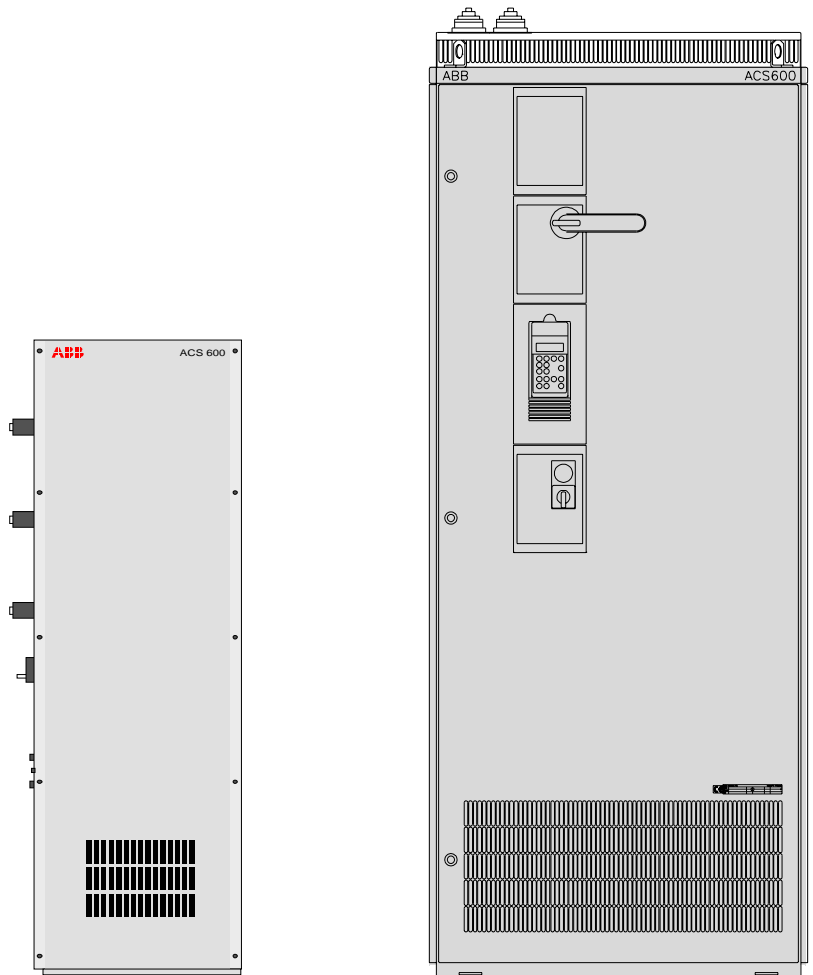


This manual includes

- Safety
- Installation
- Maintenance
- Product Information

## ACS/ACC/ACP 604/607 AC Drives 75 to 700 HP (55 to 630 kW)





ACS/ACC/ACP 604/607 AC Drives  
75 to 700 HP  
(55 to 630 kW)

**Hardware Manual**

This manual concerns the ACS 607, ACC 607, and ACP 607 and the ACS 604, ACC 604 and ACP 604 AC Drives. In the text, they are collectively referred to as ACx 604/607.

ACS607-5.0-US-04  
3AUA489002B4974 R0101 REV A

EFFECTIVE: 10/1/98  
SUPERSEDES: None



# Safety Instructions

---

## Overview

This chapter states the safety instructions which must be followed when installing, operating and servicing the ACS 600. If neglected, physical injury and death may follow, or damage may occur to the AC drive, the motor and driven equipment. The material in this chapter must be studied before attempting any work on, or with, the unit.

## Warnings and Notes

This manual distinguishes two sorts of safety instructions. Warnings are used to inform of conditions which can, if proper steps are not taken, lead to a serious fault condition, physical injury and death. Notes are used when the reader is required to pay special attention or when there is additional information available on the subject. Notes are less crucial than Warnings, but should not be disregarded.

### Warnings

Warnings are provided in the instruction manuals and on labels attached to the AC drive. Readers are informed of situations that can result in serious physical injury and/or serious damage to equipment with the following symbols:



**Dangerous Voltage Warning:** warns of situations in which a high voltage can cause physical injury and/or damage equipment. The text next to this symbol describes ways to avoid the danger.



**General Warning:** warns of situations which can cause physical injury and/or damage equipment by means other than electrical. The text next to this symbol describes ways to avoid the danger.



**Electrostatic Discharge Warning:** warns of situations in which an electrostatic discharge can damage equipment. The text next to this symbol describes ways to avoid the danger.

### Notes

Notes are provided in the instruction manuals to notify readers of the need for special attention or additional information available on the subject with the following symbols:

#### CAUTION!

**Caution** aims to draw special attention to a particular issue.

#### Note:

**Note** gives additional information or points out more information available on the subject.

**Installation and  
Maintenance Safety**

These safety instructions are intended for all work on the ACX 600. In addition to the instructions given below, there are more safety instructions on the first pages of the appropriate hardware manual.

---



**WARNING!** All electrical installation and maintenance work on the ACX 600 should be carried out by qualified electricians.

The ACX 600 and adjoining equipment must be properly grounded.

Do not attempt any work on a powered ACS 600. After switching off the power, always allow the intermediate circuit capacitors 5 minutes to discharge before working on the drive, the motor or the motor cable. It is good practice to check (with a voltage indicating instrument) that the drive is in fact discharged before beginning work.

The ACX 600 motor cable terminals are at a dangerously high voltage when power is applied, regardless of motor operation.

The brake control terminals (UDL & UDC, R+ and R- terminals) carry a dangerous DC voltage (over500V).

There can be dangerous voltages inside the ACX 600 from external control circuits when the ACX 600 input power is shut off. Exercise appropriate care when working with the unit. Neglecting these instructions can cause physical injury and death.

---



**WARNING!** The ACS 600 introduces electric motors, drive train mechanisms and driven machines to an extended operating range. The ACS 600 can be adjusted to operate the motor at speeds above and below the speed provided by connecting the motor directly to the power line. Before adjusting the drive and putting it into service, make sure that the motor and all driven equipment is suitable for operation throughout the speed range provided by the AC drive.

---



**WARNING!** If an external source for start command is selected and it is ON, the ACS 600 will start immediately after fault reset unless the drive is configured for 3-wire Start/Stop.

---



**WARNING!** The printed circuit boards contain integrated circuits that are extremely sensitive to electrostatic discharge. Exercise appropriate care when working on the unit to avoid permanent damage to the circuits. Do not touch the boards unnecessarily

---



**WARNING!** There are several automatic reset functions in the ACX 600. If selected, they reset the unit and resume operation after a fault. These functions should not be selected if other equipment is not

---

compatible with this kind of operation, or dangerous situations can be caused by such action.

---

### **Supply Connections**

ACx 607 units include a door interlocked fused disconnect. This switch does not switch off the power from the EMC Line Filter of ACS/ACC 607-0400-3, -0490-3/5/6, -0610-3/5/6 and -0760-5/6 units. For ACS/ACC 607-0400-3, -0490-3/5/6, -0610-3/5/6 and -0760-5/6 units with EMC Line Filter, and for the ACx 604 module an input power disconnecting means must be installed between the ac power source and the ac drive. The disconnecting means must conform to applicable safety regulations. The disconnecting means must be locked to the open position during installation and maintenance work.

If an ACx 607 with the integrated EMC filter (code 0 or 3 in the type code for EMC Filters) is connected to an ungrounded power system or high resistance grounded power system (over 30 Ohms), the power line will be connected to ground potential through the EMC filter capacitors of the ACx 601. This may cause danger or damage the unit. Disconnect the EMC filter capacitors before connecting the ACx 601 to an ungrounded power system. For detailed instructions on how to do this, please contact your local ABB distributor.


### **Ground Fault Protective Function**

The ACx 600 (with Standard and Motion Control Application Programs) is equipped with an internal ground fault protective function to protect the unit against ground faults in the drive, the motor and the motor cable. This is not a personal safety or a fire protection feature. The earth fault protective function of the ACS/ACP 600 can be disabled by Parameter 30.17 (ACC: 30.11).

The internal earth fault protective function is not in use in the 12-pulse supplied units. For ACS 62x units, refer to *ACS 600 Power Extension Range Supplement* or *ACS 600 Converter Module Installation in User-defined Cabinet*.

The EMC filter of the ACx 600 includes capacitors connected between the power circuit and the chassis. These capacitors increase the ground leakage current from the AC line through the ground (PE) connection and may cause some ground fault current circuit breakers to trip.

### **Emergency Stop Devices**

Emergency stop devices must be installed at each operator control station and at other operating stations where emergency stop may be required. Pressing the  key on the Control Panel of ACx 600 does not generate an emergency stop of the motor or separate the drive from dangerous potential. Line Contactor and Emergency Stop Switch are factory installed as an option for ACx 607.

## Motor Connections



---

**WARNING!** Operation is not allowed if the motor nominal voltage is less than one half of (ACP: 0.4 times) the ACx 600 nominal input voltage, or the motor nominal current is less than 1/6 of the ACx 600 nominal output current.

---



---

**WARNING!** Do not make any voltage tolerance or insulation resistance test (Hi Pot or Megger) on any part of the ACx 600. Disconnect motor wires before making any tests of the motor or the cables between the drive and motor.

---

### **Motor Insulation Requirements**

As with all AC drives employing the most modern IGBT inverter technology, the output waveform of the ACx 600 consists of a series of rectangular voltage pulses. Regardless of the output frequency, the voltage of the pulses is approximately 1.35 times the input line voltage with a very short rise time.

The voltage of the pulses can be almost double at the motor terminals, depending on the properties of the cable between the drive and the motor. This in turn can cause additional stress to the motor insulation. The motor manufacturer should be consulted regarding the characteristics of the motor insulation system. Failure of the motor to fulfill the following requirements may shorten its life.



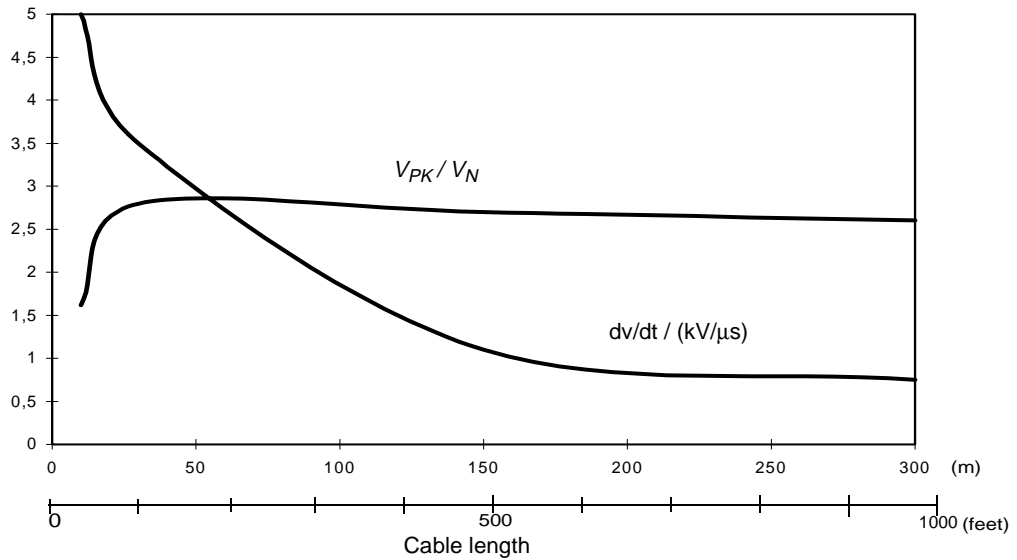
The following table lists the insulation requirements for motors used with ACx 600 AC drives.

Motor Type	Nominal AC Line Voltage	Motor Insulation Requirement
<b>ABB Motors</b> (manufactured from beginning of 1998)	$V_N < 500 \text{ V}$	Standard insulation system
	$525 \text{ V} \leq V_N \leq 690 \text{ V}$	Standard insulation and dv/dt filter or special insulation system
<b>Random-wound Motors</b>	$V_N \leq 420 \text{ V}$	Motor insulation system must withstand $V_{PK} = 1300 \text{ V}$ .
	$420 \text{ V} < V_N \leq 500 \text{ V}$	If motor insulation system withstands $V_{PK} = 1600 \text{ V}$ and 0.2 $\mu\text{s}$ rise time, a dv/dt filter is not needed.  With a dv/dt filter at the output of the ACx 600, motor insulation system must withstand $V_{PK} = 1300 \text{ V}$ .
	$500 \text{ V} < V_N \leq 600 \text{ V}$	Motor insulation system must withstand $V_{PK} = 1600 \text{ V}$ . A dv/dt filter must be used at the output of the ACx 600.
	$600 \text{ V} < V_N \leq 690 \text{ V}$	Motor insulation system must withstand $V_{PK} = 1800 \text{ V}$ . A dv/dt filter must be used at the output of the ACx 600.
<b>Form-wound Motors</b>	$V_N \leq 690 \text{ V}$	If motor insulation system withstands $V_{PK} = 2000 \text{ V}$ and rise time 0.3 $\mu\text{s}$ , no dv/dt filter is needed.

Symbol	Definition
$V_N$	nominal mains voltage
$V_{PK}$	peak line to line voltage at motor terminals
Rise time:  $\Delta t = 0.8 \cdot V_{PK} / (dv/dt)$	Rise time is line to line voltage change rate at motor terminals (the interval during which the voltage changes from 10% to 90 % of the whole voltage range)  $V_{PK}$ and $\Delta t$ depend on cable length. Read the values of $V_{PK}$ and dv/dt from the diagrams below.

