ABB DRIVES

ACH580-01, ACS580-01 and ACQ580-01 Hardware Manual Supplement

125 - 150 HP 208/230V R9 & Free space for R1-R9

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Introduction to the supplement

Contents of this chapter

This chapter describes the supplement.

Applicability

This supplement is applicable to ACH580-01, ACQ580-01 and ACS580-01. Information in this document supersedes corresponding information in these manuals:

ACH580-01 Drives Hardware Manual (3AXD50000044839)

ACQ580-01 Drive Hardware Manual (3AXD50000044862)

ACS580-01 Drives Hardware Manual (3AXD50000044794)

Target audience

This supplement is intended for people who plan the installation and install the drive. Read the supplement before you work on the drive. You are expected to know the fundamentals of electricity, wiring, electrical components and electrical schematic symbols.

Purpose of the supplement

This supplement provides technical data and other information for the ACS580-01, ACH580-01 and ACQ580-01 208/230V R9 drives and updated free space data for all frames.

Related documents

Drive hardware manuals and guides	Code (English)
ACS580-01…, ACH580-01… and ACQ580-01…+C135 drives with 3AXD50000349821 flange mounting kit supplement	*3AXD50000349821*
ACS580-01…+C135, ACH580-01…+C135 and ACQ580-01…+C135 frames R1 to R3 flange mounting kit quick installation guide	*3AXD50000119172*
ACS580-01…+C135, ACH580-01…+C135 and ACQ580-01…+C135 frames R4 to R5 flange mounting kit quick installation guide	*3AXD50000287093*
ACS880-01…+C135, ACS580-01…+C135, ACH580-01…+C135 and ACQ580-01…+C135 frames R6 to R9 flange mounting kit quick installation guide	*3AXD50000019099*
ACS580-01 drives (0.75 to 250 kW, 1.0 to 350 hp) hardware manual frames R1 to R9	*3AXD50000044794*
ACS580-01 drives quick installation and start-up guide for frames R1 to R5	*3AXD50000044838*
ACS580-01 drives quick installation and start-up guide for frames R6 to R9	*3AXD50000009286*
ACH580-01 drives (0.75 to 250 kW, 1 to 350 hp) hardware manual 3AXD50000044839 frames R1 to R9	*3AXD50000044839*
ACH580-01 drives quick installation and start-up guide for frames R1 to R5	*3AXD50000044861*
ACH580-01 drives quick installation and start-up guide for frames R6 to R9	*3AXD50000036602*
ACQ580-01 drives (0.75 to 250 kW, 1.0 to 350 hp) hardware manual frames R1 to R9	*3AXD50000044862*
ACQ580-01 drives quick installation and start-up guide for frames R1 to R5	*3AXD50000044864*
ACQ580-01 drives quick installation and start-up guide for frames R6 to R9	*3AXD50000037301*

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. The codes below open an online listing of the manuals applicable to the product.

ACS580-01 manuals

ACH580-01 manuals

ACQ580-01 manuals

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Hardware description (R9)

Contents of this chapter

This chapter describes the ACx580-01 ratings for 125 and 150 HP at 208/230V.

Product overview

One purpose of this supplement is to provide information for the two ratings: 125 and 150 HP at 230V. These ratings are built in the R9 drive frame. They are only available in North America and have cULus listing. They do not have certifications for use in other parts of the world.

Another purpose of this supplement is to update the free space recommendations.

NOTICE: In this manual, the reference “ACx580” refers to any of the types: ACS580, ACH580 and ACQ580. Reference to “Hardware Manual” refers to the respective ACS580, ACH580 or ACQ580 Hardware Manual.

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Mechanical Installation - Free Space (R1-R9)

Contents of this chapter

This chapter contains revised free space requirements for ACx580-01, 208/230, 460 and 575 volt ratings, all frames R1 - R9.

Safety

Warning! See Hardware Manual for important safety information about mechanical installation.

Check the installation site

The drive must be installed on the wall or an enclosure. There are three alternative ways to install it. This supplement only describes the first way (vertical). See Hardware Manual for the other two ways (vertical side-by-side, horizontal).

Vertical

Note: Do not install the drive upside down.

