ПРИВОДЫ ПЕРЕМЕННОГО ТОКА НИЗКОВОЛЬТНЫЕ

Техническое описание на преобразователи ACS501

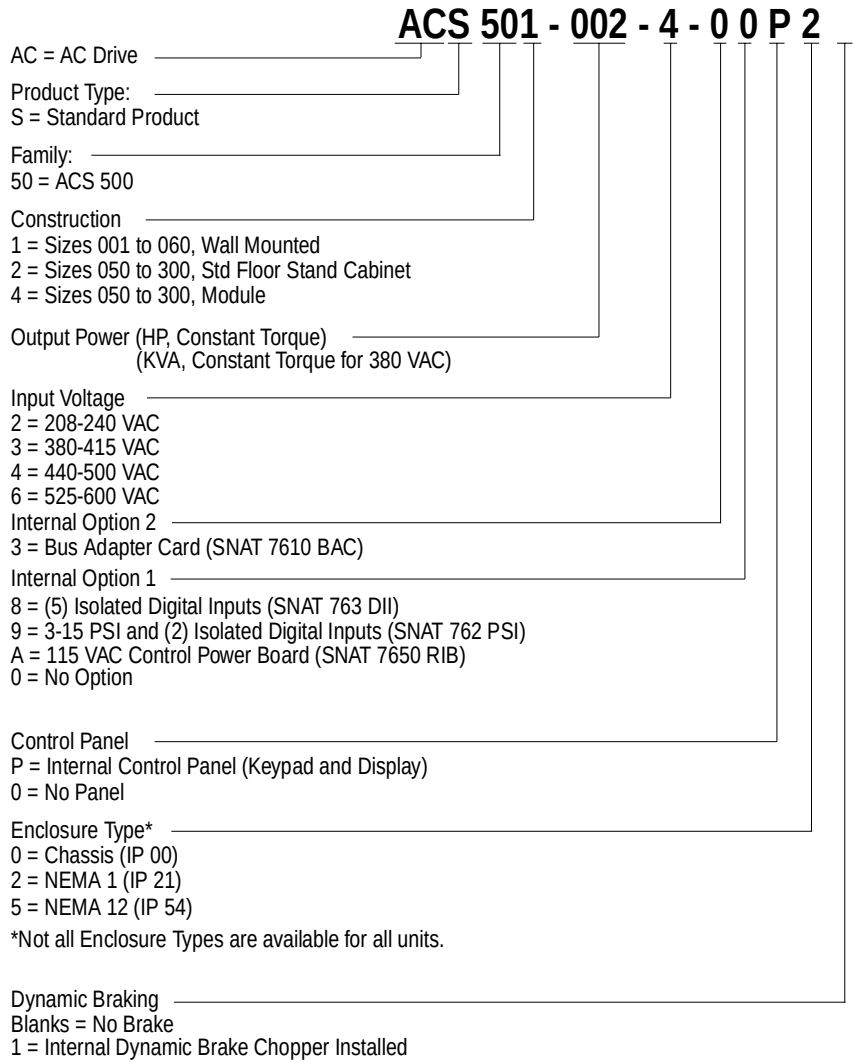
Overview of the ACS 501

This chapter describes the features and functions of the ACS 501, and includes illustrations and block diagrams. It also describes the ACS 501 hardware components and the Control Panel displays and keys. The last part of this chapter presents an overview of the Parameters menu system and Application macros.

Nameplate Identification

Figure 2-1 explains the drive code printed on the nameplate, located at the bottom of your drive between the mounting holes.

Figure 2-1 Explanation of ACS 501 Drive Code



Features and Functions

Component Descriptions

A diode bridge converts line power almost entirely to active power. The displacement power factor approaches unity (>0.98) regardless of the speed or load of the connected motors.

The DC-Intermediate Circuit filters the DC-voltage ripple supplied by the Rectifier Stage. This section consists of an inductor and capacitors, as well as a charging circuit. The charging circuit limits the in-rush current when power is applied by directing the current through a resistor. Once the bus is charged, the resistor is shorted with a relay or SCR.