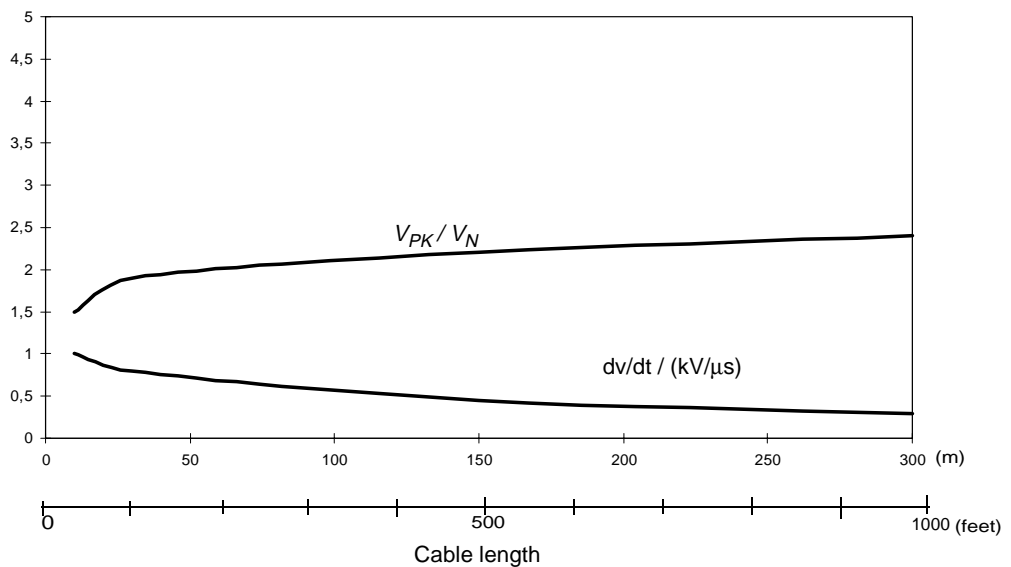
*Without Filter*

Below is a diagram of  $V_{PK}$  and  $dv/dt$  as a function of cable length when no  $dv/dt$  filter is used.



*With  $dv/dt$  Filter*

Below is a diagram of  $V_{PK}$  and  $dv/dt$  as a function of cable length with  $dv/dt$  filter at the output of the ACx 600.



**Power Factor Correction Capacitors**

Power factor correction capacitors and surge absorbers must not be connected between the drive and the motor. These devices are not designed to be used with AC drives, and will degrade motor control accuracy. They can cause permanent damage to the ACx 600 or themselves due to the rapid changes in the ACx 600 output voltage.

If there are power factor correction capacitors in parallel with the ACx 600 make sure that the capacitors and the ACx 600 are not charged simultaneously to avoid voltage surges which might damage the unit.

### **Output Contactors**

If a contactor is used between the output of the ACx 600 and the motor with DTC control mode selected, the output voltage of the ACx 600 must be controlled to zero before the contactor is opened: ACS 600 units via parameter 21.3 (ACP: 10.4), choose COAST. If RAMP is selected, the output of the ACS/ACP 600 must be reduced to zero using Parameter 16.1 by giving zero V DC to the selected digital input. Otherwise the contactor will be damaged. In scalar control the contactor can be opened with ACS/ACC 600 running.

Varistors or RC networks (AC) or diodes (DC) should be used to protect against voltage transients generated by contactor coils. The protective components should be mounted as close as possible to the contactor coils. Protective components should not be installed at the NIOC board terminal block.

### **Components Connected to Digital/ Analog Inputs**



**WARNING!** IEC 664 requires double or reinforced insulation between live parts and the surface of accessible parts of electrical equipment which are either non-conductive or conductive but not connected to the protective earth.

To fulfil this requirement, the connection of a thermistor (and other similar components) to the digital inputs of ACx 600 can be implemented in three alternate ways:

1. There is double or reinforced insulation between the thermistor and live parts of the motor.
  2. Circuits connected to all digital and analog inputs of the ACx 600
    - are protected against contact, and
    - insulated with basic insulation (the same voltage level as the converter main circuit) from other low voltage circuits.
  3. An external thermistor relay is used. The insulation of the relay must be rated for the same voltage level as the converter main circuit.
- 

### **Mechanical Installation**

**CAUTION!** The ACx 607 should only be transported on the original pallet, or with a proper lifting device using the lifting lugs on top of the cabinet. The drive is not intended to be lifted by running lines under the unit. The ACx 607 center of gravity is quite high, and there is the risk of

## *Safety Instructions*

overturning. The ACx 607 can be laid on its back to fit through confined spaces. Exercise appropriate care when maneuvering the unit to avoid damage and injury. This work should only be attempted with two or more people working together.

**CAUTION!** The ACx 607 should not be fastened from any other point than the holes at its base or the fastening hooks. Do not fasten the ACx 600 by riveting or welding.

# Table of Contents

---

## **Safety Instructions**

Overview .....	iii
Warnings and Notes .....	iii
Installation and Maintenance Safety .....	iv
Supply Connections .....	v
Ground Fault Protective Function .....	v
Emergency Stop Devices .....	v
Motor Connections .....	vi
Motor Insulation Requirements .....	vi
Power Factor Correction Capacitors .....	viii
Output Contactors .....	ix
Components Connected to Digital/Analog Inputs .....	ix
Mechanical Installation .....	ix

## **Table of Contents**

### **Chapter 1 –Introduction**

Delivery Check .....	1-1
Nameplate .....	1-1
Type Code .....	1-1
Frame Size .....	1-1
Serial Number .....	1-1
ACx 604/607 Type Code .....	1-2
Inquiries .....	1-3

### **Chapter 2 – Mechanical Installation**

Check The Installation Site .....	2-1
Installation Site Checklist .....	2-1
Installation Procedure ACx 607 .....	2-2

### **Chapter 3 – Electrical Installation**

Insulation Checks .....	3-1
Disconnecting Means .....	3-2
Input Line Fuses .....	3-2
Motor Overload Protection .....	3-2
Power Cables .....	3-2
Cable Insulation Voltage Ratings .....	3-3
Wiring Practices .....	3-3
Conduit .....	3-4
Armored Cable .....	3-4
Control Cables .....	3-4
Encoder Cable (ACP607) .....	3-5
Wiring Connections .....	3-6

ACx 607 . . . . .	3-6
Wiring Access . . . . .	3-6
Conduit Plate . . . . .	3-6
Control Panel in Remote Use . . . . .	3-8
Pulse Encoder Insulation (ACP600) . . . . .	3-9
Installation of Optional Modules and Drive Window . . . . .	3-9
Braking Chopper . . . . .	3-12

**Chapter 4 – Installation Checklist**

Installation Checklist . . . . .	4-1
----------------------------------	-----

**Chapter 5 – Maintenance**

Heatsink . . . . .	5-1
Fan . . . . .	5-1
Capacitors . . . . .	5-1
Reforming . . . . .	5-1

**Appendix A – ACS/ACC/ACP 604/607 Technical Data**

IEC Ratings . . . . .	A-1
NEMA Ratings . . . . .	A-3
Output Current Temperature Derating . . . . .	A-3
Input Power Connection . . . . .	A-4
Motor Connection . . . . .	A-4
Efficiency and Cooling . . . . .	A-5
Ambient Conditions . . . . .	A-5
Fuses . . . . .	A-5
Example . . . . .	A-6
Cable Entries . . . . .	A-7
Terms used . . . . .	A-7
Terminal Sizes and Tightening Torques . . . . .	A-8
External Control Connection Diagrams . . . . .	A-10
Optional Terminal Block X2 . . . . .	A-12
Optional Terminal Block 2TB . . . . .	A-13
NIOCP Board . . . . .	A-14
NIOC and NIOCP Board Specifications . . . . .	A-15
Encoder Signals . . . . .	A-17
Enclosures, Space Requirements . . . . .	A-18
Cooling Air Flow Requirements . . . . .	A-19
Heat Dissipation Requirements . . . . .	A-19
Dimensions and Weights (ACx 604) . . . . .	A-20
ACS 607 Enclosure Size and Style . . . . .	A-21
Dimensions and Weights (ACx 607) . . . . .	A-22
Application Programs . . . . .	A-23
Application Macros . . . . .	A-23
Macro/Language Combinations . . . . .	A-24
Protection Features . . . . .	A-25
Applicable Standards . . . . .	A-26
Materials . . . . .	A-26
Transportation Position . . . . .	A-26

- Disposal ..... A-26
- CE Marking ..... A-27
  - Compliance with the EMC Directive ..... A-27
  - Machinery Directive ..... A-29
- UL/CSA Markings ..... A-30
  - UL ..... A-30
- Equipment Warranty and Liability ..... A-31
  - Limitation of Liability ..... A-31

**Appendix B – ACx 607 Dimensional Drawings**

- Drawings ..... B-1
  - Dimension Drawings ..... B-1
  - Connection Drawings ..... B-1

**Appendix C – IEC Installation**

- IEC Installations ..... C-3
- Power Cables ..... C-3
  - Alternative Power Cable Types ..... C-3
  - Motor Cable Shield ..... C-4
- Cable Routing ..... C-4
- Mains, Motor and Control Cable Connection ..... C-5
  - ACx 607 ..... C-6
  - Control Cable Connecting Procedure ..... C-8
- Components Connected to Digital/Analogue Inputs ..... C-9





# Chapter 1 –Introduction

---

The ACS 600 product family of three phase AC drives includes

- the ACS 600 (for most applications)
- the ACP 600 (for positioning, synchronizing and other high-precision control applications)
- the ACC 600 (for crane drive applications)
- the ACS 600 MultiDrive (for multidrive applications)

The application programs are introduced in *Appendix – A*.

Study this manual carefully before installing, commissioning, operating or servicing the drive. We expect that you have a basic knowledge of physical and electrical fundamentals, electrical wiring practices, electrical components and electrical schematic symbols.

## **Delivery Check**





Check that there are no signs of damage. Before attempting installation and operation, check the information on the drive nameplate to verify that the unit is of the correct model.

**Nameplate** Each ACx 600 has a nameplate for identification purposes. See Figure 1-1. The nameplate data includes a type code and a serial number, which allow individual recognition of each unit.

**Type Code** The ACx 600 Type Code contains information on the properties and configuration of the drive. The Type Code Chart explains the significance of each digit or character in the Type Code.

**Frame Size** ACx 600 drives are manufactured in several different chassis sizes that are designated as Frame R2, R3, etc. Drives of several different ratings are manufactured in the same frame. The ACx 600 rating tables on page A-1 in Appendix A, list the Frame Size used for each Type Code. The Frame Size is not marked on the nameplate.

**Serial Number** The first digit of the serial number refers to the manufacturing plant. The next three digits refer to the units manufacturing year and week, respectively. The remaining digits complete the serial number so that there are no two units with the same serial number.

U1 3-380...500V U2 3-0...U1 I1n/I1nsq 168/198A I2n/I2nsq 164/193A f1 48...63Hz f2 0...300Hz ACS60101405...	U1 3-380...480V U2 3-0...U1 I1hd/I1n 143/184A I2hd/I2n 141/180A f1 57...63Hz f2 0...300Hz ACS60101404...	  	ABB Industry Oy  Serno *1983509999*  000C150001
--	--	---	---

↑ IEC Ratings  
 CE Marking  
 FIIND Type Code

↑ NEMA Ratings  
 UL, cUL & CSA Markings  
 USINY Type Code

↑ Serial Number  
 Bar Code  
 Type Code continued

**ACx 604/607 Type Code** The meaning of main selections of ACx 604/607 type code characters is given in the table below. Not all selections are available for all types. More information on selections is in the ACS 600 price list

Character no.	Meaning	Refer to
Example: ACS60701003000B1200901		
1	<b>Product Category</b> A = AC Drive	
2...3	<b>Product Type</b> CS = Standard, CC = Crane Drive, CP = MotionControl	
4	<b>Product Family</b> 6 = ACS 600	
5	<b>Input Bridge</b> 0 = 6-pulse rectifier, 2 = 12-pulse rectifier, 7 = Regenerative 4Q thyristor bridge	
6	<b>Construction</b> 1 = Wall mounted, 4 = Module, 7 = Drives-MNS Cabinet	
7.10	<b>Power Rating (kVA)</b>	Appendix A: Ratings
11	<b>Voltage Rating</b> 3 = 380/400/415 V a.c. 4 = 380/400/415/440/460/480/500 V a.c. 5 = 380/400/415/440/460/480/500 V a.c. 6 = 525/550/575/600/660/690 V a.c.	
12...14	<b>Option 1, Option 2, Option 3</b>	
15	<b>Application Software</b> x = Languages and Application Macro Options	Appendix A: Application Programs
16	<b>Control Panel</b> 0 = None, 1 = CDP 312 Control Panel included, 4 = Customer I/O Terminal Block X2, 5 = 1 + 4	

Character no.	Meaning	Refer to
17	<b>Degree of Protection</b> 0 = IP 00 (chassis), A = IP 21, 2 = IP 22, 4 = IP 42, 5 = IP 54, 6 = IP 00 with Coated Boards, 7 = IP 22 with Coated Boards, 8 = IP 42 with Coated Boards 9 = IP 54 with Coated Boards B = IP 21 with Coated Boards	<i>Appendix A: Enclosures</i>
18	<b>Line Input and Protection Options</b>	
19	<b>Starter for Auxiliary Motor Fan</b>	
20	<b>Filters</b> 0 = CE with EMC Filters (not for 690V or 12-pulse rectifier) 3 = CE with output du/dt Filters + EMC Filters (not for 690V) 5 = Output du/dt Filters + no EMC Filters 8 = No CE, no EMC filters, US conduit (ACS 607 only, 115 VAC transformer secondary; compliant with NFPA 90) 9 = CE Low Voltage and Machinery Directives; No EMC (ACS 607 only, secondary of all transformers 220 VAC)	<i>Appendix A: CE marking</i>
21	<b>Braking Chopper and Cabling Direction</b>	
22	<b>Other Options</b>	

### ***Inquiries***

Any inquiries about the product should be addressed to the local distributor or ABB representative, quoting the type code and the serial number of the unit. If the local ABB representative cannot be contacted, inquiries should be addressed to directed to the address and phone numbers on the back cover of this manual.



