size of your inverter, see *Operating instructions*, page *24*.

Installing control cables

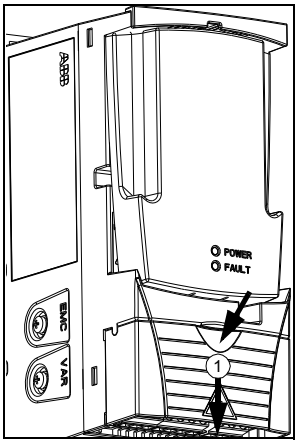
Default I/O connections



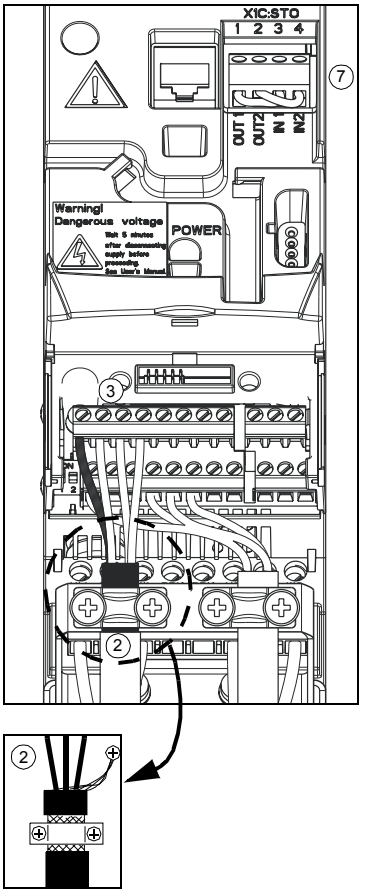
1) AI1 is used as a speed reference if vector mode is selected.

2) 360 degree grounding under a clamp.
Tightening torque = 0.4 N·m / 3.5 lbf·in.

Connection procedure



1. Remove the terminal cover by simultaneously pushing the recess and sliding the cover off the frame.
2. Strip the outer insulation of the analog signal cable and ground the bare shield 360 degrees under the clamp.
3. Connect the conductors to the appropriate terminals. Use a tightening torque of 0.4 N·m (3.5 lbf·in).
4. For double-shielded cables, twist also the grounding conductors of each pair in the cable together and connect the bundle to the SCR terminal 1.
5. Secure all cables outside the drive mechanically.
6. Unless you need to install the optional fieldbus module, slide the terminal cover back in place.
7. Connect STO conductors to the appropriate terminals. Use a tightening torque of 0.4 N·m (3.5 lbf·in).



Operating instructions

The solar pump inverter is developed using the ACS355 firmware. Install the inverter as defined in sections *Mechanical installation*, *Installing power cables*, and *Installing control cables*. Before operating the inverter, set the required parameters defined in the following steps.

Step	Action	Additional information
1	Install the solar pump inverter.	See section *Mechanical installation* in *ACS355 User's manual (3AUA0000066143 [English])*.
2	Connect the AC/DC input and motor cables and the control cables.	See section *Connecting the power cables* and *Connecting the control cables* in *ACS355 User's manual (3AUA0000066143 [English])*.
3	Enter the commissioning data parameters in *99 START-UP DATA*.	See section *99 START-UP DATA* in *ACS355 User's manual (3AUA0000066143 [English])*.
4	Set the basic application data using either the control panel or the Drive window light PC tool application: Group *10 START/STOP/DIR* Group *11 REFERENCE SELECT* Group *20 LIMITS* Group *21 START/STOP* Group *60 PUMP CONTROL* Group *61 FLOW CALCULATION* Group *99 START-UP DATA*	See section *Control panels* in *ACS355 User's manual (3AUA0000066143 [English])*. The inverter is supported by version 2.91 or later of the Drive Window Light 2 PC tool which includes a graphical Sequence programming tool.
5	Monitor the inverter signals in Group *01 OPERATING DATA*.	See section *Actual Signals* in *ACS355 User's manual (3AUA0000066143 [English])*.

If the inverter power rating matches the motor power rating, the inverter is ready to run. If any parameter tuning such as acceleration and deceleration times, maximum and minimum speeds, and so on is required, see *ACS355 User's manual (3AUA0000066143 [English]).*

5

Start-up and controls

About this chapter

This chapter describes the start-up operation of the solar pump inverter.

Start-up procedure

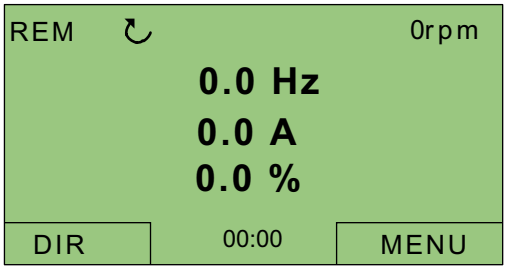
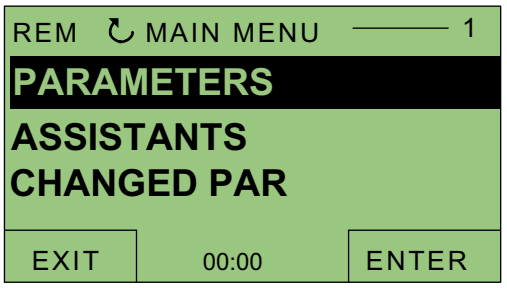
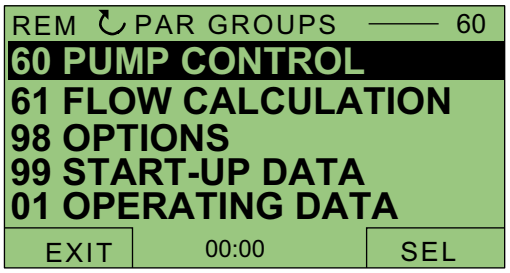
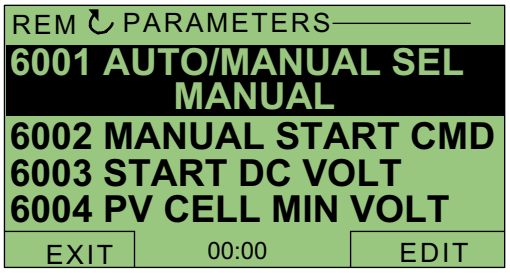
The start-up procedure to set up the solar pump inverter is similar to the ordinary ACS355 drive. See section *Starting up the drive* in *ACS355 User's manual (3AUA0000066143 [English])*.

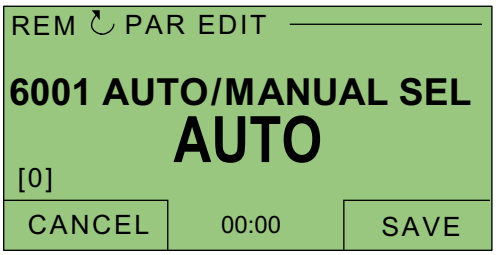
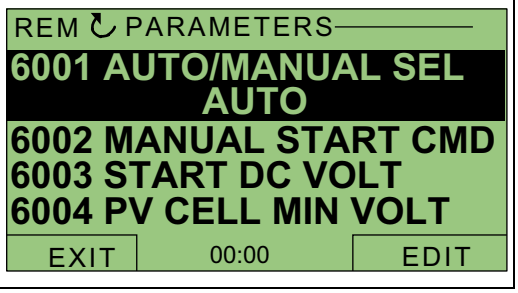
Selecting the Auto/Manual mode

- In auto mode, the inverter does not need any manual start/stop input.The inverter starts automatically if current DC bus voltage is more than the start DC voltage set in parameter *6003 START DC VOLT*. To use the auto mode, set the parameter *6001 AUTO/MANUAL SEL* to AUTO [0].
- In manual mode, the drive starts by external connections to either of the digital inputs common DI1, DI2 or DI3 pins as shown in *Default I/O connections*. The inverter waits for the activation of digital inputs defined in parameter *6002 MANUAL START CMD*. To use the manual mode, set the parameter *6001 AUTO/MANUAL SEL* to MANUAL [1].

Note: Only one input can be selected at a time.

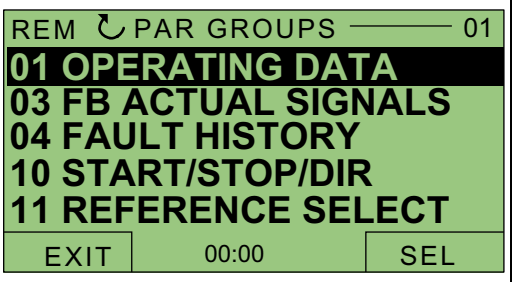
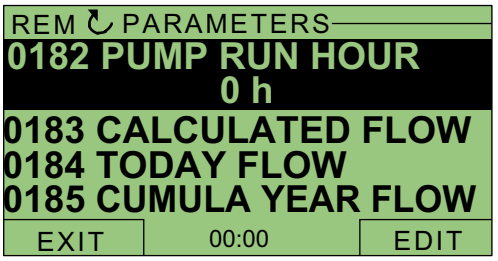
To select auto/manual mode in the control panel, follow these steps:

Step	Description	Keys	Control panel
1	Press MENU to go to the main menu.		
2	Select PARAMETERS with the UP/DOWN keys and press ENTER.		
3	Select 60 PUMP CONTROL with the UP/DOWN keys and press SEL.		
4	Select the parameter 6001 AUTO/MANUAL SEL with the UP/DOWN keys. Press EDIT to change the parameter value.		
5	Press the UP/DOWN keys to change the parameter value. For more details, see parameter *6001 AUTO/MANUAL SEL*. **Note**: MANUAL is the default selection.		

Step	Description	Keys	Control panel
6	Press SAVE to store the modified value or press CANCEL to leave the set mode. Any modifications not saved are cancelled.		
7	Press EXIT to return to the main menu.		