Note: *600 VAC units have an AC choke in place of the DC choke.*

Note: *The maximum number of chargings in one minute is four. In applications where frequent start/stop is required, electronic start/stop should be used with the unit powered continuously.*

The Inverter Stage forms symmetrical three-phase AC voltage from the constant DC voltage supplied by the DC-Intermediate Circuit.

A Motor Control Card controls the Inverter Stage and monitors the operation of the ACS 501.

A Control Interface Card is the link between the operator and the ACS 501. It features a Control Panel with an alphanumeric display and keypad. A terminal block for external control connections is also located on the Control Interface Card.

The Control Interface Card is optically isolated from the line potential. The Control Interface Card common is connected to the chassis ground through a 10 megohm resistor.

Figure 2-2 shows a diagram of the hardware components and control functions of the ACS 501.

Table 2-1 Rating Table

Drive Type	Constant Torque			Variable Torque			I_N	Dimension Reference
	hp	Amps (Current Rating of Drive)		hp	Amps (Current Rating of Drive)			
		I_R	I_{IN}		I_{RSQ}	I_{INSQ}		
208/230 VAC								
ACS501-001-2	1.0	4.0	3.6	2.0	7.5	6.8	6.2	R2
ACS501-002-2	2.0	7.5	6.8	3.0	10.6	9.6	10.0	
ACS501-003-2	3.0	10.6	9.6	5.0	16.8	15.2	13.2	R3
ACS501-005-2	5.0	16.8	15.2	7.5	24.2	21.8	18.0	
ACS501-007-2	7.5	24.2	21.8	10.0	30.9	27.8	24.0	R4
ACS501-010-2	10.0	30.9	27.8	15.0	46.2	41.6	31.0	
ACS501-015-2	15.0	46.2	41.6	20.0	59.4	53.5	47.0	R5
ACS501-020-2	20.0	59.4	53.5	25.0	74.8	67.4	62.0	
ACS501-025-2	25.0	74.8	67.4	30.0	88.0	79.2	76.0	R5.5
ACS501-030-2	30.0	88.0	79.2	40.0	114.4	103.0	89.0	
480 VAC								
ACS501-002-4	2.0	3.4	3.1	3.0	4.8	4.3	6.2	R2
ACS501-003-4	3.0	4.8	4.3	5.0	7.6	6.8	7.5	
ACS501-005-4	5.0	7.6	6.8	7.5	11.0	9.9	10.0	
ACS501-007-4	7.5	11.0	9.9	10.0	14.0	12.6	13.2	R3
ACS501-010-4	10.0	14.0	12.6	15.0	21.0	18.9	18.0	
ACS501-015-4	15.0	21.0	18.9	20.0	27.0	24.3	24.0	R4
ACS501-020-4	20.0	27.0	24.3	25.0	34.0	30.6	31.0	
ACS501-025-4	25.0	34.0	30.6	30.0	40.0	36.0	38.0	R5
ACS501-030-4	30.0	40.0	36.0	40.0	52.0	46.8	47.0	
ACS501-040-4	40.0	52.0	46.8	50.0	65.0	58.5	62.0	
ACS501-050-4	50.0	65.0	58.5	60.0	77.0	69.3	76.0	R5.5
ACS501-060-4	60.0	77.0	69.3	75.0	96.0	86.4	89.0	
600 VAC								
ACS501-005-6	5.0	6.1	5.0	7.5	9	7.4	13.2	R3
ACS501-007-6	7.5	9	7.4	10.0	11	9.8	13.2	
ACS501-010-6	10.0	11	9.8	15.0	17	15.1	24.0	R4
ACS501-015-6	15.0	17	15.1	20.0	22	19.5	24.0	
ACS501-020-6	20.0	22	19.5	25.0	27	25.0	31.0	
ACS501-025-6	25.0	27	25.0	30.0	32	29.6	38.0	R5
ACS501-030-6	30.0	32	29.6	40.0	41	37.6	47.0	
ACS501-040-6	40.0	41	37.6	50.0	52	47.7	62.0	R5.5
ACS501-050-6	50.0	52	47.7	60.0	62	53.0	62.0	