## Chapter 2 – Mechanical Installation

---

For installation of ACx 604 module in a cabinet refer to a supplement to this manual: *Converter Module Installation in User-defined Cabinet*.

The ACx 607 should be installed in an upright vertical position.

**The floor** that the unit is installed on should be of non-flammable material, as smooth as possible, and strong enough to support the weight of the unit. The maximum allowed deviation from the surface level must be  $\leq 2$  mm (0.08 in) measured every 1 m (40in). The installation site should be leveled (when needed), as the ACx 607 is not equipped with adjustable feet.

The ACx 607 can be installed on an elevated floor and over a cable duct. The integrity of the supporting structure must be checked before the ACx 607 is placed in such a position.

ACx 607 can be installed with its back against a wall. Sufficient room around the ACx 607 is required to enable cooling air flow, service and maintenance. Refer to Enclosure Space Requirements in Appendix A on page A-7. Be sure to also observe all safety requirements of applicable safety regulations

**The wall** behind the unit should be of non-flammable material.

### **Check The Installation Site**

Check the intended installation site to make sure that the environment is suitable. The service life and performance of the ACx 600 can be adversely affected if the drive is subjected to unsuitable environmental conditions. Complete environmental rating specifications are listed in Appendix A.

If unsuitable conditions are found at the intended installation site, select a different location, improve the environment at the selected site, or provide additional protection for the ACx 601.

### **Installation Site Checklist**

- Make sure that the ambient temperature is suitable for the type of enclosure provided and the output current required. (pages A-3 & A-4 and A-12)
- Make sure that the installation site altitude is suitable for the output current required. (A-12)
- Make sure that the ambient air is sufficiently clean and dry or that the drive is adequately protected from contaminants. (A-12)
- Make sure that the enclosure selected is adequate to protect the drive considering site conditions regarding access by unauthorized persons, liquids that might be splashed, sprayed or fall on the enclosure, or any other foreign material that might get into the

enclosure.

- Do not mount the drive on any surface with temperature exceeding the allowable air temperature.
- Do not mount the drive in direct sunlight.
- Do not mount the drive where it will be subjected to excessive vibration. (A-12)

**Installation Procedure  
ACx 607**

It is advisable to secure the cabinet to the floor with bolts through the holes at its base or with fastening hooks attached to its bottom front and back edges. This is especially important in installations subjected to vibration or other movement.

1. Check the intended installation site for sufficient room. Check that there is nothing on the floor to inhibit installation. See *Appendix B – ACx 607 Dimensional Drawings* for cabinet details. Mark the locations for the mounting holes (and the cable duct opening).
2. Make mounting holes according to the dimensional drawings. Smooth cable duct edges if required. Install bolt anchors in the mounting holes.
3. Place the drive carefully onto the holes
4. Place bolts in the bolt anchors.
5. Tighten the bolts.

## Chapter 3 – Electrical Installation

---



**WARNING!** The electrical installation described in this chapter should only be carried out by a qualified electrician. The *Safety Instructions* on the first pages of this manual must be followed. Negligence of these instructions can cause injury or death.

---

### Insulation Checks

Before connecting the motor to the drive, check the insulation of the motor and the cable between the drive and the motor.

---



**WARNING!** Do not make any voltage tolerance or insulation resistance test (Hi Pot or Meggar) on any part of the ACx 600.

---

A test (2500V rms, 50 Hz, 1 second) has been performed at the factory on every ACx 600 drive to verify the integrity of the insulation between the power circuitry and the chassis. To avoid damaging sensitive circuitry, this test is performed using a special procedure that can not easily be performed outside the factory.

Use the following procedure to check the insulation of the motor and the cable between the drive and the motor.

1. Disconnect all sources of power from the drive and motor.
- 



**WARNING!** Before proceeding with the insulation checks, make sure that the motor is disconnected from all sources of power including the drive and any bypass circuitry.

---

2. Check that the motor cable is disconnected from the ACx 601 output terminals U2, V2, and W2.
3. Check that the motor cable is disconnected from the motor and remove bridging connections at the motor.
4. Measure the insulation resistances of the motor between the phases and between each phase and Ground (PE). The voltage range of the resistance meter must be at least equal to the line voltage, but not higher than 1000V. The insulation resistance must be greater than 1 M $\Omega$ .
5. Measure the insulation resistance of the motor cable between the phases and between each phase and Ground (PE). The insulation resistance must be greater than 1 M $\Omega$ .

### **Disconnecting Means**

ACx 607 units include a door interlocked fused disconnect. This switch does not switch off the power from the EMC Line Filter of ACS/ACC 607-0400-3, -0490-3/5/6, -0610-3/5/6 and -0760-5/6 units. For ACS/ACC 607-0400-3, -0490-3/5/6, -0610-3/5/6 and -0760-5/6 units with EMC Line Filter, and for the ACx 604 module an input power disconnecting means must be installed between the ac power source and the ac drive. The disconnecting means must conform to applicable safety regulations. The disconnecting means must be locked to the open position during installation and maintenance work.

The motor must not be controlled with the supply disconnecting means; instead, the ⬆ and ⬇ keys of the Control Panel or commands via the I/O board of the ACx 600 should be used. The maximum number of charging cycles of the d.c. capacitors of ACx 600 (i.e. power-ups by applying power) is five in ten minutes.

The drive disconnecting means can serve as the motor disconnecting means if it complies with applicable safety regulations.

### **Input Line Fuses**

Input line Fuses are required to protect the input bridge of the ACx 600 in the event of an internal short circuit or ground fault. The ACx 607 is equipped with internal input fuses listed on page A-3 in *Appendix A*. Fuses are not included in the ACx 604 and must be installed externally to the drive chassis. The recommended fuses are the ultrarapid fuses listed on page A-3. To ensure that adequate protection is maintained, do not install slower types of fuses or allow blown fuses to be replaced with slower types.

The fuses recommended for input bridge protection can be installed as drive and motor branch-circuit short-circuit and ground fault protection if they comply with applicable safety regulations.

### **Motor Overload Protection**

The ACx 607 can provide overload protection for the motor by monitoring a thermostat or thermistor in the motor or by calculating the motor temperature from measured operating data. The overload protection provided by the drive complies with the requirements of UL508c. Additional overload protection is not required unless more than one motor is connected to the drive or unless additional protection is required by applicable safety regulations.

### **Power Cables**

The input power, motor and ground cables must be sized *according to local regulations*:

1. The cable must carry the ACx 600 load current.
2. The cable terminals of the ACx 600 warm up to 60 °C in use. The cable must be rated for at least 60 °C maximum operating



temperature.

### **Cable Insulation Voltage Ratings**

As a minimum requirement, cable insulation voltage ratings must conform to all applicable safety regulations. In addition, motor connecting cable insulation must accommodate the voltage peaks described under *Motor Insulation Requirements* on page vi of the Safety Instructions.

For drives that are rated up to 500 V, cables that have a 600 VAC insulation rating are suitable for both input power and motor wiring.

For drives that are rated over 500 V up to 600 V, cables that have a 600 VAC insulation rating are suitable for input power wiring. The motor wiring requires a higher voltage rating to accommodate the voltage peaks described under *Motor Insulation Requirements* on page vi of the Safety Instructions. As a general rule, the motor cable insulation should be rated for a minimum of 1000 V.

For drives that are rated over 600 V up to 690 V, cables that have a 1000 VAC insulation rating are suitable for both input power and motor wiring.

### **Wiring Practices**

---

**NOTE!** When installing the ACx 600 wiring, it is important to carefully follow the wiring practice recommendations presented in the following paragraphs. Following these recommendations will ensure reliable long term operation of the ACx 600 drive. If these recommendations are not followed, the drive may experience various problems such as:

- Improper drive performance
- Nuisance shutdown trips
- Damage to drive electronic circuits

Incorrect installation practices can also cause malfunctions or damage to other equipment through electromagnetic interference (EMI) and noise injected into the grounding system.

The drive warranty does not cover problems caused by improper installation.

---

When installing AC drive power wiring, wiring methods that provide shielding for the power cables reduce the possibility of electromagnetic interference (EMI). It is also important to ground the motor frame using a ground conductor connected to the grounding terminal in the drive. EMI reduction measures are most important for the motor wiring but are also applicable to the input power wiring.

Any wiring method that is in conformance with applicable safety regulations is acceptable for input power wiring. Metallic conduit or

armored cable must be used for motor wiring. Detailed conduit and armored cable wiring practice guidelines are provided below.

Type MC continuous corrugated aluminum armor cable with symmetrical grounds is the best type of wiring to provide a good low impedance high frequency ground return path between the motor and the drive. This helps to prevent high frequency ground current from flowing in a potentially damaging path through the motor bearings and connected load bearings. Type MC continuous corrugated aluminum armor cable with symmetrical grounds is highly recommended for motor connections to drives rated 490 KVA and larger.

**Conduit** Metallic conduit must be used for motor wiring unless armored cable is used. Where conduits must be coupled together, the joint must be bridged with a ground conductor bonded to the conduit on each side of the joint. The conduits must also be bonded to the drive enclosure. Use separate conduits for input power, motor, brake resistors and control wiring. The recommended wiring configuration is shown on page 7. Do not run motor wiring from more than one drive in the same conduit.

**Armored Cable** If metallic conduit is not used, type MC continuous corrugated aluminum armor cable with symmetrical grounds must be used for the motor cables. If type MC armor cables are used, the motor cables can be run in the same cable tray as other 480V or 600V power wiring. Control and signal cables must not be run in the same tray as power cables.

Six conductor (3 phases and 3 grounds) type MC continuous corrugated aluminum armor cable with symmetrical grounds is available from the following suppliers. Trade names are in parentheses.

Anixter Wire & Cable (Philsheath)  
BICC Cables Corp. (Philsheath)  
Rockbestos Co. (Gardex)  
Oaknite (CLX)

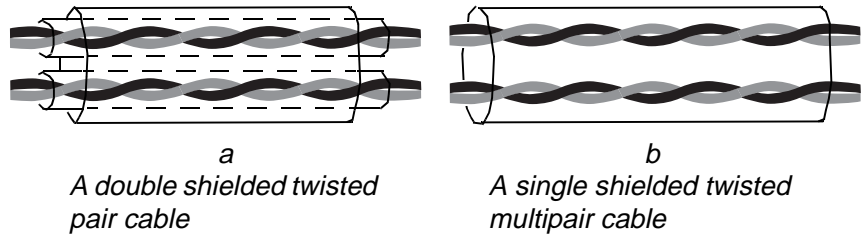
### **Control Cables**

All control cables must be shielded. As a general rule, the control signal cable shield should be grounded directly in the ACx 600. The other end of the shield should be left unconnected.

Twisting the signal wire with its return wire reduces disturbances caused by inductive coupling. Pairs should be twisted as close to terminals as possible. A double shielded twisted pair cable (Figure a, e.g. Belden 9729) must be used for analog signals and is recommended for the pulse encoder signals. Employ one individually shielded pair for each signal. Do not use common return for different analog signals.

A double shielded cable is the best alternative for low voltage digital signals but single shielded twisted multipair cable (Figure b) is also

usable.



The analog and digital input signals should be run in separate, shielded cables.

Relay-controlled signals, providing their voltage does not exceed 48 V, can be run in the same cables as digital input signals. It is recommended that the relay-controlled signals be run as twisted pairs.

**Never mix 24 VDC and 115 / 230 VAC signals in the same cable.**

***Encoder Cable  
(ACP607)***

Min. 4 x 0.25 mm<sup>2</sup> (#22 AWG) + 2 x 0.5 mm<sup>2</sup> (#20AWG) min. single shielded twisted multipair cable, optical coverage  $\geq 91$  %. The maximum cable length is 150 m (500ft.) Recommendations for a suitable cable are available from ABB

***Control Panel Cable***

In remote use the cable connecting the Control Panel to the ACx 600 must not exceed 3 meters (10ft). The cable type tested and approved by ABB Industry is used in Control Panel option kits.

## Wiring Connections



---

**WARNING!** This work should only be carried out by a qualified electrician. The Safety Instructions on the first pages of this manual must be followed. Negligence of these instructions can cause injury or death.

---

### ACx 607

The input power and motor cables connect to the ACx 607 in the left part of the cabinet. Input power, motor and control cable entry is from below or from above as specified at time of order and indicated by the Type Code. Refer to *Appendix B* for additional information and drawings showing cable entry and terminal locations.

To connect the input power, motor and control cables, carry out the following procedure.



---

**WARNING!** Make sure that the ACx 607 is disconnected from the power during installation. Wait for 5 minutes if the ACx 607 is already connected to the mains after disconnecting mains power.

---

## Wiring Access

1. Open the cabinet door.
2. Open the hinged assembly plate to gain access to the input power and motor cable terminals.
3. **Measure the voltage between each input terminal (U1, V1, W1) and ground with a multimeter (impedance at least 1 M $\Omega$ ) to ensure that the drive is discharged.**

## Conduit Plate



The External Filter Type Code 8 (20th digit of the Type Code) identifies drives equipped with blank conduit plates shown in the dimensional drawings in Appendix B. The following installation procedure applies to installations utilizing conduit. For CE installation, refer to Appendix C.