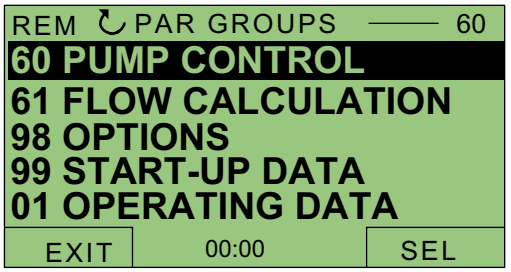
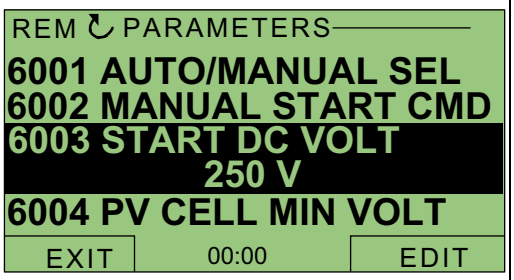
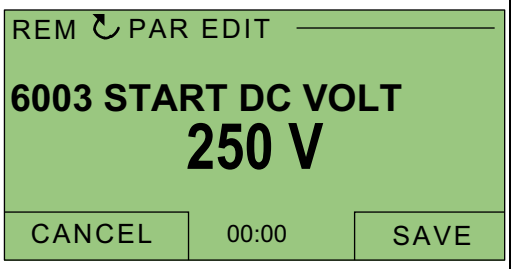
Viewing pump signals

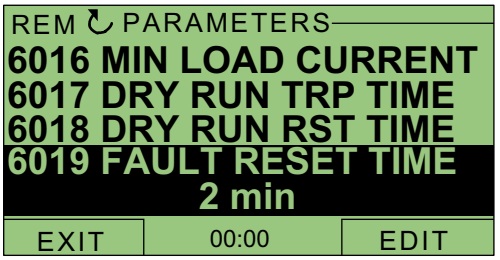
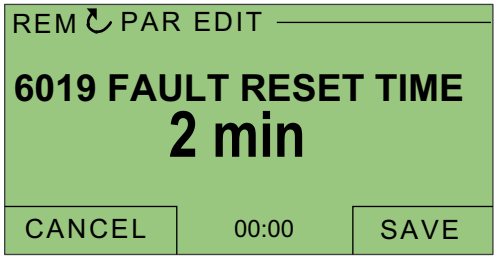
The parameters 0182...0185 display the actual signals of the pump. These values are read only. To view these values in the control panel, follow these steps:

Step	Description	Keys	Control panel
1	Select 01 OPERATING DATA with the UP/DOWN keys and press SEL.		
2	Press the UP/DOWN keys to view the actual values displayed below individual parameters. For more details, see section *Actual signals*, page *37*. Press EXIT to return to the main menu.		

Editing pump parameters

The parameters 6001...6019 are user adjustable parameters to control the pump operation. The below steps explain the editing of inverter start voltage and inverter reset time. Similarly, edit the other pump parameters in this group.

Step	Description	Keys	Control panel
Setting inverter starting voltage			
1	Select 60 PUMP CONTROL with the UP/DOWN keys and press SEL.		
2	Select parameter 6003 START DC VOLT with the UP/DOWN keys. Press EDIT to change the parameter value. You can edit the minimum DC voltage to start the inverter. **Note**: If you change this value while the inverter is running, the changed value is effective only during the next start.		
3	Press the UP/DOWN keys to change the parameter value and press SAVE to store the modified value or press CANCEL to leave the set mode. Any modifications not saved are cancelled. Press EXIT to return to the listing of parameter groups, and again to return to the main menu.		

Step	Description	Keys	Control panel
Setting inverter reset time			
1	Select parameter 6019 FAULT RESET TIME with the UP/DOWN keys. Press EDIT to change the parameter value. You can set the auto reset time to start the inverter after it has tripped in the event of under-voltage fault, PV cell maximum voltage fault or when actual speed decreases below the minimum motor speed limit.		
2	Press the UP/DOWN keys to change the parameter value. Press SAVE to store the modified value or press CANCEL to leave the set mode. Any modifications not saved are cancelled.		



6

Program features

About this chapter

This chapter describes the pump control features of solar pump inverter. Each feature includes a list of related user settings, actual signals, and/or fault and alarm messages.

Dry run function

The solar pump inverter trips to a *DRY RUN* when the water flow is not available at the pump inlet or when a blockage occurs in the pump. During these conditions the inverter consumes less current than the minimum load current (*6016 MIN LOAD CURRENT*) or the actual motor current is lower than the minimum load current for the defined trip time.

Note: The dry run function is disabled during the initial start up time.

Settings

Parameter	Additional information
6017 DRY RUN TRP TIME	Dry run trip time
6018 DRY RUN RST TIME	Auto reset time in case of a dry run fault.

Diagnostics

Fault	Additional information
DRY RUN	Fault message to notify that pump is dry.

Boost voltage factor

Boost voltage factor enables increasing the pump speed. When the actual DC bus voltage is greater than the boost voltage, the pump speed increases by a defined boost factor. The

MPPT algorithm achieves this increased speed limit only if the actual DC bus voltage is appropriate to the boost factor.

Settings

Parameter	Additional information
6008 BOOST VOLT	DC voltage reference to activate boost factor.
6009 BOOST FACTOR	Factor at which the inverter functions the best.

Voltage limits

The solar pump inverter operates within the voltage limits defined for PV cells and beyond these limits the inverter trips. At maximum voltage limit, the inverter trips to a *PV MAX VOLT* fault. Below the minimum DC voltage limit, the inverter stops modulating.

Settings

Parameter	Additional information
6004 PV CELL MIN VOLT	Minimum DC voltage below which the inverter cannot operate.
6005 PV CELL MAX VOLT	Maximum DC voltage.

Diagnostics

Fault	Additional information
PV MAX VOLT	Fault message to notify that DC bus voltage in the inverter is higher than the maximum DC voltage (*6005 PV CELL MAX VOLT*).

Speed limits

The ACS355 solar pump inverter operates within the defined speed limits set in the group *60 PUMP CONTROL* parameters.

- Minimum pump speed—Below this value, inverter stops the pump operation. The inverter restarts automatically only after the *6019 FAULT RESET TIME*, see page *58*. This operation of the inverter prevents the pump from running at a low speed (where the pump capacity drops and is near zero).
- Maximum pump speed—The pump operates within this speed limit defined by MPPT in *6007 PUMP MAXIMUM SPD*, provided that the maximum speed limit of the inverter in *2002 MAXIMUM SPEED* is equal to or higher than this value.

Note: Ensure that the pump speed is always defined within the allowed speed limit of the inverter.

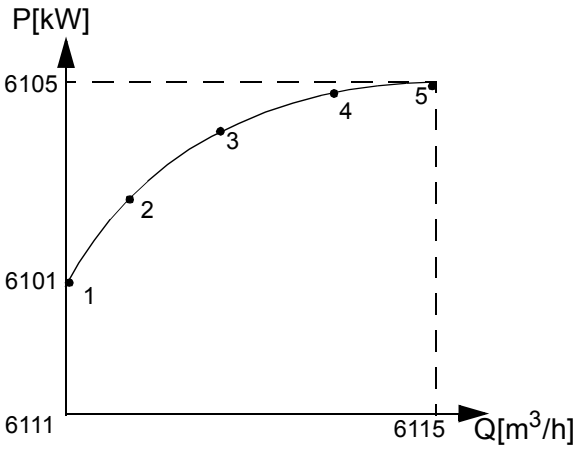
Settings

Parameter	Additional information
6006 PUMP MINIMUM SPD	Minimum motor speed allowed.
6007 PUMP MAXIMUM SPD	Maximum motor speed allowed.
2002 MAXIMUM SPEED	Maximum speed limit.

Flow calculation

The flow calculation function provides a reasonably accurate calculation of the flow without the installation of a separate flow meter. The function defines the flow estimate using the pump performance curve and drive actual load. The PQ (power/flow) performance curve enables calculating the flow output from the pump. The performance curve is provided by the pump manufacturer. The user saves five operating points (P,Q) of the performance curve to drive parameters.

PQ curve



The solar pump inverter records and stores the flow rate on each day and provides the required data for current day and current year.

Note:

- The flow calculations are available only with assistant control panel. Ensure that the assistant control panel is attached before starting the inverter.
- Do not use the flow calculation function outside the normal operating range of the pump.
- Do not use the flow calculation function for invoicing purposes.
- Ensure that power and flow points are in incremental order with non-zero values.

Settings

Parameter	Additional information
6101 PQ CURVE P1...*6105 PQ CURVE P5*	Input power of pump at points 1...5 on the PQ performance curve.
6111 PQ CURVE Q1...*6115 PQ CURVE Q5*	Flow rate at points 1...5 on the PQ curve respectively.
6121 PUMP EFFICIENCY	Efficiency of the pump.

Diagnostics

Actual signal	Additional information
0183 CALCULATED FLOW	Calculated flow rate in cubic meter per hour.
0184 TODAY FLOW	Measured flow for the current day in cubic meter.
0185 CUMULA YEAR FLOW	Measured flow for current year in cubic deca meter.

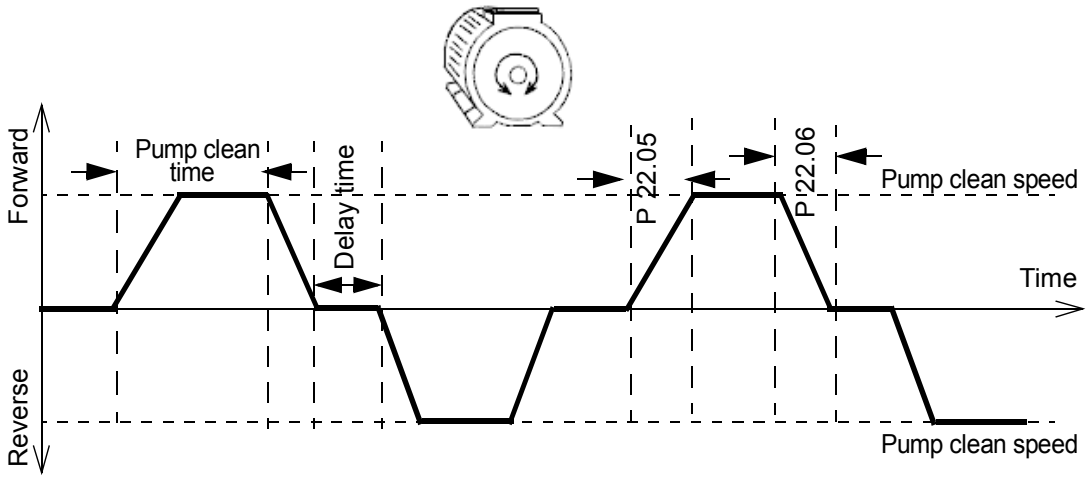
PID control macro

The ACS355 solar pump drive is designed to work with MPPT algorithm. Hence the PID control macro is disabled and similarly when the PID control macro is enabled, the MPPT algorithm is disabled.