Frame size	Vertical installation - minimum free space											
	IP21 (UL Type 1)						IP55 (UL Type 12)					
	Above (a)[1]		Below (b)[2]		Besides (c)[3]		Above (a)[1]		Below (b)[2]		Besides (c)[3]	
	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
R1	***65***	***2.56***	86	3.39	150	5.91	137	5.39	116	4.57	150	5.91
R2	***65***	***2.56***	86	3.39	150	5.91	137	5.39	116	4.57	150	5.91
R3	***65***	***2.56***	53	2.09	150	5.91	200	7.87	53	2.09	150	5.91
R4	53	2.09	200	7.87	150	5.91	53	2.09	200	7.87	150	5.91
R5	***75***	***2.95***	200	7.87	150	5.91	100	3.94	200	7.87	150	5.91
R6	155	6.1	300	11.81	150	5.91	155	6.1	300	11.81	150	5.91
R7	155	6.1	300	11.81	150	5.91	155	6.1	300	11.81	150	5.91
R8	155	6.1	300	11.81	150	5.91	155	6.1	300	11.81	150	5.91
R9	200	7.87	300	11.81	150	5.91	200	7.87	300	11.81	150	5.91

Note: Data in bold italics differs from and supersedes data from the Hardware Manual.

(1) Free space measured from the frame, not from the hood used in UL Type 12 frames.

Note: The height of the hood for frames R4 and R9 exceeds the listed free space above the units for these frames.

Frame size	R4	R9
Hood height (in)	2.83	9.06
Hood height (mm)	72	230

(2) Free space below is always measured from the drive, not from the cable box.

(3) Free space between the drive and any other object, e.g. wall

Note 1: The free space above and below the drive is for installations where the drive is mounted on a wall indoors.

Note 2: For cabinet-built drives that have been thermally tested and approved by ABB for a specified temperature range, free space could vary from these values.

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Technical data (R9)

Contents of this chapter

This chapter contains the technical specifications of the ACx580-01 ratings for 125 and 150 HP at 208/230 V, for example ratings, sizes, and technical requirements as well as provisions for fulfilling the required approvals.

Electrical ratings

NOTICE: UL pending

Type ACx580-01-	Input rating	Output ratings					Max losses		Air flow	Frame size
		Max current	Light-duty use		Heavy-duty use					
	I_1	I_{max}	I_{LD}	P_{LD}	I_{HD}	P_{HD}				
	A	A	A	hp	A	hp	BTU/hr	W	CFM	
3-phase U1 = 200...240 V, PN at UN = 208/230 V, 60 Hz										
343A-2	343	491	343	125	273	100	8691	2547	677	R9
396A-2	396	559	396	150	343*	125	10441	3060	677	R9

Type ACx580-01-	Input ratings	Output ratings	Output ratings	Frame size
	I_1	I_N	P_N	
	A	A [1)]	HP	
1-phase U_N = 230V				
343A-2	343	154	60	R9
396A-2	396	192	75	R9

[1)] Continuous rating, no overload

Definitions	
U_N	Nominal output voltage of the drive. For input voltage range U1, see section Electrical power network specification on page 294 in ACx580-01 Hardware Manual.
I_1	Nominal input current (rms) at 40 °C (104 °F)
I_{max}	Maximum output current. Available for two seconds at start.
I_{Ld}	Maximum current with 10% overload, allowed for one minute every ten minutes
P_{Ld}	Typical motor power in light-duty use (10% overload). The horsepower (hp) ratings apply to most NEMA 4-pole motors.
I_{Hd}	Maximum current with 50% overload, allowed for one minute every ten minutes 1) Maximum current with 30% overload, allowed for one minute every ten minutes 2) Maximum current with 25% overload, allowed for one minute every ten minutes * Maximum current with 40% overload, allowed for one minute every ten minutes.
P_{Hd}	Typical motor power in heavy-duty use (50% overload)