Appendix A – ACS 501 Technical Data

Input Power

Voltage: 208/220/230/240 VAC ± 10% for 230 VAC units
380/400/415 VAC ± 10% for 380 VAC units
440/460/480/500 VAC ± 10% for 480 VAC units 525/550/575/600 VAC ± 10% for 600 VAC units

Frequency: 48 – 63 Hz

Displacement Power Factor: > 0.98

Line Imbalance: ± 3% of V_R

Output Power

Voltage: 0 – V_N, three-phase (full voltage at field weakening point)

Frequency: ACS 501, 0 – 500 Hz

ACS 502, 0 – 120 Hz

Frequency Resolution: 0.01 Hz

Continuous Current (constant torque): 1.0 x I_R

Continuous Current (variable torque): 1.0 x I_{RSQ}

Maximum Current (1 min/every 10 min): 1.5 x I_N

Short Time Overload (2 sec/every 1 min): 2.0 x I_N

Overcurrent Trip: 3.75 x I_N instantaneous, 2.65 x I_N (RMS) **Field**

Weakening Point: ACS 501, 30 – 500 Hz

Field Weakening Point: ACS 502, 30 – 180 Hz

Continuous Loadability of Motor: 100% at rated speed (for F class motor) **Modulation Frequency:** ACS 501, 1 – 12 kHz

ACS 502, 3 kHz

Analog Inputs

Two programmable analog inputs.

Current Reference: 0 – 20 mA, R_I = 250 ohms

- Minimum: 0 mA / 4 mA / 0 – 20 mA
- Maximum: 0 – 20 mA

Voltage Reference: 0 - 10 V, R_I = 200K ohms

- Minimum: 0 V / 2 V / 0 – 10 V
- Maximum: 0 – 10 V

Potentiometer: 1K – 10K ohms

Potentiometer Reference Voltage: 10 V, 10 mA

Resolution: AI1 = 10 Bit; AI2 = 12 Bit **Accuracy:**

- Analog Control: ± 0.5%
- Digital Control: ± 0.01%

Reference Signal Update: < 20 mSec

Auxiliary Voltage (for Controls)

24 VDC ± 10%, 200 mA

Digital Inputs

Six programmable digital inputs. < 4.0 V is logical 0 > 18 V is logical 1

Updating of Start/Stop Signal: < 5 mSec

Updating of Other Signals: < 20 mSec

Analog Outputs

Two programmable analog outputs.
0 – 20 mA or 4 - 20 mA, R_L less than or equal to 500 ohms, floating.

Digital Relay Outputs

Three programmable relay outputs, Form C contacts. **Maximum Switching Voltage:** 300 VDC / 250 VAC

Maximum Switching Current/Power: 8 A @ 24 VDC, 0.4 A @ 250 VDC, or 2000 VA @ 250 VAC

Maximum Continuous Current: 2 A rms

Environmental Limits

Ambient Operating Temperature:

- Constant Torque 32° to 113°F (0° to 45°C) NEMA 1, f_s = 3 kHz
- Constant Torque 32° to 104°F (0° to 40°C) NEMA 12, f_s = 3 kHz
- Variable Torque 32° to 104°F (0° to 40°C) NEMA 1, f_s = 3 kHz

Storage Temperature: - 40°F to + 158°F (-40°C to +70°C)

Relative Humidity: less than 95%, non-condensing

Continuous Vibration Level: less than 0.5 G

Altitude: 3300 ft (1000 m) above sea level, derate 1% for every 330 ft (100 m) above 3300 ft (1000 m)

Enclosures

NEMA 1, NEMA 12, CHASSIS

Glossary

Analog Input (AI)

An Analog Input is an input to the ACS 501 for a user-supplied DC signal. The signal may be a speed reference or a process feedback. This signal can be from:

- Manual speed pot
- DC voltage (0 to 10 VDC)
- DC current (0 to 20 mADC)

Analog inputs on the ACS 501 Keypad Display are abbreviated AI.