See section *PID control macro* in *ACS355 user's manual (3AUA0000066143[English]).*

Pump cleaning

The solar pump inverter provides the pump cleaning function to prevent solids from building up on pump impellers or piping. The function consists of a programmable sequence of forward and reverse runs of the pump to shake off any residue on the impeller or piping.



The cleaning sequence can be activated only in the manual mode of operation. The cleaning sequence starts in the forward direction and follows the reverse direction. This cycle repeats three times. If any intermediate fault occurs, the pump cleaning function stops.

Settings

Parameter	Additional information
6021 PMP CLEAN SELECT	Initiates pump cleaning sequence.
6022 PMP CLEAN SPEED	Speed at which the pump cleaning sequence is initiated.
6023 PMP CLEAN TIME	Pump cleaning time.

Excluded functions

The following features of ACS355 firmware are not supported in the solar pump inverter.

- Timer and counter
- Frequency input
- Sequential programming
- Jogging
- Constant speed
- IR compensation
- Mechanical brake

7

Actual signals and parameters

About this chapter

This chapter describes the actual signals and user-adjustable parameters of the MPPT function specific to the solar pump inverter. Refer these parameters in addition to the actual signals and parameters described in the *ACS355 User's manual (3AUA0000066143 [English])*.

Actual signals

Actual signals			
No.	**Name/Value**	**Description**	**FbEq**
01 OPERATING DATA		Basic signals for monitoring the solar pump inverter (read-only). The inverter sets the values based on measurements or calculations.	
0182	PUMP RUN HOUR	Shows the actual run time of the pump in hours. **Note**: You can reset the counter to zero when the control panel is in parameter mode. Non-zero values are not accepted. To reset the counter, press the  UP/DOWN keys simultaneously.	1 = 1 h
0183	CALCULATED FLOW	Shows the calculated flow rate of water in cubic meter per hour. The calculation is based on the correction factor defined in *6124 FLOW CAL GAIN*.	100 = 1 m³/h
0184	TODAY FLOW	Shows the measured flow of current day in cubic meter. **Note**: You can reset this value using *6131 RESET FLOW*.	10 = 1 m³

<table>
<tr><th colspan="6">Actual signals</th></tr>
<tr><th>No.</th><th>Name/Value</th><th colspan="3">Description</th><th>FbEq</th></tr>
<tr><td>0185</td><td>CUMULA YEAR FLOW</td><td colspan="3">Shows the measured flow of current year in cubic decameter. The value displayed is the measured flow from first day to current day of the year.
Note: You can reset this value using 6131 RESET FLOW.</td><td>1 = 1 m^6</td></tr>
<tr><td colspan="2">03 FB ACTUAL SIGNALS</td><td colspan="3">Data words for monitoring the fieldbus communication (read-only). Each signal is a 16-bit data word. Data words are displayed on the panel in hexadecimal format.</td><td></td></tr>
<tr><td>0310</td><td>SOLAR STS WORD1</td><td colspan="3">A 16-bit data word.</td><td>1 = 1</td></tr>
<tr><td colspan="2"></td><td>Bit</td><td>Name</td><td>Value</td><td>Status</td></tr>
<tr><td colspan="2"></td><td>0</td><td>RDY_ON</td><td>1</td><td>Ready to switch on.</td></tr>
<tr><td colspan="2"></td><td></td><td></td><td>0</td><td>Not ready to switch on.</td></tr>
<tr><td colspan="2"></td><td>1</td><td>RDY_ REF</td><td>1</td><td>Operation enabled.</td></tr>
<tr><td colspan="2"></td><td></td><td></td><td>0</td><td>Operation inhibited.</td></tr>
<tr><td colspan="2"></td><td>2</td><td>RUNNING</td><td>1</td><td>Drive is modulating.</td></tr>
<tr><td colspan="2"></td><td></td><td></td><td>0</td><td>Drive is not modulating.</td></tr>
<tr><td colspan="2"></td><td>3</td><td>FAULT</td><td>1</td><td>Drive is in fault state.</td></tr>
<tr><td colspan="2"></td><td></td><td></td><td>0</td><td>Drive is not in a fault state.</td></tr>
</table>

Actual signals					
No.	**Name/Value**	**Description**			**FbEq**
		4	DRY_RUN	1	Dry run fault is detected.
				0	No dry run fault.
		5	DC_OVERVOLT	1	Excessive intermediate circuit DC voltage detected.
				0	No excessive intermediate circuit DC voltage.
		6	DC_UNDERVOLT	1	Intermediate circuit DC voltage is not sufficient.
				0	Intermediate circuit DC voltage is sufficient.
		7	PUMP_MINIMUM_ SPEED	1	Minimum speed alarm is active.
				0	Minimum speed alarm is not active.
		8	SHORT_CIRC	1	Short circuit in motor cable(s), motor or internal fault of the drive.
				0	No short circuit.
		9	EARTH_FAULT	1	Earth (ground) fault in motor or motor cable detected by drive.
				0	No earth (ground) fault.
		10	MOTOR_PHASE	1	Motor circuit fault due to missing motor phase.
				0	No motor circuit fault.
		11	SUPPLY_ PHASE	1	Intermediate circuit DC voltage is oscillating due to missing input power line phase or blown fuse.
				0	No oscillation of intermediate circuit DC voltage.
		12	MOTOR_STALL	1	Motor is operating in stall region due to excessive load or insufficient motor power.
				0	Motor is not operating in stall region.

Actual signals					
No.	**Name/Value**	**Description**			**FbEq**
		13	OVERCURRENT	1	Output current exceeds the trip level.
				0	Output current is within limits.
		14	EXT_FAULT1	1	External fault 1.
				0	No external fault 1.
		15	START_DELAY_ ACTIVE	1	Start delay alarm is active.
				0	Start delay alarm is not active.
0311	SOLAR STS WORD2	A 16-bit data word.			1 = 1
		Bit	**Name**	**Value**	**Status**
		0	EXT_FAULT2	1	External fault 2.
				0	No external fault 2.
		1	AI1_LOSS	1	Analog input AI1 signal is below the limit defined in parameter 3021 AI1 FAULT LIMIT (See ACS355 User's manual (3AUA0000066143 [English])).
				0	Analog input AI1 signal is within the limits defined in parameter 3021 AI1 FAULT LIMIT.
		2	AI2_LOSS	1	Analog input AI2 signal is below the limit defined in parameter 3022 AI2 FAULT LIMIT (See ACS355 User's manual (3AUA0000066143 [English])).
				0	Analog input AI2 signal is within the limit defined in parameter 3022 AI2 FAULT LIMIT.
		3	PANEL_LOSS	1	Control panel selected as active control location for drive has stopped communicating.
				0	No panel loss.

Actual signals					
No.	**Name/Value**	**Description**			**FbEq**
		4	DEV_OVERTEMP	1	Drive IGBT temperature is excessive.
				0	Drive IGBT temperature is within limit.
		5	ID_RUN_FAIL	1	Motor ID run is not completed successfully.
				0	Motor ID run is completed successfully.
		6	OUTP_WIRING	1	Incorrect input power and motor cable connection.
				0	Correct input power and motor cable connection.
		7	SAFE_TORQUE_OFF	1	STO (Safe torque off) is active.
				0	STO (Safe torque off) is not active.
		8	MOT_OVERTEMP	1	Motor temperature estimation is beyond limit.
				0	Motor temperature estimation is within limit.
		9	START_ENABLE	1	Start enable signal received.
				0	No start enable signal received.
		10	RUN_ENABLE	1	Run enable is activated.
				0	Run enable is not activated.
		11	CONFIG_FILE	1	Internal configuration file error detected.
				0	No internal configuration file error detected.
		12... 15	Reserved		

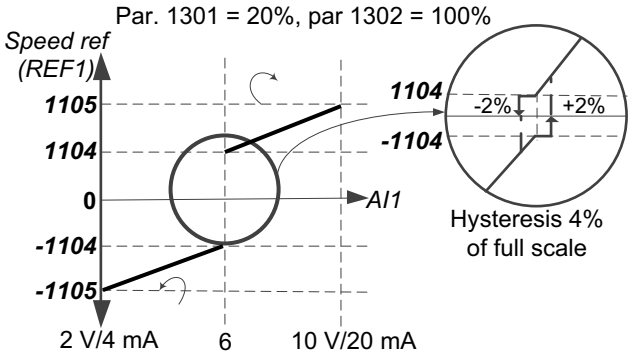
Parameters

All parameters			
No.	**Name/ Value**	**Description**	**Def/ FbEq**
10 START/STOP/DIR		Defines the sources for external start, stop and direction control.	
1001	EXT1 COMMANDS	Defines the connections and source for start, stop and direction commands for external control location 1 (EXT1). **Note**: Timer stop/start, Counter stop/start and Sequence programming is not applicable for solar pump inverter.	SOLAR
	NOT SEL	No start, stop and direction command source.	0
	DI1	Start and stop through digital input DI1. 0 = stop, 1 = start. Direction is fixed according to parameter *1003 DIRECTION* (setting REQUEST = FORWARD).	1
	DI1,2	Start and stop through digital input DI1. 0 = stop, 1 = start. Direction is set through digital input DI2. 0 = forward, 1 = reverse. To control the direction, set the parameter *1003 DIRECTION* = REQUEST.	2
	DI 1P,2P	• Pulse start through digital input DI1. 0 -> 1: Start. **Note**: To start the inverter, activate the digital input DI2 prior to the pulse fed to DI1. • Pulse stop through digital input DI2. 1 -> 0: Stop. The direction of rotation is fixed according to parameter *1003 DIRECTION* (setting REQUEST = FORWARD). **Note**: If you deactivate (no input) the stop input (DI2), the control panel start and stop keys are disabled.	3
	DI1P,2P,3	• Pulse start through digital input DI1. 0 -> 1: Start. **Note**: To start the inverter, activate the digital input DI2 prior to the pulse fed to DI1. • Pulse stop through digital input DI2. 1 -> 0: Stop. • Direction through digital input DI3. 0 = forward, 1 = reverse. To control direction, set parameter *1003 DIRECTION* = REQUEST. **Note**: If you deactivate (no input) the stop input (DI2), the control panel start and stop keys are disabled.	4