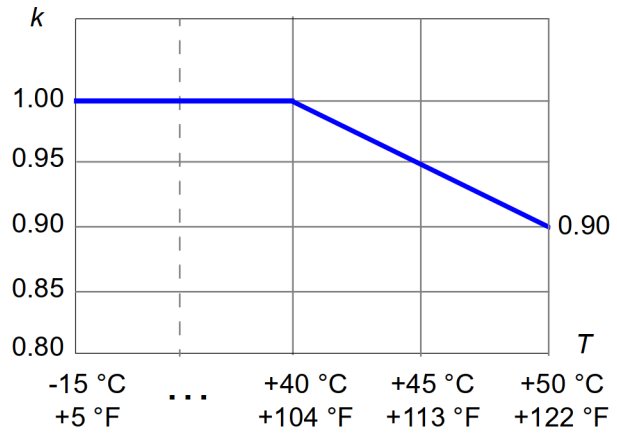
Derating

The output load capacity (I_N, I_{Ld}, I_{Hd}; note that I_{max} is not derated) decreases in certain situations. In situations, where full motor power is required, oversize the drive so that the total derated output current provides sufficient capacity to supply the required nominal voltage to run the motor. In most cases, the derating is the same as stated in the ACx580-01 Hardware Manual. The exceptions are listed below.

Temperature derating - Type 1 (IP21) and Type 12 (IP55)

-343A-2 and -396A-2: In the temperature range +40...50 °C (+104...122 °F), the rated output current is derated by 1% for every added 1 °C (1.8 °F).

The output current can be calculated by multiplying the current given in the rating table by the derating factor (k):



Switching frequency derating

The output current is calculated by multiplying the current given in the rating table by the derating factor given in the table below.

Note: If the minimum switching frequency is changed using parameter 97.02 Minimum switching frequency, derate according to the table below. Changing parameter 97.01 Switching frequency reference does not require derating.

UL (NEC)

Frame size	UL/NEC Type ACx580-01-	Derating factor (k) for the minimum switching frequencies at 40 °C (104 °F)				
		1 kHz	2 kHz	4 kHz	8 kHz	12 kHz
3-phase U_1 = 200...240 V, P_N at U_N = 208/230 V, 60 Hz						
R9	343A-2...396A-2	1	1	1	0.9	0.8

Fuses UL (NEC)

The UL listed fuses in the table are the required branch circuit protection. Class J, CC, and CF fuses are also allowed at the same nominal current and voltage ratings. Refer to Alternate Fuses, MMPs and Circuit Breakers for ABB Drives (*3AXD50000645015* [English]) for additional UL fuses and circuit breakers that can be used as branch circuit protection. Fuses are to be provided as part of the installation.

Note 1: Fuses are not included in the purchased drive and must be provided by others.

Note 2: Fuses with higher current rating than specified must not be used.

Note 3: Fuses with lower current rating than specified may be used if they are of the same class and voltage rating. It is the user's responsibility to verify that lower current rated fuses are compliant with local regulations and appropriate for the application.

Note 4: Drive fuses must be used to maintain the drive UL listing. Additional protection can be used. Refer to local codes and regulations.

UL/NEC Type ACx580-01-	Input current	UL (NEC)			
		Maximum current	Voltage rating	Bussmann type	UL class
	A	A	V		
3-phase U_1 = 200...240 V, P_N at U_N = 208/230 V, 60 Hz					
343A-2	343	491	600	JJS-500	T
396A-2	396	559	600	JJS-600	T

Losses, cooling data and noise UL (NEC)

The air flow direction is from bottom to top.

Cooling air flow, heat dissipation and noise for stand-alone drives

The table below specifies the heat dissipation in the main circuit at nominal load and in the control circuit with minimum load (I/O, options and panel not in use) and maximum load (all digital inputs and relays in the ON state, and the panel, fieldbus

and fan in use). The total heat dissipation is the sum of the heat dissipation in the main and control circuits. Use the maximum heat dissipation when designing cabinet or electrical room cooling needs.

UL/NEC Type ACx580-01-	Heat dissipation					Air flow		Noise	Frame size
	Main circuit at rated I_1 at I_{LD}	Control circuit minimum	Control circuit maximum	Main and control boards maximum					
	W	W	W	W	BTU/hr	m^3/hr	CFM	db (A)	
3-phase U_1 = 200...240V, P_N at U_N = 208/230V, 60 Hz									
343A-2	2511	4.1	36	2547	8691	1150	677	68	R9
396A-2	3024	4.1	36	3060	10441	1150	677	68	R9

Cooling air flow and heat dissipation for flange mounting (option +C135)

Flange mounting kit is ordered separately in North America, not with a plus code.