Attach conduits to the conduit entry plates at the top and/or bottom of the drive. Conduit plate sizes and locations and terminal locations are shown on the dimensional drawings in Appendix B. Terminal wire size capacities are listed on page \_\_\_ in Appendix A. Select locations for input power, motor, brake resistor and control conduits according to terminal locations and size requirements. Pull the wires and cables through the conduits into the enclosure.

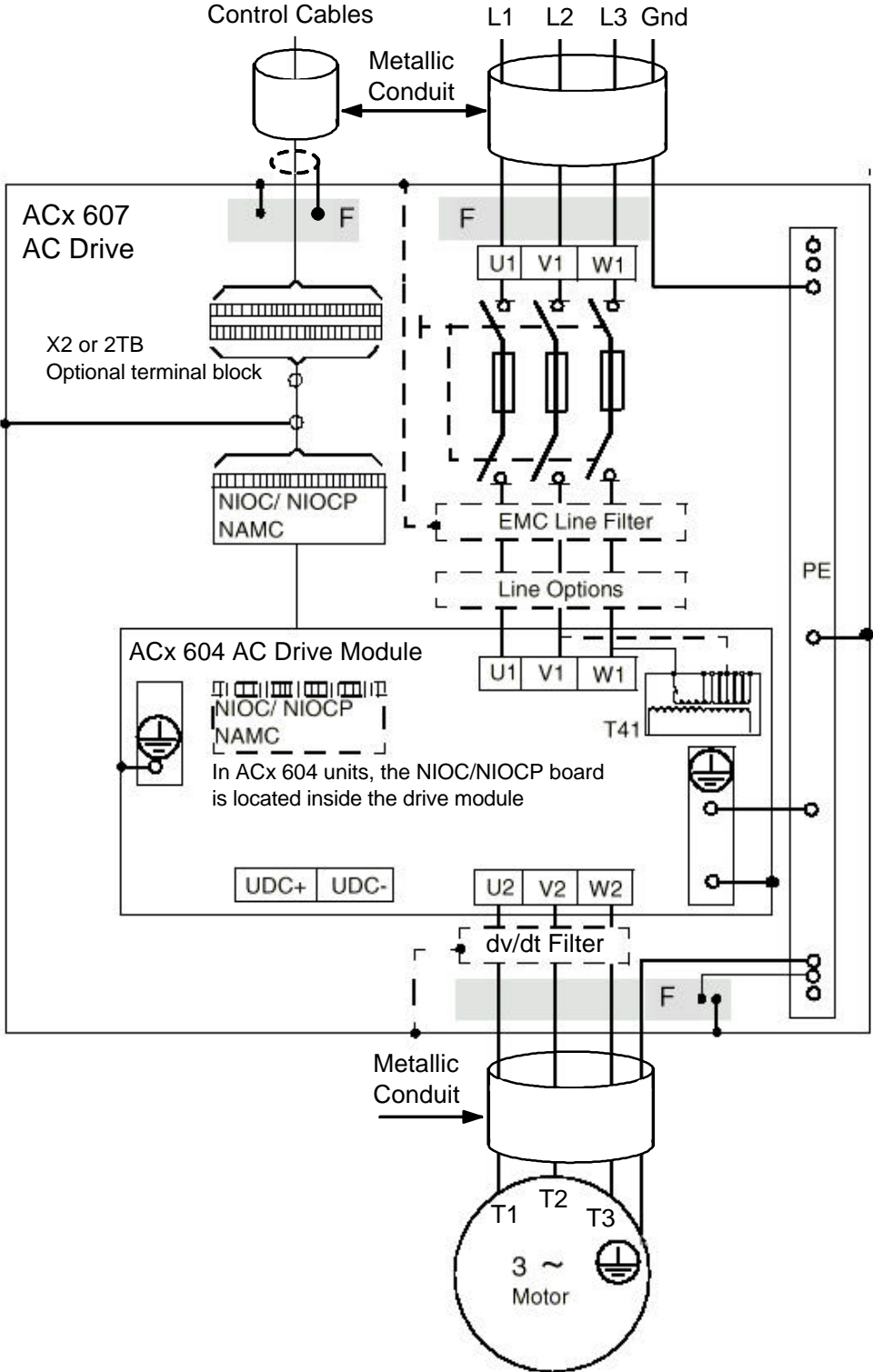
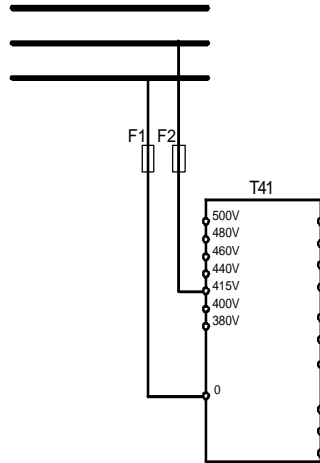


Figure 3-1 A view of the recommended wiring configuration.

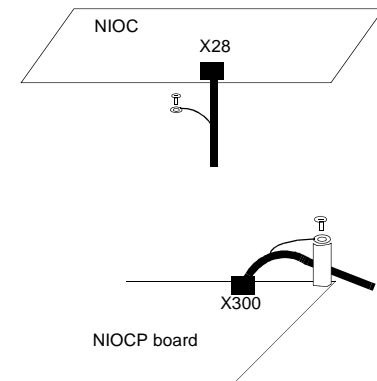
**Transformer Settings** ACx 604/607 units (except frame R7 units) include a transformers unit. The transformer is set to 415 V, 500 V or 690 V at the factory. Adjust the setting if it does not correspond to the supply voltage. To access the transformer remove the front cover of the drive unit with the ABB logo. After adjusting the voltage put the plate back into its place.



Cabinets with the line contactor option include an internal auxiliary voltage transformer. Its input voltage is set to 415 V, 500 V or 690 V at the factory. Adjust the setting if it does not correspond to the supply voltage. The transformer is located in the upper right part of the cabinet, and is visible when the cabinet door is opened.

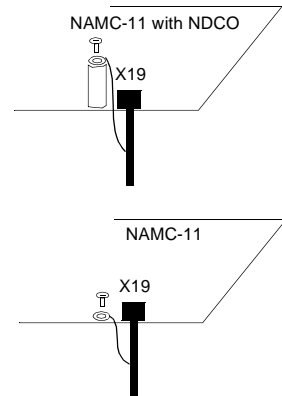
**Control Panel in Remote Use** Connect the Control Panel cable to terminal X19 of the NAMC-11, or with NAMC-03 board to terminal X28 of the NIOC board (X300 of the NIOCP board).

ACx 601/604 with NAMC-3 board and ACx 607



Ground the cable screen at the near grounding screw.

ACx 601/604 with NAMC-11 board



### **Pulse Encoder Insulation (ACP600)**

The tachometer shall be insulated electrically from stator or rotor to prevent forming of current path through the tachometer. The usual coupling-type encoder must have an electrically insulating coupling. When a hollow-shaft type tachometer is used, the insulation can be implemented by insulating the ball joints of the engaging arm, or insulating the bar of the engaging arm. Shield of the tachometer cable should be insulated from the tachometer frame. The other end of the shield is grounded at the converter drive.

### **Installation of Optional Modules and Drive Window**

This section gives general installation instructions for Drive Window PC tool and ACx 600 optional modules, such as fieldbus adapters, I/O extension modules and the pulse encoder interface. Connection examples are given at the end of the section.

#### *Placement*

The module should be installed on the DIN mounting rail inside the cabinet. Follow the instructions given in the *Mechanical Installation* chapter of the module manual.

#### *Power Supply for the Module*

The 24 V d.c. supply for **one** optional module is provided by the NIOC/NIOCP board of the converter (NIOC: terminal X23, NIOCP: terminal X4). The location of the NIOC/NIOCP board is shown in the dimensional drawings (*Appendix B*).

#### *Fiber Optic Link*

Optional modules are connected via a DDCS fiber optic link to the NAMC board or NDCO board (mounted on top of the NIOC board). The terminals on the NAMC/NDCO board to which the cables are connected are as follows:

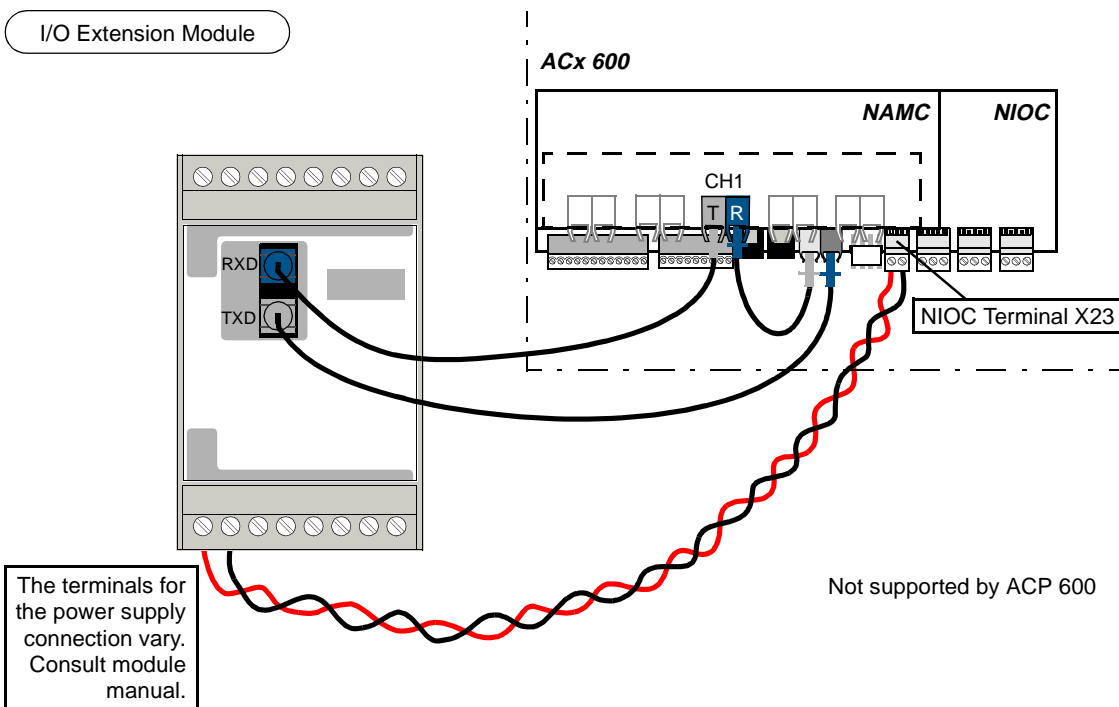
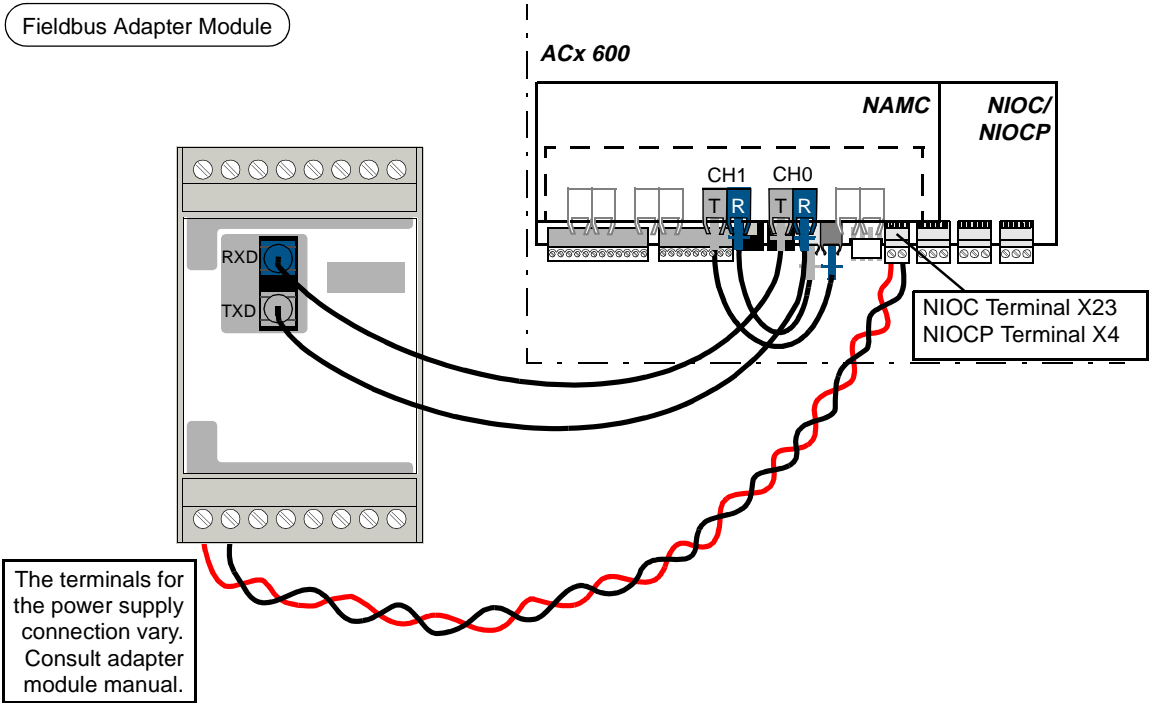
Module Type	Channel	Terminals
Fieldbus Adapter Modules	CH0	V13*, V14*
I/O Extension Modules	CH1	V15, V16
Pulse Encoder Interface Module	CH2 with ACS 600 Standard Application Program 5.0	V17, V18
	CH1 with ACC Application Program	V15, V16
Double Pulse Encoder Interface Module (for ACP 600 only)	CH2	V17, V18
DriveWindow	CH3	V19, V20