<table>
<tr><th colspan="3">All parameters</th></tr>
<tr><th>No.</th><th>Name/ Value</th><th>Description</th><th>Def/ FbEq</th></tr>
<tr><td></td><td>DI1P,2P,3P</td><td>• Pulse start forward through digital input DI1.
0 -> 1: Start forward.
• Pulse start reverse through digital input DI1.
0 -> 1: Start reverse.
Note: To start the inverter, activate the digital input DI3 prior to the pulse fed to DI1/DI2.
• Pulse stop through digital input DI3. 1 -> 0: Stop.
To control direction, set parameter 1003 DIRECTION = REQUEST.
Note: If you deactivate (no input) the stop input (DI3), the control panel start and stop keys are disabled.</td><td>5</td></tr>
<tr><td></td><td>KEYPAD</td><td>Start, stop and direction commands through control panel when EXT1 is active. To control the direction, set the parameter 1003 DIRECTION = REQUEST.</td><td>8</td></tr>
<tr><td></td><td>DI1F, 2R</td><td>Start, stop and direction commands through digital inputs DI1 and DI2.<table><tr><th>DI1</th><th>DI2</th><th>Operation</th></tr><tr><td>0</td><td>0</td><td>Stop</td></tr><tr><td>1</td><td>0</td><td>Start forward</td></tr><tr><td>0</td><td>1</td><td>Start reverse</td></tr><tr><td>1</td><td>1</td><td>Stop</td></tr></table>To control direction, set the parameter 1003 DIRECTION = REQUEST.</td><td>9</td></tr>
<tr><td></td><td>COMM</td><td>Fieldbus interface as the source for the start and stop commands (control word 0301 FB CMD WORD 1. bits 0...1). The fieldbus controller sends the control word to the drive through the fieldbus adapter or embedded fieldbus (Modbus). For details of control word bits, see section DCU communication profile in ACS355 User’s manual (3AUA0000066143[English]).</td><td>10</td></tr>
<tr><td></td><td>TIMED FUNC 1</td><td>Timed start/stop control. Timed function 1, Active = start and Inactive = stop.
See parameter Group 36: TIMED FUNCTIONS in ACS355 User’s manual (3AUA0000066143[English]).</td><td>11</td></tr>
<tr><td></td><td>TIMED FUNC 2</td><td>See selection TIMED FUNC 1.</td><td>12</td></tr>
<tr><td></td><td>TIMED FUNC 3</td><td>See selection TIMED FUNC 1.</td><td>13</td></tr>
<tr><td></td><td>TIMED FUNC 4</td><td>See selection TIMED FUNC 1.</td><td>14</td></tr>
</table>

All parameters			
No.	**Name/ Value**	**Description**	**Def/ FbEq**
	DI5	Start and stop through digital input DI5. 0 = stop, 1 = start. Direction fixes based on parameter *1003 DIRECTION* (REQUEST = FORWARD).	20
	DI5,4	Start and stop through digital input DI5. 0 = stop, 1 = start. Direction control through DI4. 0 = forward, 1 = reverse. To control direction, set the parameter *1003 DIRECTION* = REQUEST.	21
	SOLAR	Solar mode. If *6001 AUTO/MANUAL SEL* is set as • Auto [0]—inverter starts only when the DC bus voltage is greater than the value in *6003 START DC VOLT* • Manual [1]—inverter starts at the rising edge of the parameter as set in *6002 MANUAL START CMD*, provided the DC bus voltage is greater than *6003 START DC VOLT*	37
1003	DIRECTION	Controls or fixes the rotational direction of the motor.	REQUEST
	FORWARD	Fixed to forward	1
	REVERSE	Fixed to reverse	2
	REQUEST	Allows rotational direction control	3
11 REFERENCE SELECT		Defines panel reference types, external control location selection and external reference sources and limits.	
1102	EXT1/EXT2 SEL	Defines the source from which the drive reads the signal that selects between the two external control locations, EXT1 or EXT2. **Note**: Only EXT1 is applicable for solar pump inverter.	EXT1
	EXT1	EXT1 active. The control signal sources are defined by parameters *1001 EXT1 COMMANDS* and *1103 REF1 SELECT*.	0
	DI1	Digital input DI1. 0 = EXT1, 1 = EXT2.	1
	DI2	See selection DI1.	2
	DI3	See selection DI1.	3
	DI4	See selection DI1.	4

All parameters			
No.	**Name/ Value**	**Description**	**Def/ FbEq**
	DI5	See selection DI1.	5
	EXT2	EXT2 active. The control signal sources are defined by parameters 1002 EXT2 COMMANDS and 1106 REF2 SELECT.	7
	COMM	Fieldbus interface as the source for EXT1/EXT2 selection, that is Control word 0301 FB CMD WORD 1 bit 5 (with ABB drives profile 5319 EFB PAR 19 bit 11). The fieldbus controller sends the control word to inverter through fieldbus adapter or embedded fieldbus (Modbus). For Control word bits, see sections *DCU communication profile* and *ABB drives communication profile* in *ACS355 User's manual (3AUA0000066143[English]*).	8
	TIMED FUNC 1	Timed EXT1/EXT2 control selection. Timed function 1, active = EXT2 and inactive = EXT1. See parameter Group 36: TIMED FUNCTIONS in *ACS355 User's manual (3AUA0000066143[English]*).	9
	TIMED FUNC 2	See selection *TIMED FUNC 1*.	10
	TIMED FUNC 3	See selection *TIMED FUNC 1*.	11
	TIMED FUNC 4	See selection *TIMED FUNC 1*.	12
	DI1 (INV)	Inverted digital input DI1. 1 = EXT1, 0 = EXT 2.	-1
	DI2 (INV)	See selection *DI1 (INV)*.	-2
	DI3 (INV)	See selection *DI1 (INV)*.	-3
	DI4 (INV)	See selection *DI1 (INV)*.	-4
	DI5 (INV)	See selection *DI1 (INV)*.	-5
1103	REF1 SELECT	Selects the signal source for external reference REF1. For more details, see section *Block diagram: Reference source for EXT1* in *ACS355 User's manual (3AUA0000066143[English]*). **Note**: Frequency input and sequence programming are not applicable for solar pump inverter.	SOLAR
	KEYPAD	Control panel	0
	AI1	Analog input AI1	1
	AI2	Analog input AI2	2

All parameters			
No.	**Name/ Value**	**Description**	**Def/ FbEq**
	AI1/JOYST	Analog input AI1 as joystick. At maximum reference, the • minimum input signal runs the motor in reverse direction. • maximum input signal runs the motor in forward direction. The minimum and maximum references are defined by parameters 1104 REF1 MIN and 1105 REF1 MAX, **Note**: To control direction, set the parameter *1003 DIRECTION* = REQUEST  **WARNING!** If parameter 1301 MINIMUM AI1 is set to 0 V and analog signal is lost (0 V), the rotation of the motor is reversed to the maximum reference. Set the following parameters to activate a fault when analog input signal is lost: • 1301 MINIMUM AI1 = 20% (2 V or 4 mA). • 3021 AI1 FAULT LIMIT = 5% or higher. • 3001 AI<MIN FUNCTION> = FAULT. For parameter details, see *ACS355 User's manual (3AUA0000066143[English]*).	3
	AI2/JOYST	See select AI1/JOYST.	4
	DI3U,4D(R)	Digital input DI3: Reference increase. Digital input DI4: Reference decrease. Stop command resets the reference to zero. Parameter 2205 ACCELER TIME 2 defines the rate of reference change.	5

All parameters			
No.	**Name/ Value**	**Description**	**Def/ FbEq**
	DI3U,4D	Digital input DI3: Reference increase. Digital input DI4: Reference decrease. The program stores the active speed reference (not reset by a stop command). When the drive is restarted, the motor ramps up at the selected acceleration rate to the stored reference. Parameter 2205 ACCELER TIME 2 defines the rate of reference change.	6
	COMM	Fieldbus reference REF1.	8
	COMM+AI1	Summation of fieldbus reference REF1 and analog input AI. See section Reference selection and correction in *ACS355 User's manual (3AUA0000066143[English])*.	9
	COMM*+AI1	Multiplication of fieldbus reference REF1 and analog input AI. See section Reference selection and correction in *ACS355 User's manual (3AUA0000066143[English])*.	10
	DI3U, 4D(R)	• Digital input DI3: Reference increase. • Digital input DI4: Reference decrease. Stop command resets the reference to zero. Parameter 2205 ACCELER TIME 2 defines the rate of the reference change.	11
	DI3U, 4D(NC)	• Digital input DI3: Reference increase. • Digital input DI4: Reference decrease. Program stores the active speed reference (not reset by a stop command). When you restart the inverter, the motor ramps up at the selected acceleration rate to the stored reference. Parameter 2205 ACCELER TIME 2 defines the rate of the reference change.	12
	AI1+AI2	Calculated reference using the equation: $REF = AI1(\%) + AI2(\%) - 50(\%)$	14
	AI1*AI2	Calculated reference using the equation: $REF = AI1(\%) \times (AI2(\%) / (50\%))$	15
	AI1-AI2	Calculated reference using the equation: $REF = AI1(\%) + 50(\%) - AI2(\%)$	16
	AI1/AI2	Calculated reference using the equation: $REF = AI1(\%) \times (50(\%) / (AI2(\%))$	17