Converter

The ACS 501 series adjustable frequency drive (AFD) uses a three-phase diode bridge to convert the applied AC line voltage to rectified DC.

DC Bus

The DC Bus is comprised of the:

- DC potential source (internal rectifier bridge or external source),
- DC link inductor (connecting the DC bus capacitors to the DC potential source), and
- DC bus capacitors that, together with the DC link inductor, provide filtration of the DC source potential and provide some buffering between the DC source and the power inverter section.

The DC Bus voltage is 1.35 x Supply Voltage (V_{IN}).

Default

A default is a pre-programmed value for a parameter. When you first install and start your ACS 501 drive, all application macro parameter values appearing on the Keypad Display are default settings. You may change these default settings in the process of customizing your drive for your particular drive application.

Digital Input (DI)

The Digital Inputs (DI) receive bistable (two-state On-Off) control signals from the outside world. An example of such would be a two-position Start-Stop selector switch. Digital inputs on the ACS 501 Keypad Display are abbreviated DI.

EEPROM

EEPROM is an acronym for Electrically Erasable Programmable Read Only Memory. The EEPROM is the non-volatile memory that stores all parameters, even when power is removed.

ESD

ESD is an acronym for Electrostatic Discharge. ESD cautions indicate situations in which static electricity can damage circuit boards on the ACS 501 drive. Follow the precautions listed in the *Safety* section at the beginning of this manual when installing or removing circuit boards.

Field Weakening Point

This is the point at which the output voltage no longer increases as the output frequency is increased. Operation above this point results in reduced motor torque capability while the output kVA remains constant. Refer to Parameter 20.4.4 (Field Weak Point).

Group

A Group is the second of three display levels in ACS 501 programming. Groups group parameters by their functionality, and provide access to them in the same way that Mains provide access to Groups. Groups appear within their respective Mains. For example, if you need to access Group 20.4 or Group 20.3, you must first select Main 20 using specific Keypad procedures. Refer to *Chapter 2 – Overview of the ACS 501*.

IGBT

An IGBT is a fast switching power transistor. ACS 501 drives use these in the inverter section as part of the process of changing DC voltage to AC voltage.

I_R

This notation abbreviates the constant torque rated output current, in amperes, of an ACS 501.

I_{RSQ}

This notation abbreviates the rated variable drive output current, in amperes, of an ACS 501.

I_N

This notation abbreviates the current which the drive trips and on which settings are based.

Inverter

The inverter changes DC power to AC power for application to the motor windings. Control of the inverter affords variable frequency and voltage to be applied to the motor for control of motor speed and direction.

IR Compensation

IR Compensation is a parameter that provides the motor with extra torque at motor speeds between 0.1 Hz and the set Field Weakening Point. Refer to Parameter 20.4.4 (Field Weak Point) and *Field Weakening Point* in this glossary.

Joystick Control

Joystick control allows you to use a joystick for external speed and direction drive control through analog input AI1. Refer to Parameter 10.2.2 (External Ref1 Sel).

Line Voltage

Line voltage in this manual means the input voltage that provides power to the
ACS 501. Line voltage is connected to the ACS 501 Terminals L_1, L_2, and L_3. Refer to Start-up Data Parameter D (Supply Voltage). Refer to *Supply Voltage* in this glossary.

Living Zero

The Living Zero function allows the ACS 501 to detect a loss of reference signal. Set Parameter 10.5.1 (Minimum AI1) to a value greater than 0.3 V/0.6 mA for a Living Zero function. You can then supervise the presence of a control signal by setting Parameter 30.1.2 (AI < Min Function) to WARNING or FAULT. A Warning or Fault message will then display if the analog input falls below the set minimum.