\* on NDCO board when NAMC-1 board is used

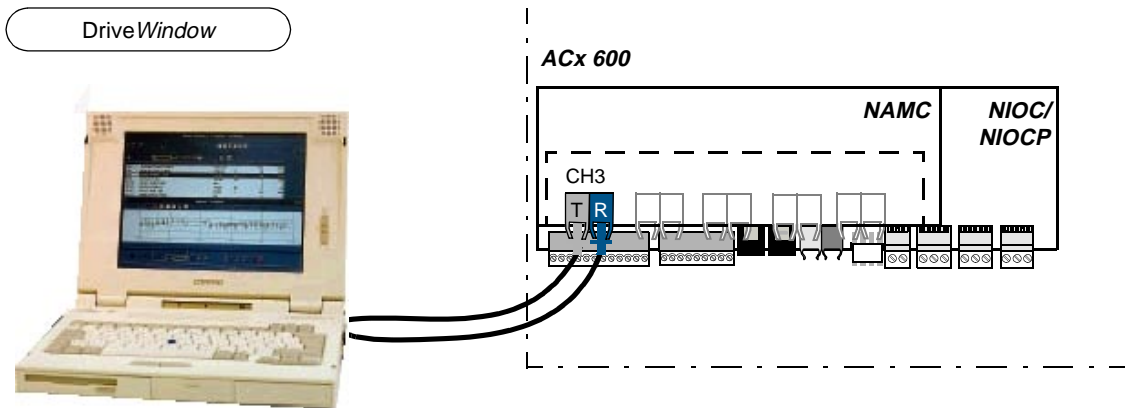
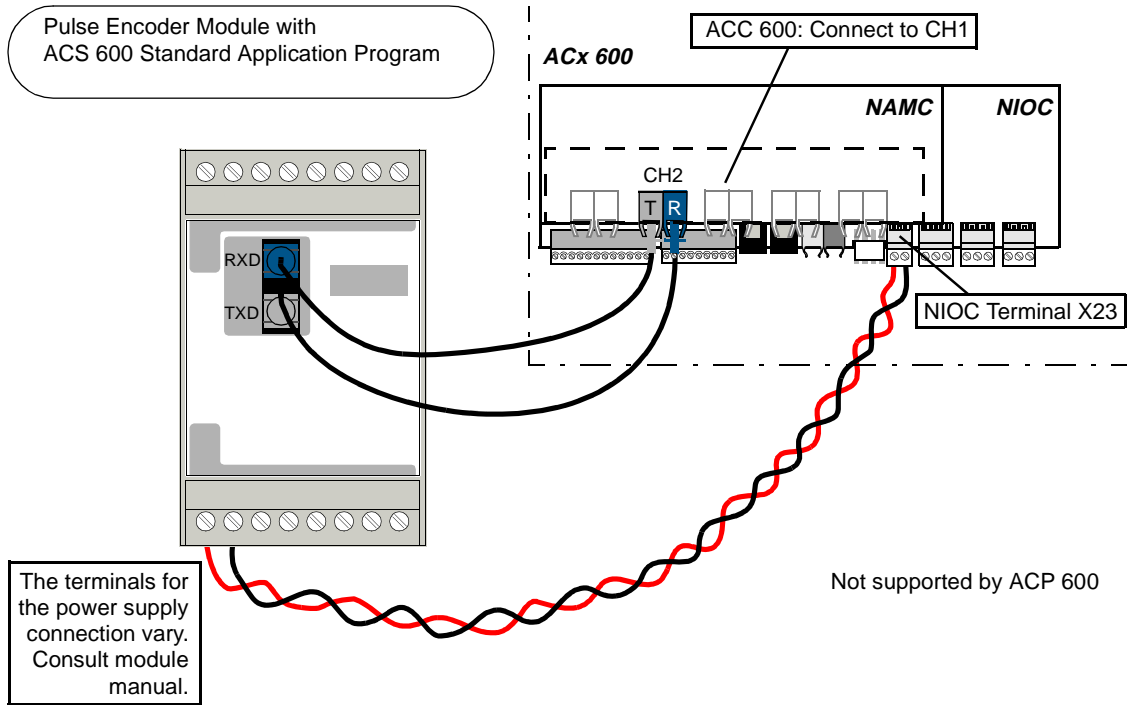
Observe color codes when installing fiber optic cables. Blue connectors should go to blue terminals, and grey connectors to grey terminals.

In case multiple modules are installed on the same channel, they must be connected in a ring.

Connection Examples







**Braking Chopper** Refer to the Braking Choppers Installation and Start-Up Guide for braking chopper installation and application information.



---

**WARNING!**The brake control terminals (UDC+, UDC-, R+ and R-terminals) carry a dangerous DC voltage (over 500V).

---

An external braking resistor must be connected to a terminal block that is supplied with the braking chopper.

## Chapter 4 – Installation Checklist

---

### **Installation Checklist**

The ACx 600 mechanical and electrical installation should be checked before start-up. It is advisable to go through the checklist below together with another person. Study carefully the Safety Instructions on the first pages of this manual before attempting any work on, or with, the unit.

### **INSTALLATION CHECKLIST**

#### **MECHANICAL INSTALLATION**

- Check that the ambient operating conditions are suitable. (See *Appendix A: environmental limits, cooling air flow requirements, free space requirements*)
- Check that the unit is mounted properly. (See *Chapter 2 – Mechanical Installation*)
- Check that cooling air flows freely.
- Check the applicability of the motor and the driven equipment. (See *Appendix A: Motor Connection*)

#### **ELECTRICAL INSTALLATION** (see *Chapter 3 – Electrical Installation*)

- If the ACx 600 is connected to an ungrounded power system or a high resistance grounded power system (over 30 ohms), check that the EMC filter capacitors are disconnected.
- Check that the drive unit is grounded properly.
- Check that the input voltage matches the drive nominal input voltage.
- In ACx 607 (except frame R7) and ACx 604, check that the setting of the transformer T41 corresponds to the supply voltage.
- With line contactor option, check that the setting of the internal transformer corresponds to the supply voltage.
- Check that input power connections at U1, V1 and W1 are OK.
- Check that appropriate input line fuses are installed.
- Check that motor connections at U2, V2 and W2 are OK.
- Check motor cable routing.
- Check that there are no power factor compensation capacitors connected between the drive and the motor.

### **INSTALLATION CHECKLIST**

- Check that control connections inside the drive are OK.
- Check that there are no tools or other foreign objects inside the drive.
- With bypass connection, check that input line voltage cannot be applied to the output of the ACx 600.

## Chapter 5 – Maintenance

---

The ACx 600 requires minimum maintenance.



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

---

### **Heatsink**

The ACx 600 can run into overtemperature Faults if the heatsink is not clean. In normal environment, the heatsink should be checked and cleaned annually.

Use compressed air to remove dust from the heatsink. (The airflow direction must be from bottom to top.) Also, use a vacuum cleaner at the air outlet to trap the dust. Fan rotation must be prevented in order to prevent bearing wear.

### **Fan**

The cooling fan lifespan is about 60,000 hours (R7) or 30,000 hours. The actual lifespan depends on the AC drive usage and ambient temperature.

Fan failure can be predicted by the increasing noise from fan bearings and the gradual rise in the heatsink temperature in spite of heatsink cleaning. If the drive is operated in a critical part of a process, fan replacement is recommended once these symptoms start appearing.

Replacement fans are available from ABB. Do not attempt operation ABB specified spare parts.

### **Capacitors**

The ACx 600 intermediate circuit employs several electrolytic capacitors. Their lifespan is about 100,000 hours. It depends on the drive loading and the ambient temperature.

Capacitor life can be prolonged by lowering the ambient temperature. It is not possible to predict capacitor failure.

Capacitor failure is usually followed by an input line fuse failure or a Fault trip. Contact ABB if capacitor failure is suspected. Replacements are available from ABB. Do not attempt operation with other than ABB specified spare parts.

### **Reforming**

For more information on reforming (re-ageing) spare part capacitors contact Technical Support.



# Appendix A – ACS/ACC/ACP 604/607 Technical Data

## IEC Ratings

The IEC ratings ratings for ACx 604 and ACx 607 with 50 Hz and 60 Hz supplies are below. ACx = ACS/ACC/ACP. The ACx 607 is housed in a Drives-MNS cabinet. The ACx 604 is to be installed in a cabinet by the user. The 690 V series and 2 x R8 and 2 x R9 frame sizes are not available for ACP 600. See next page for symbols.

Frequency Converter Type	Normal Use					Heavy-duty Use							Frame Type
	Duty Cycle 1/10 min		S <sub>N</sub> [kVA]	P <sub>N</sub> [kW]	P <sub>N</sub> [HP]	Duty Cycle 1/10 min		Duty Cycle <sup>1)</sup> 2/15 s		S <sub>hd</sub> [kVA]	P <sub>hd</sub> [kW]	P <sub>hd</sub> [HP]	
	I <sub>2N</sub> 9/10min [A]	I <sub>2Nmax</sub> 1/10min [A]				I <sub>2hd</sub> 9/10min [A]	I <sub>2hdmax</sub> 1/10min [A]	I <sub>2hd</sub> 13/15s [A]	I <sub>2hdmax</sub> 2/15s [A]				
<b>Three-phase supply voltage 380 V, 400 V or 415 V</b>													
ACx 604/607-0100-3	147	162	100	75	100	112	168	112	224	70	55	75	R7
ACx 604/607-0120-3	178	196	120	90	125	147	221	147	294	100	75	100	R8
ACx 604/607-0140-3	216	238	140	110	150	178	267	178	356	120	90	125	
ACx 604/607-0170-3	260	286	170	132	200	216	324	216	432	140	110	150	R9
ACx 604/607-0210-3	316	348	210	160	250	260	390	260	520	170	132	200	
ACx 604/607-0260-3	395	435	260	200	300	316	474	316	632	210	160	250	R9
ACx 604/607-0320-3	480	528	320	250	350	395	593	395	790	260	200	300	
ACx 604/607-0400-3	600	661	400	315	400	494	741	494	988	320	250	350	2xR8
ACx 604/607-0490-3	751	827	490	400	500	600	901	600	1200	400	315	400	2xR9
ACx 604/607-0610-3	912	1003	610	500	600	751	1127	751	1502	490	400	500	
<b>Three-phase supply voltage 380 V, 400 V, 415 V, 440 V, 460 V, 480 V or 500 V</b>													
ACx 604/607-0120-5	135	149	120	90	100	112	168	112	224	100	75	75	R7
ACx 604/607-0140-5	164	180	140	110	125	135	203	135	270	120	90	100	R8
ACx 604/607-0170-5	200	220	170	132	150	164	246	164	328	140	110	125	
ACx 604/607-0210-5	240	264	210	160	200	200	300	200	400	170	132	150	R9
ACx 604/607-0260-5	300	330	260	200	250	240	360	240	480	210	160	200	
ACx 604/607-0320-5	365	402	320	250	300	300	450	300	600	260	200	250	R9
ACx 604/607-0400-5	460	506	400	315	350	365	548	365	730	320	250	300	
ACx 604/607-0490-5	570	627	490	400	500	456	684	456	912	400	315	400	2xR8
ACx 604/607-0610-5	694	764	610	500	600	570	855	570	1140	490	400	500	2xR9
ACx 604/607-0760-5	874	961	760	630	700	694	1041	694	1388	610	500	600	
<b>Three-phase supply voltage 525 V, 550 V, 575 V, 600 V, 660 V or 690 V</b>													
ACx 604/607-0100-6	88	97	100	75	100	65	98	65	98	70	55	75	R7
ACx 604/607-0120-6	105	116	120	90	125	88	132	88	132	100	75	100	R8
ACx 604/607-0140-6	127	140	140	110	150	105	158	105	158	120	90	125	
ACx 604/607-0170-6	150	165	170	132	150	127	191	127	191	140	110	150	R9
ACx 604/607-0210-6	179	197	210	160	200	150	225	150	225	170	132	150	
ACx 604/607-0260-6	225	248	260	200	250	179	269	179	269	210	160	200	R9
ACx 604/607-0320-6	265	292	320	250	300	225	338	225	338	260	200	250	
ACx 604/607-0400-6	351	386	400	315	350	265	398	265	398	320	250	300	2 x R8
ACx 604/607-0490-6	428	470	490	400	450	340	511	340	510	400	315	350	
ACx 604/607-0610-6	504	555	610	500	500	428	642	428	642	490	400	450	2 x R9
ACx 604/607-0760-6	667	734	760	630	700	504	756	504	756	610	500	500	

The table continues from previous page.

ACS 604/607 Type	Pump and Fan Use (Squared Load)		P <sub>N</sub> [Hp]	Frame Type
	I <sub>2Nsq</sub>	P <sub>N</sub>		
	[A]	[kW]		
<b>Three-phase supply voltage 380 V, 400 V or 415 V</b>				
ACS 604/607-0100-3	178	90	125	R7
ACS 604/607-0120-3	200	110 (100)	150	R8
ACS 604/607-0140-3	260	132	200	
ACS 604/607-0170-3	300	160	250	
ACS 604/607-0210-3	375	200	300	R9
ACS 604/607-0260-3	480	250	350	
ACS 604/607-0320-3	510	315 (265)	400	
<b>Three-phase supply voltage 380 V, 400 V, 415 V, 440 V, 460 V, 480 V or 500 V</b>				
ACS 604/607-0120-5	164	110	150	R7
ACS 604/607-0140-5	193	132	200	R8
ACS 604/607-0170-5	240	160	250	
ACS 604/607-0210-5	285	200	300	
ACS 604/607-0260-5	345	250	350	R9
ACS 604/607-0320-5	460	315	400	
ACS 604/607-0400-5	490	400 (335)	500	

The current ratings are the same regardless of the supply voltage within one voltage range. The rated current of the ACx 60x must be higher than or equal to the rated motor current to achieve the rated motor power given in the table.