All parameters			
No.	**Name/ Value**	**Description**	**Def/ FbEq**
	KEYPAD (RNC)	Defines the control panel as reference source. The stop command resets the reference to zero (R represents reset). **Note**: The reference value is not saved if the control source is changed (EXT1 to EXT2 or EXT2 to EXT2).	20
	KEYPAD (NC)	Defines the control panel as reference source. The stop command does not reset the reference to zero. The reference is stored. **Note**: The reference is not saved if the control source is changed (EXT1 to EXT2 or EXT2 to EXT2).	21
	ODVA HZ REF	Defines the fieldbus interface with ODVA AC/DC profile and reference values in Hz. In the ODVA profile, the unit for SpeedRef if rpm. The Speed (Frequency) reference can be given also in Hz instead of rpm.	36
	SOLAR	SOLAR mode. The inverter takes the speed reference calculation from MPPT.	37
1105	REF1MAX	Defines the maximum value for external reference REF1. This value corresponds to the maximum setting of the used source signal. For solar operation this signal limits the maximum speed reference calculated internally.	50.0 Hz/ 3000 rpm
	0.0...500.0 Hz/ 0...30000 rpm	Maximum value in Hz/rpm. If *9904 MOTOR CTRL MODE* is set as SCALAR: FREQ, the unit is Hz.	1 = 0.1 Hz/ 1 rpm
16 SYSTEM CONTROLS		Parameter view, Run enable, parameter lock, etc.	
1604	FAULT RESET SEL	Selects the source for the fault reset signal. The signal resets the drive after a fault trip if the cause of the fault no longer exists.	DI2
	KEYPAD	Fault reset only from the control panel	0
	DI1	Reset through digital input DI1 (reset on the rising edge of DI1) or from the control panel	1
	DI2	See selection *DI1*.	2
	DI3	See selection *DI1*.	3
	DI4	See selection *DI1*.	4
	DI5	See selection *DI1*.	5

All parameters			
No.	**Name/ Value**	**Description**	**Def/ FbEq**
	START/STOP	Reset along with the stop signal received through a digital input, or from the control panel. **Note**: Do not use this option when start, stop and direction commands are received through fieldbus communication.	7
	COMM	Fieldbus interface as the source for the fault reset signal, that is the Control word 0301 FB CMD WORD 1 bit 4 (with ABB drives profile 5319 EFB PAR 19 bit 7) (see ACS355 User's manual (3AUA0000066143 [English]). The Control word is sent by the fieldbus controller through the fieldbus adapter or embedded fieldbus (Modbus) to the drive. For the Control word bits, see sections DCU communication profile and ABB drives communication profile in ACS355 User's manual (3AUA0000066143 [English]).	8
	DI1(INV)	Reset through inverted digital input DI1 (reset on the falling edge of DI1) or from the control panel	-1
	DI2(INV)	See selection *DI1(INV)*.	-2
	DI3(INV)	See selection *DI1(INV)*.	-3
	DI4(INV)	See selection *DI1(INV)*.	-4
	DI5(INV)	See selection *DI1(INV)*.	-5
1606	LOCAL LOCK	Disables entering local control mode or selects the source for the local control mode lock signal. When the local lock is active, entering the local control mode is disabled (LOC/REM key of the panel).	DI2
	NOT SEL	Local control is allowed.	0
	DI1	Local control mode lock signal through digital input DI1. Rising edge of digital input DI1: Local control disabled. Failing edge of digital input DI1: Local control allowed.	1
	DI2	See selection *DI1*.	2
	DI3	See selection *DI1*.	3
	DI4	See selection *DI1*.	4
	DI5	See selection *DI1*.	5
	ON	Local control is disabled.	7

All parameters			
No.	**Name/ Value**	**Description**	**Def/ FbEq**
	COMM	Fieldbus interface as the source for the local lock, that is Control word 0301 FB CMD WORD 1 bit 14 (see ACS355 User's manual (3AUA0000066143 [English])). The Control word is sent by the fieldbus controller through the fieldbus adapter or embedded fieldbus (Modbus) to the drive. For the Control word bits, see section DCU communication profile in ACS355 User's manual (3AUA0000066143 [English]). **Note**: This setting applies only for the DCU profile	8
	DI1(INV)	Local lock through inverted digital input DI1. Raising edge of inverted digital input DI1: Local control allowed. Falling edge of inverted digital input DI1: Local control disabled.	-1
	DI2(INV)	See selection *DI1(INV)*.	-2
	DI3(INV)	See selection *DI1(INV)*.	-3
	DI4(INV)	See selection *DI1(INV)*.	-4
	DI5(INV)	See selection *DI1(INV)*.	-5
20 LIMITS		Defines inverter operation limits. **Note**: Speed values are used in vector control and frequency values are used in scalar control. Select control mode in *9904 MOTOR CTRL MODE*.	
2002	MAXIMUM SPEED	Defines the maximum speed limit.	3000 rpm
	0...30000 rpm	Maximum speed.	1 = 1 rpm
2003	MAX CURRENT	Defines the allowed maximum motor current.	I_{2N} A
	0.0...1.8 I_{2N} A	Continuous output RMS current.	1 = 0.1 A
2005	OVERVOLT CTRL	Activates or deactivates the overvoltage control of the intermediate DC link. Fast braking of a high inertia load causes the voltage to rise to the overvoltage control limit. To prevent the DC voltage from exceeding the limit, the overvoltage controller automatically decreases the braking torque. **Note**: If a brake chopper and resistor are connected to the drive, the controller must be switched off (selection DISABLE) to allow chopper operation.	DISABLE
	DISABLE	Overvoltage control deactivated	0
	ENABLE	Overvoltage control activated	1

All parameters			
No.	**Name/ Value**	**Description**	**Def/ FbEq**
2006	UNDERVOLT CTRL	Activates or deactivates the undervoltage control of the intermediate DC link. If the DC voltage drops due to input power failure, the undervoltage controller automatically decreases the motor speed to keep the voltage above the lower limit. By decreasing the motor speed, the inertia of the load regenerates back to the drive, keeping the DC link charged and preventing an undervoltage trip until the motor coasts to stop. This acts as a power-loss ride through functionality in systems with high inertia, such as a centrifuge or a fan. See section Motor identification in ACS355 User's manual (3AUA0000066143 [English]).	ENABLE
	DISABLE	Undervoltage control is deactivated	0
	ENABLE (TIME)	Undervoltage control is activated. The control is active for 500 ms.	1
	ENABLE	Undervoltage control is activated. No operation time limit.	2
2020	BRAKE CHOPPER	Select the brake chopper control. When using the inverter in a common DC bus system, the parameter must to set to EXTERNAL. When in common DC, the drive cannot feed or receive more power than P_N.	EXTERNAL
	INBUILT	Internal brake chopper control. **Note**: Ensure the brake resistor(s) is installed and the overvoltage control is switched off by setting parameter *2005 OVERVOLT CTRL* to selection *DISABLE*.	0
	EXTERNAL	External brake chopper control. **Note**: • The drive is compatible only with ABB **ACS-BRK-X** brake units. • Ensure the brake unit is installed and the overvoltage control is switched off by setting parameter *2005 OVERVOLT CTRL* to selection *DISABLE*.	1

All parameters			
No.	**Name/ Value**	**Description**	**Def/ FbEq**
21 START/STOP		Start and stop modes of the motor	
2102	STOP FUNCTION	Selects the motor stop function.	COAST
	COAST	Stop by cutting off the motor power supply. The motor coasts to stop.	1
	RAMP	Stop along a ramp. See parameter Group *22 ACCEL/DECEL* (for more details see, *ACS355 User's manual (3AUA0000066143 [English]).*	2
22 ACCEL/DECEL		Acceleration and deceleration times.	
2202	ACCELER TIME 1	Defines the acceleration time 1, that is the time required for the speed to change from zero to the speed defined by parameter 2008 MAXIMUM FREQ (in scalar control), see ACS355 User's manual (3AUA0000066143 [English])/ *2002 MAXIMUM SPEED* (in vector control). The control mode is selected by parameter *9904 MOTOR CTRL MODE*. • If speed reference increases faster than the set acceleration rate, the motor speed follows the acceleration rate. • If speed reference increases slower than the set acceleration rate, the motor speed follows the reference signal. • If acceleration time is set too short, the drive automatically prolongs the acceleration, not to exceed the drive operating limits. The actual acceleration time depends on parameter 2204 RAMP SHAPE 1 setting (see ACS355 User's manual (3AUA0000066143 [English]).	20.0 s
	0.0...1800.0 s	Time	1 = 0.1 s
2205	ACCELER TIME 2	Defines the acceleration time 2, that is the time required for the speed to change from zero to the speed defined by parameter 2008 MAXIMUM FREQ (in scalar control), see ACS355 User's manual (3AUA0000066143 [English])/ *2002 MAXIMUM SPEED* (in vector control). The control mode is selected by parameter *9904 MOTOR CTRL MODE*. See parameter *2202 ACCELER TIME 1*. Acceleration time 2 is used also as jogging acceleration time. See parameter 1010 JOGGING SEL in ACS355 User's manual (3AUA0000066143 [English]).	20.0 s
	0.0...1800.0 s	Time	1 = 0.1 s

All parameters			
No.	**Name/ Value**	**Description**	**Def/ FbEq**
26 MOTOR CONTROL		Motor control variables	
2605	U/F RATIO	Selects the voltage to frequency (U/f) ratio below the field weakening point. For scalar control only.	SQUARED
	LINEAR	Linear ratio for constant torque applications.	1
	SQUARED	Squared ratio for centrifugal pump and fan applications. With squared U/f ratio the noise level is lower for most operating frequencies. **Note**: This parameter value is not recommended for permanent magnet synchronous motors.	2
	USER DEFINED	Custom ratio defined by parameters 2610…2618. See section Custom U/f ratio in ACS355 User's manual (3AUA0000066143 [English]).	3
2609	NOISE SMOOTHING	Enables the noise smoothing function. Noise smoothing distributes the acoustic motor noise over a range of frequencies instead of a single tonal frequency resulting in lower peak noise intensity. A random component with an average of 0 Hz is added to the switching frequency set by parameter 2606 SWITCHING FREQ. See ACS355 User's manual (3AUA0000066143 [English]) **Note**: Parameter has no effect if parameter 2606 SWITCHING FREQ is set to 16 kHz.	ENABLE
	DISABLE	Disabled	0
	ENABLE	Enabled	1
2619	DC STABILIZER	Enables or disables the DC voltage stabilizer. The DC stabilizer is used to prevent possible voltage oscillations in the drive DC bus caused by motor load or weak supply network. In case of voltage variation, the drive tunes the frequency reference to stabilize the DC bus voltage and therefore the load torque oscillation.	ENABLE
	DISABLE	Disabled	0
	ENABLE	Enabled	1