UL/NEC Type ACx580-01-	Heat dissipation (with flange kit)		Air flow (with flange kit)				Frame size
	Heatsink	Front	Heatsink		Front		
	W	W	m^3/hr	CFM	m^3/hr	CFM	
3-phase U_1 = 200...240V, P_N at U_N = 208/230V, 60 Hz							
343A-2	2170	347	1150	677	170	100	R9
396A-2	2598	422	1150	677	170	100	R9

Applicable standards

The ACx580-01 230V 125 & 150 HP 3-phase drives comply with the following standards.

UL 61800-5-1	UL Standard for Safety, Power Conversion Equipment, second edition
NEMA 250:2020	Enclosures for Electrical Equipment (1000 Volts Maximum)

The ACx580-01 230V 125 & 150 HP 3-phase drive have NOT been verified to comply with CSA, CE or IEC directives or any other world standards outside of North America.

UL marking

The ACS580-01, ACH580-01 and ACQ580-01 230V 125 & 150 HP 3-phase drive is cULus Listed.

UL checklist

WARNING! Operation of this drive requires detailed installation and operation instructions provided in the hardware and firmware manuals. The manuals can be found on the Internet. Depending on the product series, the drive package may contain the manuals in electric format or as hard copies (as standard or ordered with option codes with the drive). Hard copies of the manuals can also be ordered through the manufacturer separately. Retain the hard copies of the manuals with the drive.

This is a supplement to the ACH580-01, ACS580-01 and ACQ580-01 Hardware Manual. See the hardware manual for the full UL checklist.

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Resistor braking (R9)

Contents of this chapter

This chapter describes how to select the brake resistor and cables, protect the system, connect the brake resistor and enable resistor braking for the ACx580-01 ratings for 125 and 150 HP at 208/230 V.

Product operation principle and hardware description

The brake chopper handles the energy generated by a decelerating motor. The chopper connects the brake resistor to the intermediate DC circuit whenever the voltage in the circuit exceeds the limit defined by the control program. Energy consumption by the resistor losses lowers the voltage until the resistor can be disconnected.

For frame R9, external brake choppers and resistors, see below.

Resistor braking, frame R9, 208/230 V

Frames R4…R9 need external brake choppers and resistors. The table below lists suitable choppers and resistors. For more information, see NBRA-6xx Braking Choppers Installation and start-up guide (3AFY58920541 [English]) and ACS-BRK Brake Units Installation and start-up guide (3AFY61514309 [English]).

UL (NEC)

The table shows reference resistor types for the maximum braking power.

UL/NEC Type ACx580-01-	R_{min}	R_{max}	P_{BRmax}		P_{BRcont}		Reference chopper type	Reference resistor type
	Ohm	Ohm	kW	hp	kW	hp		
3-phase U1 = 200...240 V, PN at UN = 208/230 V, 60 Hz								
343A-2	0.65	1.8	106	142	8.9	12	NBRA-658	2x(2xSAFUR210F575)
396A-2	0.65	1.1	133	178	11.1	15	NBRA-658	2x(2xSAFUR210F575)

Symbols

R_{min} = minimum allowed brake resistor that can be connected to the brake chopper

R_{max} = maximum allowed brake resistor that allows PBRmax

P_{BRmax} = maximum braking capacity of the drive, must exceed the desired braking power

P_{BRcont} = continuous rating of the braking resistor assuming 5 seconds every 60 seconds operation a Pmax

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The Safe Torque Off (STO) function

Contents of this chapter

This chapter describes the Safe torque off (STO) function of the drive and gives instructions for its use.

Description

The Safe torque off function can be used, for example, as the final actuator device of safety circuits that stop the drive in case of danger (such as an emergency stop circuit). Another typical application is a prevention of unexpected start-up function that enables short-time maintenance operations like cleaning or work on non-electrical parts of the machinery without switching off the power supply to the drive.

When activated, the Safe torque off function disables the control voltage for the power semiconductors of the drive output stage (A, see the diagrams below), thus preventing the drive from generating the torque required to rotate the motor. If the motor is running when Safe torque off is activated, it coasts to a stop.

The Safe torque off function has a redundant architecture, that is, both channels must be used in the safety function implementation. The safety data given in this manual is calculated for redundant use and does not apply if both channels are not used.

Additional information

Additional information about the safe torque off function can be found in chapter The Safe Torque Off Function in the ACS, ACH or ACQ 580-01 Drive Hardware Manual.

Safety Data

The safety data for the Safe torque off function for ratings 125 and 150 HP at 230V is given below.