**Note 1:** The maximum allowed motor shaft power is limited to  $1.5 \cdot P_{hd}$ . If the limit is exceeded, the motor torque and the  $I_{2hdmax}$  2/15 s current is automatically restricted. The function protects the input bridge of the ACS 600 against overload.

**Note 2:** The load capacity (current and power) decreases if the installation site altitude exceeds 1000 metres, or if the ambient temperature exceeds 40 °C (or 35 °C with ACx 60x-0120-03 and ACx 60x-0140-05 units in Pump and Fan Use). See Output Current Temperature Derating on page A-3.

**Note 3:** The Pump and Fan rating is not to be used with dv/dt filters. Usually dv/dt filters are needed at the output of 525 V to 690 V units with random wound motors. No dv/dt filters are usually required with form wound motors.

**Notes concerning Pump and Fan Use only**

Pump and Fan rating is available for ACS 600 with Standard and Pump and Fan Control Application Programs.

**Normal use** (10% overload capacity):

- I<sub>2N</sub> rated rms output current
- I<sub>2Nmax</sub> rms overload current (allowed for one minute every 10 minutes):  
 $I_{2Nmax} (1/10 \text{ min}) = 1.1 \cdot I_{2N}$   
  
 $I_{2Nmax} (2/15 \text{ s}) = 1.5 \cdot I_{2N}$  (400 and 500 VAC units)
- S<sub>N</sub> rated apparent output power
- P<sub>N</sub> typical motor power. The power ratings in kW apply to most IEC 34 motors. The power ratings in HP apply to most four pole NEMA rated motors.

**Pump and Fan Use (Squared Load):** no overload capacity

- I<sub>2Nsq</sub> rated rms output current
- P<sub>N</sub> typical motor power. The power ratings in kW apply to most IEC 34 motors. The power ratings in HP apply to most four pole NEMA rated motors.

**Heavy-duty use** (50% or 100% overload capacity\*):

- I<sub>2hd</sub> rated rms output current
- I<sub>2hdmax</sub> rms overload current (allowed for one minute every 10 minutes or 2 seconds every 15 seconds) Maximum current depends on parameter setting, refer to *Firmware Manual*.  
 $I_{2hdmax} (1/10 \text{ min}) = 1.5 \cdot I_{2hd}$   
 $I_{2hdmax} (2/15 \text{ s}) = 2.0 \cdot I_{2hd}$  (400 and 500 VAC units) or  $1.5 \cdot I_{2hd}$  (690 VAC units)
- S<sub>hd</sub> rated apparent output power
- P<sub>hd</sub> typical motor power. The power ratings in kW apply to most IEC 34 motors. The power ratings in HP apply to most four pole NEMA rated motors.



**NEMA Ratings**

The NEMA ratings for ACS 604 and ACS 607 with 60 Hz supply are below. Symbols are described on previous page.

ACS 604/607 Type	Normal Use			Heavy-duty Use					Frame Type
	Duty Cycle 1/10 min		$P_N$ [HP]	Duty Cycle 1/10 min		Duty Cycle <sup>1)</sup> 2/15 s		$P_{hd}$ [HP]	
	$I_{2N}$ 9/10min [A]	$I_{2Nmax}$ 1/10min [A]		$I_{2hd}$ 9/10min [A]	$I_{2hdmax}$ 1/10min [A]	$I_{2hd}$ 13/15s [A]	$I_{2hdmax}$ 2/15s [A]		
<b>Three-phase supply voltage 380 V, 400 V, 415 V, 440 V, 460 V, 480 V or 500 V</b>									
ACS 604/607-0120-4	156	172	125	113	168	113	224	75	R7
ACS 604/607-0140-4	180	198	150	141	203	141	270	100	
ACS 604/607-0170-4	216	238	150	172	246	172	328	125	R8
ACS 604/607-0210-4	260	286	200	200	300	200	400	150	
ACS 604/607-0260-4	316	348	250	240	360	240	480	200	R9
ACS 604/607-0320-4	414	455	300/350	300	450	300	600	250	
ACS 604/607-0400-4	480	528	400	365	548	365	730	300	

**Note:** The US manufactured units are labeled as -4 types. The information in this manual concerning the corresponding -5 type applies to them.

**Output Current  
Temperature Derating**

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

Temperature derating factor for ACx 607:

- *General rule:* Above +40 °C / +104 °F (+35 °C / +95 °F for types ACS 601-0120-03 and ACS 60x-0140-3 with  $I_{2Nsq}$  rating), the rated output current is decreased 1.5% for every additional 1 °C / 1.8 °F (up to +50 °C / +122 °F). This applies to  $I_{2N}$  and  $I_{2Nsq}$  (for  $I_{2hd}$  no derating is needed).
- *Example 1.* If the ambient temperature is 50 °C / +122 °F the derating factor is

$$100\% - 1.5 \frac{\%}{^\circ\text{C}} \cdot 10 \text{ }^\circ\text{C} = 85\% \text{ or } 0.85.$$

The output current is then  $0.85 \cdot I_{2N}$  or  $0.85 \cdot I_{2Nsq}$  or  $1 \cdot I_{2hd}$ .

### Input Power Connection

#### Voltage ( $U_1$ ):

380/400/415 VAC 3-phase  $\pm 10\%$  for 400 VAC units  
 380/400/415/440/460/480/500 VAC 3-phase  $\pm 10\%$  for 500 VAC units  
 525/550/575/600/660/690 VAC 3-phase  $\pm 10\%$  for 690 VAC units  
 (690 VAC 3-phase -10...+ 5% for ACx 607 units)

**Short Circuit Capability:** The rated short time withstand current of ACx 600 is 50 kA 1 s.

Measured according to US standards ACS 604 / ACS 607 (100...400 kVA): Suitable for use in a circuit capable of delivering not more than 65 kA rms symmetrical amperes at 480 V maximum (500 V units), and at 600 V maximum (690 V units).

**Frequency:** 48 to 63 Hz, maximum rate of change 17%/s

**Imbalance:** Max.  $\pm 3\%$  of nominal phase to phase input voltage

**Fundamental Power Factor ( $\cos \phi_1$ ):** 0.97 (at nominal load)

### Motor Connection

**Voltage ( $U_2$ ):** 0 to  $U_1$ , 3-phase symmetrical

**Frequency:** DTC mode: 0 to  $3.2 \cdot f_{FWP}$  Maximum frequency 300 Hz.

$$f_{FWP} = \frac{U_{N\text{mains}}}{U_{N\text{motor}}} \cdot f_{N\text{motor}}$$

$f_{FWP}$ : Frequency at field weakening point;  $U_{N\text{mains}}$ : Input power voltage;  
 $U_{N\text{motor}}$ : Rated motor voltage;  $f_{N\text{motor}}$ : Rated motor frequency

Scalar Control mode (not for ACP 600): 0 to 300 Hz  
 With dv/dt Filter (DTC and Scalar Control modes): 0 to 120 Hz

**Frequency Resolution:** 0.01 Hz

**Current:** see rating tables

**Power Limit:**  $1.5 \cdot P_{hd}$

**Overcurrent Trip:**  $3.5 \cdot I_{2hd}$

**Field Weakening Point:** 8 to 300 Hz

**Switching Frequency:** 3 kHz (average). In 690 V units 2 kHz (average).

**Maximum Recommended Motor Cable Length:** 300 m (980 ft). This is the cumulative length in case of parallel connected motors. For ACx 601-0005-3 to ACx 601-0016-3, ACx 601-0006-5 to ACx 601-0020-5, ACx 601-0009-6 to ACx 601-0020-6, if the motor cable length exceeds 70 metres (230 ft), an ABB representative should be consulted.

**Motors larger than 90 kW (125 HP) Motors:** Insulated bearing at non-driven end is recommended.

**Efficiency and Cooling**

**Efficiency:** Approximately 98% at nominal power level

**Cooling Method:** Internal fan, flow direction from the bottom to the top

**Ambient Conditions**

Environmental limits of the ACS/ACC/ACP 600 drives are given below. The drives are to be used in a heated, indoor, controlled environment.

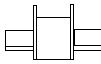
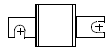
ACS/ACC/ACP 600	Operation installed for stationary use	Storage in the protective package	Transportation in the protective package
<b>Installation Site Altitude</b>	Nominal output power at 0 to 1000 m (3300 ft) above sea level <sup>1)</sup>	-	-
<b>Air Temperature</b>	0 to +40 °C (32 to 104°F) <sup>2)</sup> (IP 21/22 and ACx 607, IP 54) 0 to +25 °C (32 to 77°F) <sup>2)</sup> (ACx 601, IP 54)	-40 to +70 °C (-40 to +158°F)	-40 to +70 °C (-40 to +158°F)
<b>Relative Humidity</b>	5 to 95%	Max. 95%	Max. 95%
	No condensation allowed. Maximum allowed relative humidity is 60% in the presence of corrosive gases.		
<b>Contamination Levels</b> (IEC 721-3-3)	No conductive dust allowed.		
	<b>Boards without coating:</b> Chemical gases: Class 3C2 Solid particles: Class 3S2  <b>Boards with coating:</b> Chemical gases: Class 3C3 Solid particles: Class 3S2	<b>Boards without coating:</b> Chemical gases: Class 1C2 Solid particles: Class 1S3  <b>Boards with coating:</b> Chemical gases: Class 1C2 Solid particles: Class 1S3	<b>Boards without coating:</b> Chemical gases: Class 2C2 Solid particles: Class 2S2  <b>Boards with coating:</b> Chemical gases: Class 2C2 Solid particles: Class 2S2
<b>Atmospheric Pressure</b>	70 to 106 kPa 0.7 to 1.05 atmospheres	70 to 106 kPa 0.7 to 1.05 atmospheres	60 to 106 kPa 0.6 to 1.05 atmospheres
<b>Vibration</b> (IEC 68-2-6)	Max. 0.3 mm (0.01 in.) (2 to 9 Hz), max. 1 m/s <sup>2</sup> (3.3 ft./s <sup>2</sup> ) (9 to 200 Hz) sinusoidal	Max. 1.5 mm (0.06 in.) (2 to 9 Hz), max. 5 m/s <sup>2</sup> (16.4 ft./s <sup>2</sup> ) (9 to 200 Hz) sinusoidal	Max. 3.5 mm (0.14 in.) (2 to 9 Hz), max. 15 m/s <sup>2</sup> (49 ft./s <sup>2</sup> ) (9 to 200 Hz) sinusoidal
<b>Shock</b> (IEC 68-2-29)	Not allowed	Max. 100 m/s <sup>2</sup> (330 ft./s <sup>2</sup> ), 11 ms	Max. 100 m/s <sup>2</sup> (330 ft./s <sup>2</sup> ), 11 ms
<b>Free Fall</b>	Not allowed	250 mm (10 in.) for weight under 100 kg (220 lbs.) 100 mm (4 in.) for weight over 100 kg (220 lbs.)	250 mm (10 in.) for weight under 100 kg (220 lbs.) 100 mm (4 in.) for weight over 100 kg (220 lbs.)

<sup>1)</sup> At sites over 1000 m (3300 ft.) above sea level, the maximum output current is derated 1% for every additional 100 m (330 ft.). If the installation site is higher than 2000 m (6600 ft.) above sea level, please contact your local ABB distributor or office for further information.

<sup>2)</sup> See subsection *Output Current Temperature Derating* on page A-3.

**Fuses**

Input fuse ratings of the ACS/ACC/ACP 607 and recommended input fuse ratings of the ACS/ACC/ACP 604 are below. A minimum rated current in amperes, A<sup>2</sup>s maximum I<sup>2</sup>t value, V rated voltage in volts. Only ultra rapid fuses guarantee proper protection for the rectifier semiconductors.

ACx 604/607 Types	Fuses							
	A	A <sup>2</sup> s	V	Manufacturer	Type DIN 43620 	Size	Type DIN 43653 	Size
ACx 60x-0100-3 ACx 60x-0120-5 ACx 60x-0120-3 ACx 60x-0140-5 ACx 60x-0140-3 ACx 60x-0170-5	400	105000	660	Bussmann	170M3819	1*	170M3019	1*
ACx 60x-0170-3 ACx 60x-0210-5	550	190000	660	Bussmann	170M5811	2	170M5011	2
ACx 60x-0210-3 ACx 60x-0260-5 ACx 60x-0400-3 ACx 60x-0490-5 ACx 60x-0260-3 ACx 60x-0320-5 ACx 60x-0490-3 ACx 60x-0610-5	700	405000	660	Bussmann	170M5813	2	170M5013	2
ACx 60x-0320-3 ACx 60x-0400-5 ACx 60x-0610-3 ACx 60x-0760-5	800	465000	660	Bussmann	170M6812	3	170M6012	3
ACx 60x-0100-6	125	3700	660	Bussmann	170M1568	000	170M1368	000
ACx 60x-0120-6	200	15000	660	Bussmann	170M1570	000	170M1370	000
ACx 60x-0140-6 ACx 60x-0170-6	250	28500	660	Bussmann	170M3816	1	170M3016	1
ACx 60x-0210-6	315	46500	660	Bussmann	170M3817	1	170M3017	1
ACx 60x-0260-6	400	105000	660	Bussmann	170M3819	1	170M3019	1
ACx 60x-0320-6 ACx 60x-0400-6	550	190000	660	Bussmann	170M5811	2	170M5011	2
ACx 60x-0490-6	400	105000	660	Bussmann	170M3819	1	170M3019	1
ACx 60x-0610-6 ACx 60x-0760-6	550	190000	660	Bussmann	170M5811	2	170M5011	2

**Note:** Fuses from other manufacturers can be used if they meet the ratings given in the table. Only ultra rapid fuses guarantee proper protection for the rectifier semiconductors. The fuses recommended in the table are UL R/C (JFRHRZ) fuses.