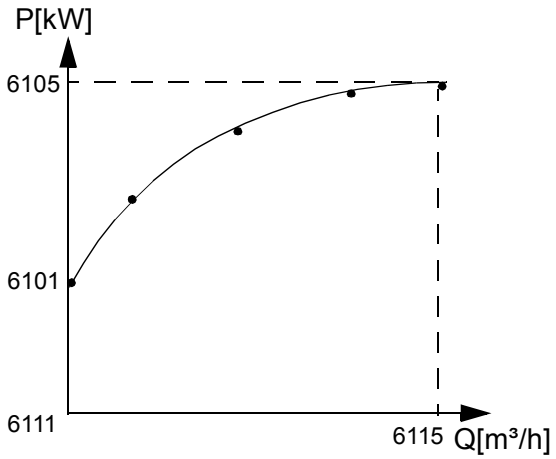
All parameters			
No.	**Name/ Value**	**Description**	**Def/ FbEq**
2621	SMOOTH START	Selects the forced current vector rotation mode at low speeds. When the smooth start mode is selected, the rate of acceleration is limited by the acceleration and deceleration ramp times (parameters *2202* and 2203 [see ACS355 User's manual (3AUA0000066143 [English])]). If the process driven by the permanent magnet synchronous motor has high inertia, slow ramp times are recommended. Can be used for permanent magnet synchronous motors only (see chapter Appendix: Permanent magnet synchronous motors (PMSMs) in ACS355 User's manual (3AUA0000066143 [English])).	ALWAYS
	NO	Disabled	0
	ALWAYS	Enabled always when the frequency is below the smooth start frequency (parameter 2623 SMOOTH STARTFRQ). See ACS355 User's manual (3AUA0000066143 [English]).	1
	START ONLY	Enabled below the smooth start frequency (parameter 2623 SMOOTH START FRQ) only when starting the motor.	2
2622	SMOOTH START CUR	Defines the current used in the current vector rotation at low speeds. Increase the smooth start current if the application requires high pull-up torque. Decrease the smooth start current if motor shaft swinging needs to be minimized. Note that accurate torque control is not possible in the current vector rotation mode. This parameter can be used for permanent magnet synchronous motors only (see chapter Appendix: Permanent magnet synchronous motors (PMSMs) in ACS355 User's manual (3AUA0000066143 [English])).	10%
	10...100%	Value as a percentage of the nominal motor current.	1 = 1%

All parameters			
No.	**Name/ Value**	**Description**	**Def/ FbEq**
30 FAULT FUNCTIONS		Programmable protection functions	
3010	STALL FUNCTION	Selects how the drive reacts to a motor stall condition. The protection is active if the drive has operated in a stall region (see the figure below) longer than the time set by parameter *3012 STALL TIME*. In vector control the user defined limit = 2017 MAX TORQUE 1 / 2018 MAX TORQUE 2 (applies for positive and negative torques). See ACS355 User's manual (3AUA0000066143 [English]). In scalar control the user defined limit = 2003 MAX CURRENT. See ACS355 User's manual (3AUA0000066143 [English]). The control mode is selected by parameter *9904 MOTOR CTRL MODE*.	FAULT
	NOT SEL	Protection is inactive.	0
	FAULT	The drive trips on fault MOTOR STALL (0012) and the motor coasts to stop. See ACS355 User's manual (3AUA0000066143 [English]).	1
	ALARM	The drive generates alarm MOTOR STALL (2012). See ACS355 User's manual (3AUA0000066143 [English]).	2
3011	STALL FREQUENCY	Defines the frequency limit for stall function. See parameter *3010 STALL FUNCTION*.	10.0 Hz
	0.5...50.0 Hz	Frequency	1 = 0.1 Hz
3012	STALL TIME	Defines the time for stall function. See parameter *3010 STALL FUNCTION*.	10 s
	10...400 s	Time	1 = 1 s
3026	POWER FAIL START	Selects how the drive reacts when the control board is externally powered by the MPOW-01 auxiliary power extension module (see Appendix: Extension modules in ACS355 User's manual (3AUA0000066143 [English]) and start is requested by the user. **Note**: Only FAULT selection is available.	FAULT
	FAULT	The drive trips on fault 0006 DC UNDERVOLT (See ACS355 User's manual (3AUA0000066143 [English]).	2

All parameters			
No.	**Name/ Value**	**Description**	**Def/ FbEq**
60 PUMP CONTROL		Defines pump control parameters.	
6001	AUTO/MANUAL SEL	Selects the start mode of the inverter.	MANUAL
	AUTO	Inverter starts automatically if DC bus voltage is more than the 6003 START DC VOLT. **Note**: If the timed function is enabled in parameter 3601 TIMERS ENABLE, then the drive starts as per the timed function configuration. For more details of timed function, see group 36 TIMED FUNCTIONS in ACS355 User's manual (3AUA0000066143 [English]).	0
	MANUAL	Inverter starts when the manual start command is on. See parameter 6002 MANUAL START CMD.	1
6002	MANUAL START CMD	Defines the source for inverter to start in manual mode. The selection is effective when parameter 6001 is MANUAL and the inverter is in remote control mode.	DI1
	DI1	Start and stop through digital input DI1. 0 = Stop, 1 = Start	0
	DI2	Start and stop through digital input DI2. 0 = Stop, 1 = Start	1
	DI3	Start and stop through digital input DI3. 0 = Stop, 1 = Start	2
	DI1P, 2P	Pulse starts through digital input DI1. 0 -> 1: Start. Pulse stops through digital input DI2. 1 -> 0: Stop **Note**: To start the inverter, activate DI2 prior to feeding pulse to DI1.	3
6003	START DC VOLT	Defines the minimum DC voltage to start the inverter. **Note**: If you change this value while the inverter is running, the changed value is effective only during the next start.	1 = 1 V
	109...800 V	DC voltage. **Note**: Range is different for 1-phase and 3-phase inverters.	400 V unit: 225 200 V unit: 129

All parameters			
No.	**Name/ Value**	**Description**	**Def/ FbEq**
6004	PV CELL MIN VOLT	Defines the minimum DC voltage below which the inverter cannot operate. **Note**: The inverter stops operating below this voltage.	1 = 1 V
	109...800 V	DC voltage. **Note**: Range is different for 1-phase and 3-phase inverters.	400 V unit: 225 200 V unit: 129
6005	PV CELL MAX VOLT	Defines the maximum DC voltage. At any value above this voltage, the inverter trips due to *PV MAX VOLT* fault.	1 = 1 V
	109...800 V	DC voltage. **Note**: Range is different for 1-phase and 3-phase inverters.	400 V unit: 640 200 V unit: 368
6006	PUMP MINIMUM SPD	Defines the minimum motor speed. At any value below this speed, the inverter stops functioning and auto restarts after the time defined in *6019 FAULT RESET TIME*. This setting avoids unnecessary operation of pump at low speed.	1 = 1 rpm
	0...3000 rpm	Speed	0
6007	PUMP MAXIMUM SPD	Defines the maximum motor speed.	1 = 1 rpm
	0...3000 rpm	Speed	3000
6008	BOOST VOLT	Defines the DC voltage above which 6009 BOOST FACTOR is effective. Below this value, motor speed follows the V/F factor.	1 = 1 V
	109...600 V	DC voltage. **Note**: Range is different for 1-phase and 3-phase inverters.	400 V unit: 450 200 V unit: 259
6009	BOOST FACTOR	Defines the factor at which the inverter functions the best. This parameter is effective when DC voltage is above the value in 6008 BOOST VOLT.	100 = 1
	0.75...1.25	Boost factor	1.00
6015	DRY RUN SEL DI	Selects the input for dry run protection.	WITH_ P60.16
	DI1	Digital input DI1. Defines the digital input DI1 as the control for dry run protection.	1
	DI2	See selection *DI1*.	2

All parameters			
No.	**Name/ Value**	**Description**	**Def/ FbEq**
	DI3	See selection *DI1*.	3
	DI4	See selection *DI1*.	4
	DI5	See selection *DI1*.	5
	DI1(INV)	Inverted digital input DI1. Defines the inverted digital input DI1 as the control for dry run protection.	6
	DI2(INV)	See selection *DI1(INV)*.	7
	DI3(INV)	See selection *DI1(INV)*.	8
	DI4(INV)	See selection *DI1(INV)*.	9
	DI5(INV)	See selection *DI1(INV)*.	10
	WITH_P60.16	See parameter *6016 MIN LOAD CURRENT*	11
6016	MIN LOAD CURRENT	Defines the minimum load current for dry run protection of inverter. When actual motor current is less than this value for the time defined in 6017 DRY RUN TRP TIME, the inverter trips due to *DRY RUN*.	1 = 1 A
	0...2 * Drive rating A	Current	0
6017	DRY RUN TRP TIME	Allows inverter to wait for this time to trip if pump is in dry run condition. See 6016 MIN LOAD CURRENT.	1 = 1 min
	0...5 mins	Time	2 mins
6018	DRY RUN RST TIME	Allows inverter to wait for this time to reset in case of a dry run fault. After this reset time, inverter starts automatically.	1 = 1 min
	2...300 mins	Time	2 mins
6019	FAULT RESET TIME	Allows inverter to wait for this time to restart automatically in case inverter tripped due to under-voltage fault, PV cell maximum voltage fault or when actual speed decreased below the minimum motor speed defined in *6006 PUMP MINIMUM SPD*.	1 = 1 min
	2...20 mins	Time	2 mins