Note: The safety data is calculated for redundant use and does not apply if both STO channels are not used.

Frame size	SIL	PL	SFF (%)	PFH (T_1 = 20 a) (1/h)	PFD_{avg} (T_1 = 2 a)	PFD_{avg} (T_1 = 5 a)	$MTTF_D$ (a)	DC (%)	Cat.	SC	HFT	CCF	T_M (a)
UN = 230V													
R9	3	e	>99	3.92E-09	3.44E-05	8.59E-05	9380	≥90	3	3	1	80	20

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- The following temperature profile is used in safety value calculations:
  - 670 on/off cycles per year with △T = 71.66 °C
  - 1340 on/off cycles per year with △T = 61.66 °C
  - 30 on/off cycles per year with △T = 10.0 °C
  - 32 °C board temperature at 2.0% of time
  - 60 °C board temperature at 1.5% of time
  - 85 °C board temperature at 2.3% of time
- The STO is a type A safety component as defined in IEC 61508-2.
- Relevant failure modes:
  - The STO trips spuriously (safe failure)
  - The STO does not activate when requested
    - A fault exclusion on the failure mode "short circuit on printed circuit board" has been made (EN 13849-2, table D.5). The analysis is based on an assumption that one failure occurs at one time. No accumulated failures have been analyzed.
- STO response times:
  - STO reaction time (shortest detectable break): 1 ms
  - STO response time: 2 ms (typical), 5 ms (maximum)
  - Fault detection time: Channels in different states for longer than 200 ms
  - Fault reaction time: Fault detection time + 10 ms
- Indication delays:
  - STO fault indication (parameter 31.22) delay: < 500 ms
  - STO warning indication (parameter 31.22) delay: < 1000 ms

Terms and abbreviations

Term or abbreviation	Reference	Description
Cat.	EN ISO 13849-1	Classification of the safety-related parts of a control system in respect of their resistance to faults and their subsequent behavior in the fault condition, and which is achieved by the structural arrangement of the parts, fault detection and/or by their reliability. The categories are: B, 1, 2, 3 and 4.
CCF	EN ISO 13849-1	Common cause failure (%)
DC	EN ISO 13849-1	Diagnostic coverage
HFT	IEC 61508	Hardware fault tolerance
$MTTF_D$	EN ISO 13849-1	Mean time to dangerous failure: (Total number of life units) / (Number of dangerous, undetected failures) during a particular measurement interval under stated conditions
PFD_{avg}	IEC 61508	Average probability of dangerous failure on demand, that is, mean unavailability of a safety-related system to perform the specified safety function when a demand occurs
PFH	IEC 61508	Average frequency of dangerous failures per hour, that is, average frequency of a dangerous failure of a safety related system to perform the specified safety function over a given period of time
PL	EN ISO 13849-1	Performance level. Levels a…e correspond to SIL
Proof test	IEC 61508, IEC62061	Periodic test performed to detect failures in a safety-related system so that, if necessary, a repair can restore the system to an "as new" condition or as close as practical to this condition
SC	IEC 61508	Systematic capability
SFF	IEC 61508	Safe failure fraction (%)
SIL	IEC 61508	Safety integrity level (1…3)
STO	IEC/EN 61800-5	Safe torque off
T_1	IEC 61508-6	Proof test interval. T1 is a parameter used to define the probabilistic failure rate (PFH or PFD) for the safety function or subsystem. Performing a proof test at a maximum interval of T1 is required to keep the SIL capability valid. The same interval must be followed to keep the PL capability (EN ISO 13849) valid. See also section Maintenance in Hardware Manual.
T_M	EN ISO 13849-1	Mission time: the period of time covering the intended use of the safety function/device. After the mission time elapses, the safety device must be replaced. Note that any T_M values given cannot be regarded as a guarantee or warranty.

TÜV certificate

The TÜV certificate is available on the Internet at *www.abb.com/drives/documents*.

Further information

Product and service inquiries

Address any inquiries about the product to your local ABB representative, quoting

the type designation and serial number of the unit in question. A listing of ABB sales, support and service contacts can be found by navigating to abb.com/searchchannels.

Product training

For information on ABB product training, navigate to new.abb.com/service/training. Providing feedback on ABB Drives manuals

Your comments on our manuals are welcome. Navigate to

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Document library on the Internet

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