Macro

A macro is a pre-programmed set of defaults for all of the parameters, which are typical for the specified application. When you select a macro from Start-up Data Parameter B (Applications), you select the macro that most closely defines the drive functions necessary for your particular application. After selecting the macro, you can modify or customize the macro to specifically conform to your application.

Refer to the *ACS 500 Adjustable Frequency AC Drives 2 to 350 HP Programming Manual Including Application Macro*s for information on macro applications, functions, and parameter values.

Main

A Main is the first of four display levels in the ACS 501 programming. Mains provide access to Groups in the same way that Groups provide access to Parameters. For example, to access Main 10 while viewing any of the 28 Operating Data Parameters, press [Right Arrow] on the Control Panel Keypad. From the Main 10 display, press [Up Arrow] to access Main 20, Main 30, and Main 40. Refer to *Chapter 2 – Overview of the ACS 501*.

Meggar Test

A Meggar Test measures an insulation system's resistance. This test passes a low current, high voltage through a capacitor and measures the resistance of the insulation system. Meggar test results are

CAUTION: The ACS 501 must not be subjected to testing of this type as damage could result. Any wires connected to the ACS 501 MUST be disconnected from the ACS 501 before being subjected to this type of test.

Memory

The ACS 501 memory provides computer storage for program data and instructions.

Multimeter

A multimeter measures electric component functions and values such as voltage (volts), resistance (ohms), and current (amperes). Some multimeters also test the condition of diodes.

Operating Data

Operating Data defines ACS 501 Parameters 1 (Output Frequency) through 28 (Act Value 2 (PFC)) located at the first of four display levels.

Many Operating Data parameters simply display information such as drive temperature and motor speed, and some parameter values can be changed according to drive application needs.

Parameter

A Parameter is the last of four display levels in the ACS 501 programming. In most cases, Groups provide access to Parameters, and Parameters allow you to modify macros, change start-up settings, and monitor drive and motor functions. Refer to *Chapter 2 – Overview of the ACS 501*.

P_R

This notation abbreviates the rated constant torque output power rating of an ACS 501.

P_{RSQ}

This notation abbreviates the rated variable torque output power rating of an ACS 501.

Rectifier

A rectifier is a device that permits current flow in one direction and blocks the flow of current in the other direction. In today's technology, rectifiers are of the silicon diode type. The ACS 501 uses six rectifiers, configured into a three-phase bridge configuration, as the power converter section of the drive.

Slip Compensation

Slip compensation is a feature in the ACS 501 that allows the drive to compensate for motor slip caused by increased load.

Start-up Data

Start-up Data parameters allow you to set certain parameter values prior to starting the ACS 501. You set these parameters according to the language you want the drive to display (such as German, Spanish, or English), the supply voltage providing power to the drive, and so on. In most cases, these parameters are one-time settings made only during the drive installation process.

Start-up Data parameters are not accessed through the same display levels as Operating Data parameters, Main level, or Group level. Instead, you must first view Operating Data Parameter 1 (Output Frequency), press and hold [*] on the Control Panel Keypad, then press [Right Arrow]. Only this procedure accesses Start-up Data parameters on the ACS 501.

Supply Voltage

Supply voltage in this manual means the input voltage that provides power to the ACS 501. Supply voltage is connected to ACS 501 Terminals L_1, L_2, and L_3. Refer to Start-up Data Parameter D (Supply Voltage). Refer to *Line Voltage* and V_{IN} in this glossary.

T_R

This notation abbreviates the rated output torque of the motor.

V_{IN}

This notation abbreviates the input voltage of the drive. Refer to *Supply Voltage* in this glossary.

V_N

This notation abbreviates the voltage for which the drive is programmed.

V_R

This notation abbreviates the rated input voltage setting, in volts, of an ACS 501.

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