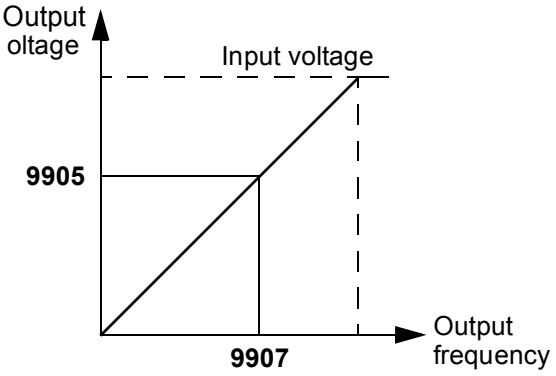
All parameters			
No.	**Name/ Value**	**Description**	**Def/ FbEq**
6021	PMP CLEAN SELECT	Enables the pump cleaning sequence for the inverter in the manual mode (see *6001 AUTO/MANUAL SEL*) and defines the selection conditions. **WARNING!** Before enabling the pump cleaning sequence, make sure that it can be performed safely with the connected equipment. **Note**: When the pump cleaning sequence is active, it cannot be stopped with OFF selection. After the cleaning sequence is completed successfully or if the sequence is interrupted due to a fault, it automatically switches to OFF selection.	OFF
	OFF	Disables pump cleaning sequence.	0
	ON	Enables pump cleaning sequence.	1
6022	PMP CLEAN SPEED	Defines the speed at which the pump cleaning sequence is initiated.	1 = 1 rpm
	500...3000	Speed.	500 rpm
6023	PMP CLEAN TIME	Defines the pump cleaning time for which the motor rotates in one direction (forward or reverse) within which the cleaning sequences are counted.	1 = 1 sec
	1...300	Time	60 sec
61 FLOW CALCULATION		Defines flow calculation parameters.	
6101	PQ CURVE P1	Defines the input power of pump in kW at point 1 on the PQ performance curve.  For description of PQ curve, see section *Flow calculation*, page *33*.	10 = 1 kW

All parameters			
No.	**Name/ Value**	**Description**	**Def/ FbEq**
	0...3276.0 kW	Power	0
6102	PQ CURVE P2	Defines the input power of pump at point 2 on the PQ curve.	10 = 1 kW
	0...3276.0 kW	Power	0
6103	PQ CURVE P3	Defines the input power of pump at point 3 on the PQ curve.	10 = 1 kW
	0...3276.0 kW	Power	0
6104	PQ CURVE P4	Defines the input power of pump at point 4 on the PQ curve.	10 = 1 kW
	0...3276.0 kW	Power	0
6105	PQ CURVE P5	Defines the input power of pump at point 5 on the PQ curve.	10 = 1 kW
	0...3276.0 kW	Power	0
6111	PQ CURVE Q1	Defines the flow rate at point 1 on the PQ curve.	10 = 1 m³/h
	0...3276.0 m³/h	Flow rate	0
6112	PQ CURVE Q2	Defines the flow rate at point 2 on the PQ curve.	10 = 1 m³/h
	0...3276.0 m³/h	Flow rate	0
6113	PQ CURVE Q3	Defines the flow rate at point 3 on the PQ curve.	10 = 1 m³/h
	0...3276.0 m³/h	Flow rate	0
6114	PQ CURVE Q4	Defines the flow rate at point 4 on the PQ curve.	10 = 1 m³/h
	0...3276.0 m³/h	Flow rate	0
6115	PQ CURVE Q5	Defines the flow rate at point 5 on the PQ curve.	10 = 1 m³/h
	0...3276.0 m³/h	Flow rate	0
6121	PUMP EFFICIENCY	Defines the total efficiency of the motor/pump combination.	1 = 1%
	0...100%	Percentage	100%
6122	PUMP NOM SPEED	Defines the nominal speed of pump. This value is used for flow calculation in *CALCULATED FLOW*, see page *37*.	1 = 1 rpm
	0...3000 rpm	Speed	3000 rpm
6123	CALC LOW SPEED	Defines the minimum speed limit below which flow is not calculated.	1 = 1 rpm
	100...3000 rpm	Speed	500 rpm

All parameters			
No.	**Name/ Value**	**Description**	**Def/ FbEq**
6124	FLOW CAL GAIN	Defines the flow calculation gain for possible calculation correction.	100 = 1
	0.50...2.00	Gain value	1
6131	RESET FLOW	Resets the measured flow data of actual signals to zero in *0184 TODAY FLOW* and *0185 CUMULA YEAR FLOW*.	DONE
	DONE	Flow reset is done.	0
	RESET	Activates the flow reset.	1
99 START-UP DATA		Defines special start-up data required to set up the inverter and allows to enter motor information. **Note**: All languages are not available for printing this manual because language list typically change as time passes.	
9902	APPL MACRO	Selects the application macros. See *Application macros in ACS355 User's manual (3AUA0000066143 [English])*.	ABB STANDARD
	ABB STANDARD	Standard macro for solar mode.	1
	3-WIRE	3-wire macro for constant speed applications.	2
	ALTERNATE	Alternate macro for start forward and start reverse applications.	3
	MOTOR POT	Motor potentiometer macro for digital signal speed control applications.	4
	HAND/AUTO	Hand/Auto macro used when two control devices are connected to the inverter: • Device 1 communicates through the interface defined by external control location EXT1. • Device 2 communicates through the interface defined by external control location EXT2. **Note**: Either EXT1 or EXT2 is active at a time. The switching between EXT1 or EXT2 happens through digital input.	5
	PID CONTROL	PID control for applications in which the inverter controls a process value. **Example**: For pressure controlled by the inverter running a pressure boost pump, the measured pressure and reference pressure are connected to the inverter.	6
	TORQUE CTRL	Torque control macro.	8

All parameters			
No.	**Name/ Value**	**Description**	**Def/ FbEq**
	AC500 MODBUS	AC500 PLC macro. See *Modbus macro in ACS355 User's manual (3AUA0000066143 [English])*.	10
	LOAD FD SET	FlashDrop parameter values as defined by the FlashDrop file. For Parameter view, see *16 SYSTEM CONTROLS* in *ACS355 User's manual (3AUA0000066143 [English])*. FlashDrop is an optional device for fast copying of parameters to unpowered inverters. FlashDrop allows easy customization of the parameter list. For example, the selected parameters can be hidden. For more information, see *MFDT-01 FlashDrop user's manual (3AFE86591074 [English])*.	31
	USER S1 LOAD	User 1 macro loaded into use. **Note**: Before loading, check that the saved parameter settings and the motor model are suitable for the application.	0
	USER S1 SAVE	Save User 1 macro. Stores the current parameter settings and the motor model.	-1
	USER S2 LOAD	User 2 macro loaded into use. **Note**: Before loading, check that the saved parameter settings and the motor model are suitable for the application.	-2
	USER S2 SAVE	Save User 2 macro. Stores the current parameter settings and the motor model.	-3
	USER S3 LOAD	User 3 macro loaded into use. **Note**: Before loading, check that the saved parameter settings and the motor model are suitable for the application.	-4
	USER S3 SAVE	Save User 3 macro. Stores the current parameter settings and the motor model.	-5
9903	MOTOR TYPE	Selects the motor type. **Note**: Value cannot be changed while the inverter is operating.	AM
	AM	Asynchronous motor	1
	PMSM	Permanent magnet synchronous motor	2

All parameters			
No.	**Name/ Value**	**Description**	**Def/ FbEq**
9904	MOTOR CTRL MODE	Selects the motor control modes. **WARNING!** The VECTOR:TORQ motor control mode is not functional for solar mode.	SCALAR: FREQ
	VECTOR: SPEED	Vector control mode without sensor. Reference 1 = Reference speed in RPM Reference 2 = Reference speed in %. Absolute maximum speed is 100%, which is equal to the value in *2002 MAXIMUM SPEED* (or 2001 MINIMUM SPEED if the absolute value of the minimum speed is greater than maximum speed).	1
	SCALAR: FREQ	Scalar control mode. Reference 1 = Reference frequency in Hz. Reference 2 = Reference frequency as %. The absolute maximum frequency is 100%, equal to the value in 20.08 MAXIMUM FREQ (or 20.07 MINIMUM FREQ if the absolute value of the minimum speed is greater than the maximum speed).	3

All parameters			
No.	**Name/ Value**	**Description**	**Def/ FbEq**
9905	MOTOR NOM VOLT	Defines the motor nominal voltage. • For AM, nominal voltage is the value displayed on the motor name plate. • For PMSM, nominal voltage is back emf voltage at nominal speed. The inverter cannot supply the motor with a voltage greater than the input voltage. **Note**: The output voltage is not limited by the nominal motor voltage, but increases linearly up to the value of the input voltage. *Motor nominal voltage plot*  **Warning!** The stress on the motor insulations depends on the inverter supply voltage. This also applies when the motor voltage rating is lower than the inverter rating and the supply voltage of the inverter. The rms voltage can be limited to the motor nominal voltage by setting the maximum frequency of the inverter in parameter 2008 to the motor nominal frequency.	1 = 1 V
	0.5...1.5 * U_{1N}	Incoming AC voltage as displayed on the inverter name plate.	200 V units: 46...345 V 400 V E units: 80...600 V
9906	MOTOR NOM CURR	Defines the nominal motor current as displayed on the motor rating plate.	I_{2N}
	0.2...2.0 I_{2N}	Rated current as displayed on the inverter name plate.	1 = 0.1 A
9907	MOTOR NOM FREQ	Defines the nominal motor frequency at which the output voltage equals the motor nominal voltage: $\text{FieldWeakeningPoint} = \frac{\text{NominalFrequency} \times \text{SupplyVoltage}}{\text{MotorNominalVoltage}}$	50 Hz

All parameters			
No.	**Name/ Value**	**Description**	**Def/ FbEq**
	10.0...600.0 Hz	Nominal motor frequency	1 = 0.1 Hz
9908	MOTOR NOM SPEED	Defines the nominal motor speed as displayed on the motor rating plate.	Type Dependent
	50...30000 rpm	Nominal motor speed	1 = 1 rpm
9909	MOTOR NOM POWER	Defines the nominal motor power as displayed on the motor rating plate.	P_N
	0.2...3.0* P_N kW	Rated power as displayed on the inverter name plate.	1 = 0.1 kW/ 0.1 hp
9910	ID RUN	Controls self -calibration process called Motor ID run. During this process, the inverter operates the motor and makes measurements to identify motor characteristics and create a model used for internal calculations.	OFF/ IDMAGN
	OFF/IDMAGN	The motor ID run process is not run. Identification magnetization is performed depending on the motor control mode. See *9904 MOTOR CTRL MODE*, page *63*. In identification magnetization, the motor model is calculated at first start by magnetizing the motor for 10 to 15 seconds at zero speed (motor not rotating, except that a permanent magnet synchronous motor can rotate a fraction of a revolution). The model is recalculated always at start after motor parameter changes. • Parameter 9904 = 1 (VECTOR: SPEED): Identification magnetization is performed. • Parameter 9904 = 3 (SCALAR: FREQ): Identification magnetization is not performed. **Note**: The parameter 9904 = 2 (VECTOR: TORQ) is not functional in the ACS355 solar pump inverter.	0