**Example** For ACS 604-0260-3, the recommended fuses for the input bridge protection are 700 A ultrarapid fuses.

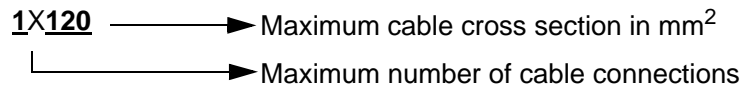
The values  $I_{2N}$ ,  $I_{2hd}$  and  $I_{2Nsq}$  for ACS 604-0260-3 are 395 A, 316 A and 480 A respectively.  $1.1 \cdot 395 \text{ A} = 434.5 \text{ A}$  and  $1.5 \cdot 316 \text{ A} = 474 \text{ A}$  and  $1.0 \cdot 480 \text{ A} = 480 \text{ A}$ . Normal fuses with nominal currents higher than 434.5 A, 474 A or 480 A can be used to protect the input cable; thus, 450 A or 500 A fuses are selected depending on the use (normal, heavy-duty or pump and fan, respectively).

**Cable Entries**

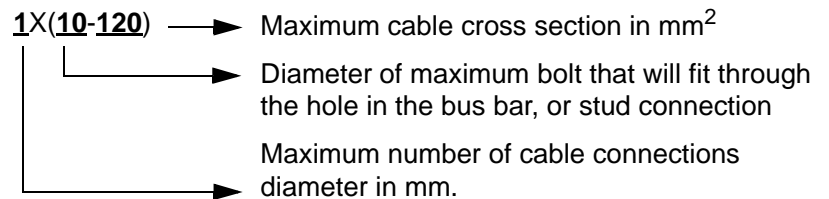
Input power and motor cable terminal wire size capabilities and tightening torques for the ACS/ACC/ACP 604/607 are in the table below. The capability is specified based on wire lug that the terminal accepts (according to DIN 46234 for copper cables and DIN 46329 for aluminum cables), cable cross section that will fit through the European lead-through plate hole, and maximum electrically needed European cable cross section. NEMA two hole lugs (1/2 inch in diameter and 1.75 inches on center) can be used in frame sizes R8 and R9 and R7 output.

**Terms used**

- Terminal kit (crush-down) connection. This kit is used in frame size R7 drives (input cable terminal) and includes screws. The conductor is plugged into the kit without a cable lug.



- Bus bar connection with hole requiring bolt, washer, nut, and wire lug to be supplied by others. The other style connection using the same reference is an insulated stud connection, washer and nut. The wire lug is provided by others.



- If an M is added before the number in the table (e.g. M10) we have a designator for a standard metric screw.

Substitution Metric to US Standard

- M8 - 5/16 inch diameter bolt
- M10 - 3/8 inch diameter bolt
- M12 - 1/2 inch diameter bolt

- T = Tightening torque.

**Terminal Sizes and Tightening Torques** Input power and motor cable terminal wire size capabilities (per phase) and tightening torques for the ACS/ACC/ACP 604/607 are below. For terms used see above.

ACx 600 Type	Input Power Terminals			Motor Terminals			Grounding Terminals		Cabinet (Frame)
	U1,V1,W1		T	U2,V2,W2		T	Grounding Ground PE	T	
	Cu	Al	Lbs-ft/Nm	Cu	Al	Lbs-ft/Nm		Lbs-ft/Nm	
ACx 607-0100-3/0120-5/0100-6	1x120 <sup>3)</sup>	1x120 <sup>3)</sup>	22/30	1x(12-120)	1x(12-120)	22/30	M12	22/30	MNS (R7)
ACx 607-0120-3/0140-5/0120-6	1x185 <sup>3)</sup>	1x185 <sup>3)</sup>	22	1x(12-185)	1x(12-185)	22/30	M12	22/30	
ACx 607-0140-3/0170-5/0140-6	2x(12-185)	2x(12-185)	33/44	2x(12-185)	2x(12-185)	33/44	M12	22/30	MNS (R8)
ACx 607-0170-3/0210-5/0170-6	2x(12-185)	2x(12-240)	33/44	2x(12-185)	2x(12-240)	33/44	M12	22/30	
ACx 607-0210-3/0260-5/0210-6	2x(12-185)	2x(12-240)	33/44	2x(12-185)	2x(12-240)	33/44	M12	22/30	
ACx 607-00260-6	2x(12-185)	2x(12-240)	33/44	2x(12-185)	2x(12-240)	33/44	M12	22/30	
ACx 607-0260-3/0320-5/0320-6	2x(12-185)	2x(12-240)	33/44	2x(12-185)	2x(12-240)	33/44	M12	22/30	MNS (R9)
ACx 607-0320-3/0400-5/0400-6	2x(12-185)	2x(12-240)	33/44	2x(12-185)	2x(12-240)	33/44	M12	22/30	
ACx 607-0400-3/0490-5/0490-6	4x(12-185)	4x(12-240)	41/55	4x(12-185)	4x(12-240)	41/55	M10 (2x2 pcs)	26/35	MNS (2xR8)
ACx 607-0490-3/0610-5/0610-6	4x(12-185)	4x(12-240)	41/55	4x(12-185)	4x(12-240)	41/55	M10 (2x2 pcs)	26/35	MNS (2xR9)
ACx 607-0610-3/0760-5/0760-6	4x(12-185)	4x(12-240)	41/55	4x(12-185)	4x(12-240)	41/55	M10 (2x2 pcs)	26/35	
ACx 604-0100-3/0120-5/0100-6	1x(10-120) <sup>4)</sup>	<sup>1)</sup>	22/30	1x(10-120)	<sup>1)</sup>	22/30	41 mm <sup>2</sup> <sup>2) 3)</sup>	22/30	- (R7)
ACx 604-0120-3/0140-5/0120-6	1x(10-120) <sup>4)</sup>	<sup>1)</sup>	22/30	1x(10-120)	<sup>1)</sup>	22/30	41 mm <sup>2</sup> <sup>2) 3)</sup>	22/30	
ACx 604-0140-3/0170-5/0140-6	1x(10-240) <sup>4)</sup>	1x(10-240) <sup>4)</sup>	22/30	3x(12-240)	3x(12-240)	33/44	M10 (2 pcs) <sup>2)</sup>	22/30	- (R8)
ACx 604-0170-3/0210-5/0170-6	1x(10-240) <sup>4)</sup>	1x(10-240) <sup>4)</sup>	22/30	3x(12-240)	3x(12-240)	33/44	M10 (2 pcs) <sup>2)</sup>	22/30	
ACx 604-0210-3/0260-5/0210-6	1x(10-240) <sup>4)</sup>	1x(10-240) <sup>4)</sup>	22/30	3x(12-240)	3x(12-240)	33/44	M10 (2 pcs) <sup>2)</sup>	22/30	
ACx 604-0260-6	1x(10-240) <sup>4)</sup>	1x(10-240) <sup>4)</sup>	22/30	3x(12-240)	3x(12-240)	33/44	M10 (2 pcs) <sup>2)</sup>	22/30	

Appendix A – ACS/ACC/ACP 604/607 Technical Data

ACx 604-0260-3/0320-5/0320-6	1x(10-240) <sup>4)</sup>	1x(10-240) <sup>4)</sup>	22/30	3x(12-240)	3x(12-240)	33/44	M10 (2 pcs) <sup>2)</sup>	22/ 30	- (R9)
ACx 604-0320-3/0400-5/0400-6	1x(10-240) <sup>4)</sup>	1x(10-240) <sup>4)</sup>	22/30	3x(12-240)	3x(12-240)	33/44	M10 (2 pcs) <sup>2)</sup>	22/ 30	

- 1) The maximum acceptable size of the cable is 3x120+70 (3x(AWG 0000) + AWG 00); cross-sectional areas of copper conductors in mm<sup>2</sup>, 3 x phase conductor + Ground PE conductor). Aluminium cable cannot be connected due to cable lug size.
- 2) This is the Grounding terminal for the Ground PE bus and the frame of the ACx 604 module. The terminal is to be connected to the Ground PE bus of the cabinet the module is installed in.
- 3) Cable size: 6 AWG...300 MCM
- 4) Isolated Stud terminal

**External Control  
Connection Diagrams**

External control connections of ACS 600 equipped with Standard Application Program (Factory Macro) are shown below. External control connections are different with other application macros and programs (see *Firmware Manual*).

External control wiring is connected either directly to terminals on the NIOC board or through an optional terminal block. If an optional I/O terminal block is furnished, the control panel code (16th digit) of the ACS 600 type code will contain a 4 or 5. Refer to Chapter 2 for the ACS 600 type code description.

An optional terminal block can be designated X2 (IEC standard designation) or 2TB (ANSI standard designation, for US manufactured units only). The 2TB arrangement is supplied in drives with 8 as the 20th digit of the ACS 600 type code.

When making the external control connections be sure to carefully compare the terminal configuration found in the drive with diagrams below to be sure that the correct diagram is used.

External control wiring of ACP 600 is connected either to terminals on the NIOC board or the NIOCP board. External control connections to NIOCP board are shown below.

**NIOC Board**

External control connections of NIOC board for ACS 600 with Standard Application Software (Factory Macro) are below. External control connections are different with other application macros and programs (see *Firmware Manual*).



ACS 601/604/607  
NIOC Board  
(A2)

**Programmable I/O  
Factory Settings**

**Terminal Block Size**

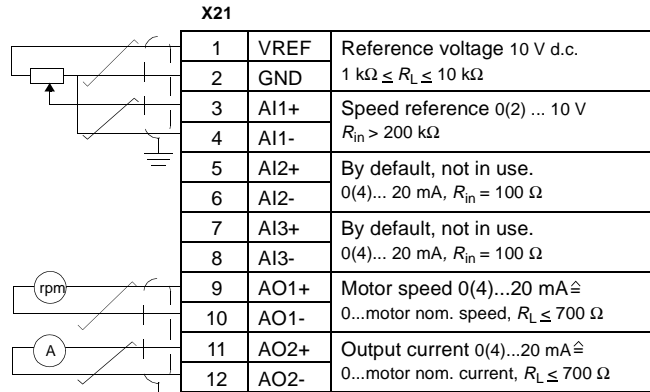
X21, X22, X23, X25, X26, X27: cables 0.5 to 1.5 mm<sup>2</sup>  
X2: cables 0.5 to 2.5 mm<sup>2</sup>

**Control Cable Lead-through Size:**

Ø: 2 x 3x2...11 mm

Factory settings of application software selection B (type code):

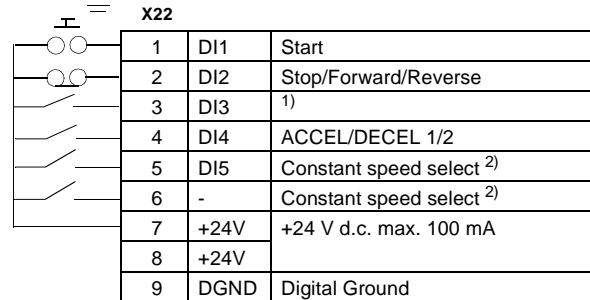
DI1: Start, DI2: Stop, DI3: Reverse, DI4: Acc/Dec 2, DI5,6: Constant speed 1 to 3 select.



1) Parameter 10.3 must be set to REQUEST.

2) Operation: 0 = Open, 1 = Closed

DI 5	DI 6	Output
0	0	Set speed through AI1
1	0	Constant Speed 1
0	1	Constant Speed 2
1	1	Constant Speed 3

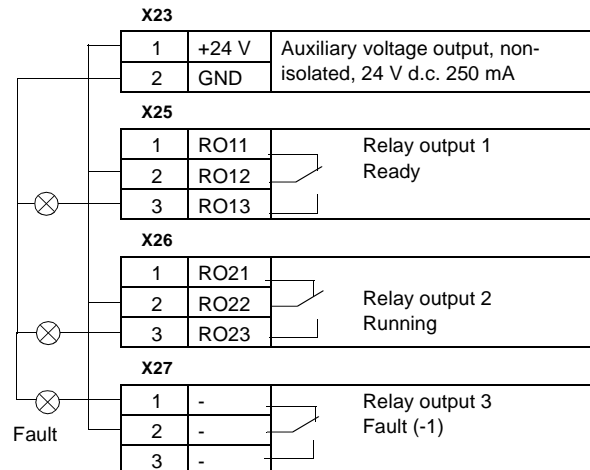


Connector X28 for RS 485 connection

1	TRANS	Link Connections
2	GND	
3	B-	
4	A+	Power to link
5	GND	
6	+24 V	

Connector X29 for RS 485 connection

1	TRANS	Link Connections
2	FAULT	
3	B-	
4	A+	Power to link
5	GND	
6	+24 V	



**Optional Terminal Block X2** External connections to optional terminal block X2 for ACS 600 Standard Application Program (Factory Macro) are shown below. External control connections are different with other application macros and programs (see *Firmware Manual*).