All parameters			
No.	**Name/ Value**	**Description**	**Def/ FbEq**
	ON	ID run for control accuracy. The ID run takes about one minute. An ID run is effective when: • parameter 9904 = 1 [VECTOR: SPEED] is used • operation point is near zero speed **Note**: Ensure the following points: • De-couple the motor from the driven equipment. • Check the direction of rotation of the motor before starting the ID run. During the run, the motor rotates in the forward direction. • If motor parameters are changed after ID run, repeat the ID run. ⚠ **WARNING**! The motor operates at up to approximately 50…80% of the nominal speed during the ID run. **ENSURE THAT IT IS SAFE TO RUN THE MOTOR BEFORE PERFORMING THE ID RUN!**	1
9912	MOTOR NOM TORQUE	Shows the calculated motor nominal torque in N-m. (Calculation is based on parameter *9909 MOTOR NOM POWER* and *9908 MOTOR NOM SPEED* values).	0
	0...3000.0 N-m	Read-only	1 = 0.1 N-m
9913	MOTOR POLE PAIRS	Shows the calculated motor pole pair numbers. (Calculation is based on parameter *9907 MOTOR NOM FREQ* and *9908 MOTOR NOM SPEED* values).	0
	-	Read-only	1 = 1
9914	PHASE INVERSION	Inverts the drive output phase order. This changes the direction of the motor rotation without exchanging the cable positions of two motor cable phase conductors at the drive output terminals or at the motor connection box.	NO
	NO	Phases not inverted	0
	YES	Phases inverted	1
9915	MOTOR COSPHI	Defines the nominal motor cos phi (power factor). The parameter improves performance especially with high efficiency motors.	0
	0	Drive identifies the cos phi automatically by estimation.	IDENTIFIED
	0.01...0.97	Value entered used as the cos phi.	1 = 0.01

8

Fault tracing

About this chapter

This chapter tells how to reset faults and view the fault history. It also lists the fault codes specific to solar pump inverter.

Safety



WARNING! Only qualified electricians are allowed to maintain the inverter. Read the safety instructions in the chapter Safety, page before you work on the inverter.

For general fault tracing information of ACS355 firmware, refer the following topics in *ACS355 User's manual (3AUA0000066143[English])*:

- Alarm messages generated by the drive
- Alarms generated by the basic control panel
- Fault messages generated by the drive

Alarm and fault indications

A fault is indicated with a red LED. See section LEDs in *ACS355 User's manual (3AUA0000066143[English])*.

An alarm or fault message on the panel display indicates an abnormal inverter status. Using the information given in this chapter, most alarm and fault causes can be identified and corrected. If not, contact your local ABB representative.

To display the alarms on the control panel, set parameter 1610 DISPLAY ALARMS to value 1 (YES). See *16 SYSTEM CONTROLS* in *ACS355 User's manual (3AUA0000066143[English])*.

The four-digit code number in parenthesis after the fault is for the fieldbus communication. See chapters *Fieldbus control with embedded fieldbus* and *Fieldbus control with fieldbus adapter* in *ACS355 User's manual (3AUA0000066143[English])*.

How to reset

During a fault condition, you can reset the inverter by pressing the keypad key 

(basic control panel) or 

(assistant control panel) through digital input or fieldbus or by switching off the supply voltage for a while. The source for the fault reset signal is selected by parameter 1604 FAULT RESET SEL. You can restart the motor after the fault is removed.

Fault history

The fault history stores all the detected faults. The latest faults are stored together with the time stamp.

Parameters 0401 LAST FAULT, 0412 PREVIOUS FAULT 1 and 0413 PREVIOUS FAULT 2 store the most recent faults. Parameters 0401...0409 show the inverter operation data at the time the latest fault occurred. The assistant control panel provides additional information about the fault history.

For more information, see section *Fault logger mode* in *ACS355 User's manual (3AUA0000066143[English])*.

Fault messages

The following faults messages are generated by the solar pump inverter.

Code	Fault	Cause	What to do
210	DRY RUN	The inverter consumes less current than the current set in *6016 MIN LOAD CURRENT*. This condition occurs when there is no water flowing in the pump.	• Check the availability of water at the pump inlet. • Check for any blockage in the pump.
216	PV MAX VOLT	The DC bus voltage in the inverter is above the voltage set in *6005 PV CELL MAX VOLT*.	• Check the number of PV cells connected in series. • Ensure that voltage is less than the voltage set in *6005 PV CELL MAX VOLT*. Maximum allowed voltage: • 400 V unit: 800 V • 200 V unit: 400 V

Alarm messages

The following alarm messages are generated by the solar pump inverter.

Code	Fault	Cause	What to do
2036	PUMP MINIMUM SPEED	This alarm occurs when the speed reference calculated by internal MPPT algorithm is less than the pump minimum speed set in *6006 PUMP MINIMUM SPD*. If the pump minimum speed alarm occurs for three consecutive time (within time defined in P *6019* * 5), the next auto restart occurs after 10 minutes.	Check the pump minimum speed set in *6006 PUMP MINIMUM SPD*.
2037	START DELAY ACTIVE	This alarm occurs when the fault auto reset delay is active. The drive is in standby mode until the fault reset time is complete.	Check the time set in *6019 FAULT RESET TIME*.

9

Technical data

About this chapter

This chapter contains the technical specifications of the solar pump inverter, for example: fuse ratings, sizes and technical requirements. It also includes the solar status word list.

For technical specifications of ACS355 Drives, see *ACS355 User's manual (3AUA0000066143 [English])*.

Fuse ratings

Use standard fuses with all ABB general machinery drives. For fuse ratings of ACS355 drives, refer the technical data on *Power cable sizes and fuses* in the *ACS355 User's manual (3AUA0000066143 [English])*.

For input fuse connection see fuse ratings in the table below. Refer to gG for AC and UR or gG for DC. The uR fuse ratings are determined by the maximum instantaneous DC current because the fuse works fast.

Important: Select fuses with current ratings two times higher than the DC current calculated from the nominal power. For gG fuses, select fuses with current ratings one size smaller than the DC current.

Type code	Frame size	IEC Fuse AC side	DC Fuse PV side	
		Fuse [A] Type gG	Fuse Type	
			UR	gG
1-phase supply voltage 200 to 240 V units				
ACS355-01X-04A7-2	R1	16	10	10
ACS355-01X-06A7-2	R1	16	10	10
ACS355-01X-07A5-2	R2	20	16	10
ACS355-01X-09A8-2	R2	25	16	16

Type code	Frame size	IEC Fuse AC side	DC Fuse PV side	
		Fuse [A] Type gG	Fuse Type	
			UR	gG
3-phase supply voltage 200 to 240 V units				
ACS355-03X-03A5-2	R0	10	10	10
ACS355-03X-04A7-2	R1	10	10	10
ACS355-03X-06A7-2	R1	16	10	10
ACS355-03X-07A5-2	R1	16	16	10
ACS355-03X-09A8-2	R2	16	16	16
ACS355-03X-13A3-2	R2	25	25	25
ACS355-03X-17A6-2	R2	25	35	25
ACS355-03X-24A4-2	R3	63	35	35
ACS355-03X-31A0-2	R4	80	50	50
ACS355-03X-46A2-2	R4	100	80	63
3-phase supply voltage 380 to 480 V units				
ACS355-03X-01A9-4	R0	10	10	10
ACS355-03X-02A4-4	R1	10	10	10
ACS355-03X-03A3-4	R1	10	10	10
ACS355-03X-04A1-4	R1	16	10	10
ACS355-03X-05A6-4	R1	16	10	10
ACS355-03X-07A3-4	R1	16	16	10
ACS355-03X-08A8-4	R1	20	25	16
ACS355-03X-12A5-4	R3	25	25	16
ACS355-03X-15A6-4	R3	35	35	25
ACS355-03X-23A1-4	R3	50	50	35
ACS355-03X-31A0-4	R4	80	63	50
ACS355-03X-38A0-4	R4	100	80	50
ACS355-03X-44A0-4	R4	100	80	63

UL checklist

- The ACS355 drive is an IP20 (UL open or NEMA 1 type) drive to be used in a heated, indoor controlled environment. The drive must be installed in clean air according to enclosure classification. Cooling air must be clean, free from corrosive materials and

electrically conductive dust. For detailed specifications, see *ACS355 User's manual (3AUA0000066143 [English]).*

- The maximum ambient air temperature is 50 °C (122 °F) at rated current. The current is derated for 40 to 50 °C (104 to 131 °F).
- The drive is suitable for use in a circuit capable of delivering not more than 100 kA rms symmetrical amperes at the inverter maximum rated voltage.
- The cables located within the motor circuit must be rated for at least 75 °C (167 °F) UL-compliant installations.
- The input cable must be protected with fuses or circuit breakers. Suitable IEC (class gG) and UL (class T) fuses are listed in the *Technical data* section of the user's manual.
- For installation in the United States, branch circuit protection must be provided in accordance with the National Electrical Code (NEC) and any applicable local codes. To fulfil this requirement, use the UL-classified fuses.
- For installation in Canada, branch circuit protection must be provided in accordance with Canadian Electrical Code and any applicable provincial codes. To fulfil this requirement, use the UL-classified fuses.
- The drive provides overload protection in accordance with the National Electrical Code (NEC).

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 www.abb.com/searchchannels.

Product training

For information on ABB product training, navigate to www.abb.com/drives and select *Training courses*.

Providing feedback on ABB Drives manuals

Your comments on our manuals are welcome. Go to www.abb.com/drives and select *Document Library – Manuals feedback form (LV AC drives)*.

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