**Terminal Block Size**

X21, X22, X23, X25, X26, X27:  
cables 0.5 to 1.5 mm<sup>2</sup> (#20 to #16 AWG)  
X2: cables 0.5 to 2.5 mm<sup>2</sup> (#20 to #14 AWG)

**Control Cable Lead-through Size:**

Ø: 2 x 3x2...11 mm (0.08 to 0.43")

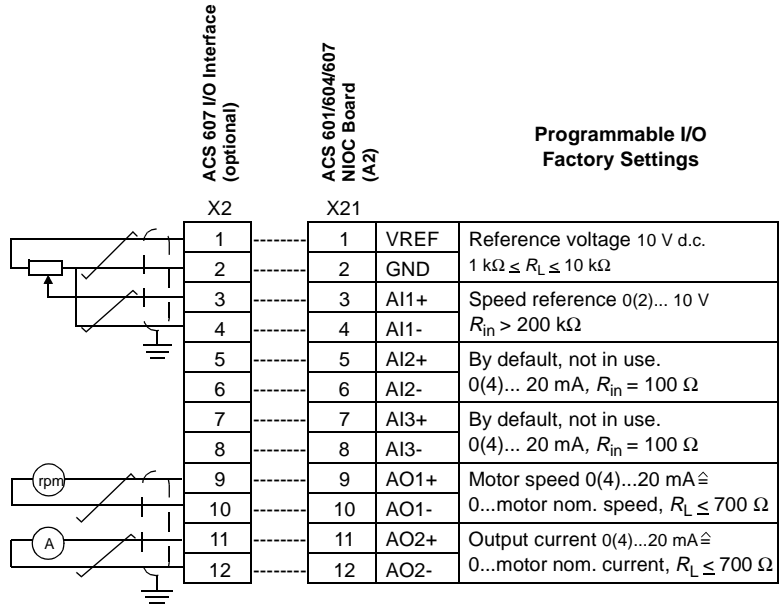
Factory settings of application software selection B (type code):

DI1: Start, DI2: Stop, DI3: Reverse,  
DI4: Acc/Dec 2,  
DI5,6: Constant speed 1 to 3 select.

1) Parameter 10.3 must be set to REQUEST.

2) Operation: 0 = Open, 1 = Closed

DI 5	DI 6	Output
0	0	Set speed through AI 1
1	0	Constant Speed 1
0	1	Constant Speed 2
1	1	Constant Speed 3

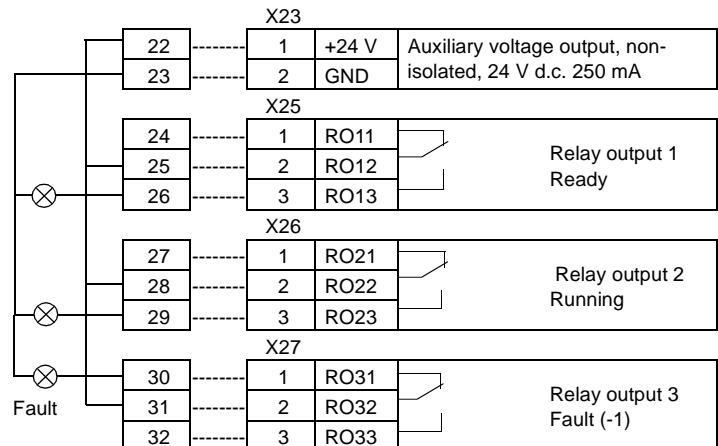
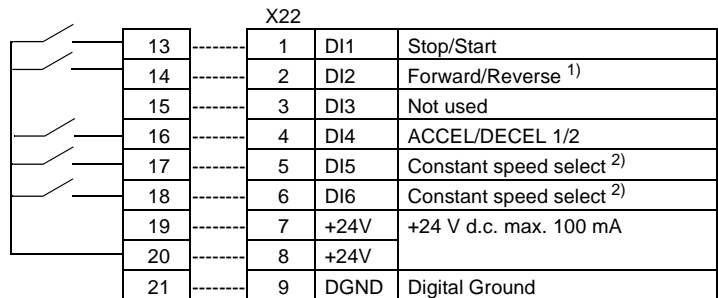


**Connector X28 for RS 485 connection**

Pin	Label	Function
1	TRANS	Panel Link Connections
2	GND	
3	B-	
4	A+	
5	GND	Power to Remote Panel
6	+24V	

**Connector X29 for RS 485 connection**

Pin	Label	Function
1	TRANS	Panel Link Connections
2	FAULT	
3	B-	
4	A+	
5	GND	Power to Panel



**Optional Terminal Block 2TB**

External connections to optional terminal block 2TB. This option is available only with ACS 600 Standard Application Program. External control connections with Factory Macro are shown below. Connections are different with other application macros (see *Firmware Manual*).

**Terminal Block Size**

X21, X22, X23, X25, X26, X27:  
cables 0.5 to 1.5 mm<sup>2</sup> (#20 to #16 AWG)  
2TB: cables 0.5 to 2.5 mm<sup>2</sup> (#20 to #14 AWG)

**Control Cable Lead-through Size:**

Ø: 2 x 3x2...11 mm (0.08 to 0.43")

Factory settings of application software selection B (type code):

DI1: Start, DI2: Stop, DI3: Reverse,  
DI4: Acc/Dec 2,  
DI5,6: Constant speed 1 to 3 select.

1) Parameter 10.3 must be set to REQUEST.

2) Operation: 0 = Open, 1 = Closed

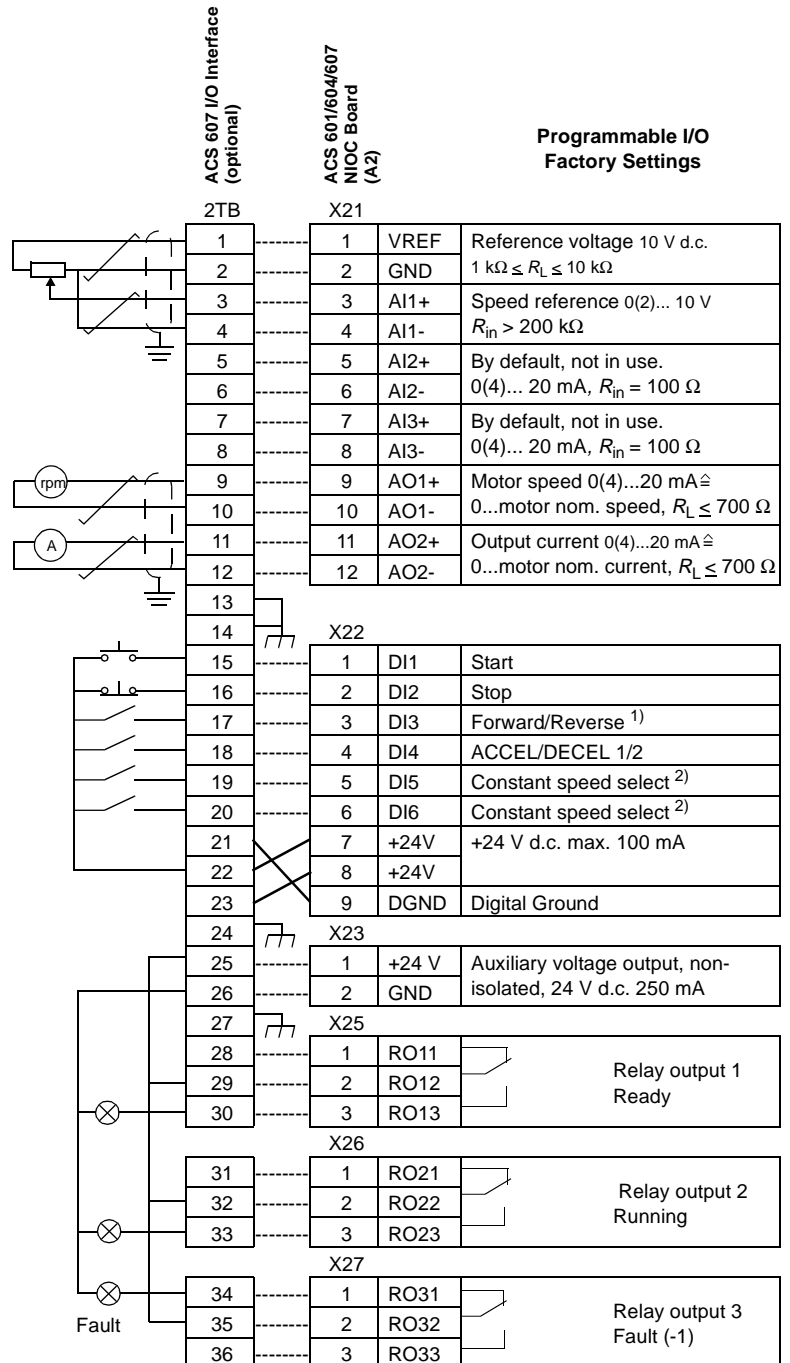
DI 5	DI 6	Output
0	0	Set speed through AI 1
1	0	Constant Speed 1
0	1	Constant Speed 2
1	1	Constant Speed 3

Connector X28 for RS 485 connection

1	TRANS	Panel Link Connections
2	GND	
3	B-	
4	A+	
5	GND	Power to Remote Panel
6	+24V	

Connector X29 for RS 485 connection

1	TRANS	Panel Link Connections
2	FAULT	
3	B-	
4	A+	
5	GND	Power to Panel



**NIOCP Board** External control connections of ACP 600 with NIOCP board (and Speed Control Application Macro) are below. External control connections are different with other application macros (see *Firmware Manual*).

**Terminal Block Size**

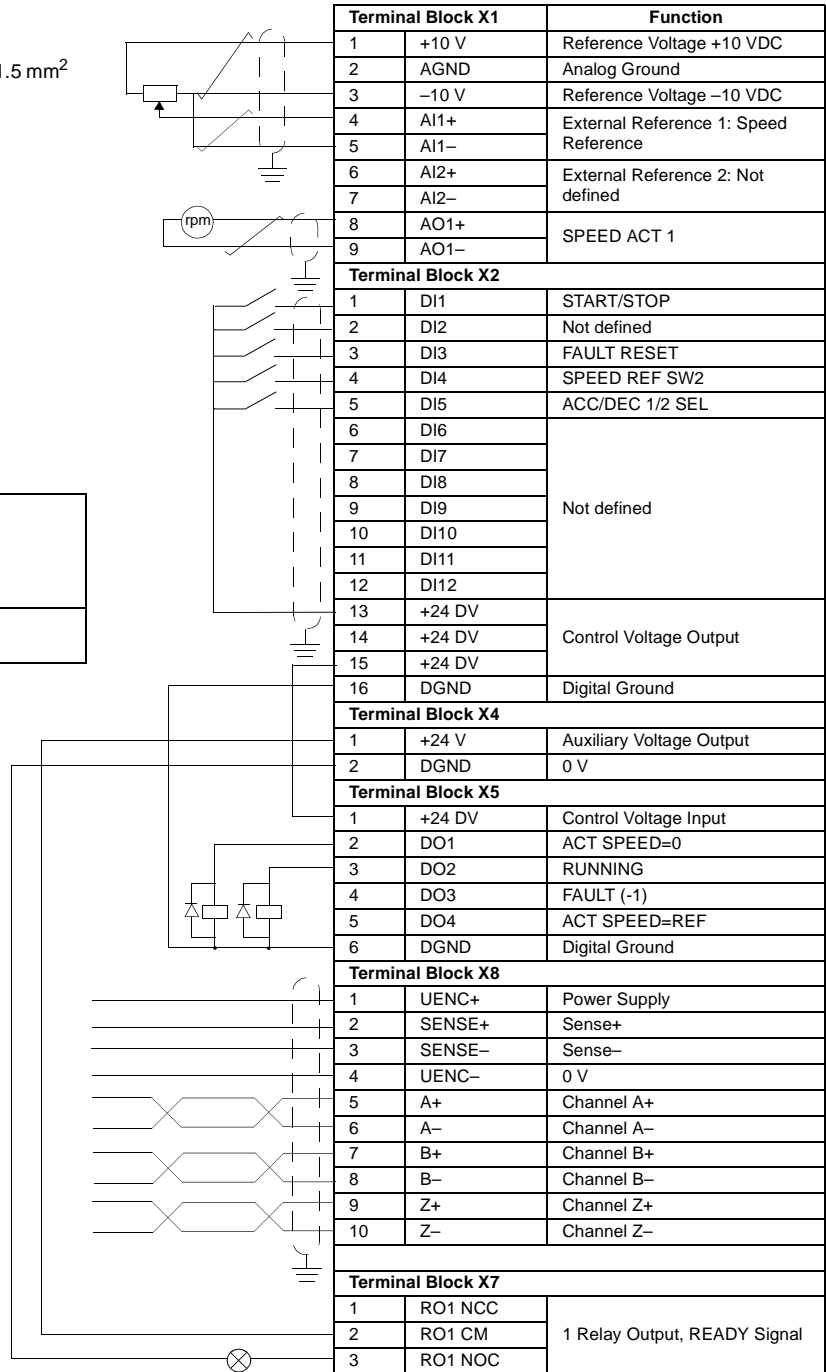
X21, X22, X23, X25, X26, X27: cables 0.5 to 1.5 mm<sup>2</sup>

**Control Cable Lead-through Size:**

Ø: 2 x 3x2...11 mm

Connector X300 for RS 485 connection

1	TRANS	Panel Link Connections
2	GND	
3	B-	
4	A+	
5	GND	Power to Remote Panel
6	+24 V	



Terminal Block X1		Function
1	+10 V	Reference Voltage +10 VDC
2	AGND	Analog Ground
3	-10 V	Reference Voltage -10 VDC
4	AI1+	External Reference 1: Speed Reference
5	AI1-	
6	AI2+	External Reference 2: Not defined
7	AI2-	
8	AO1+	SPEED ACT 1
9	AO1-	
Terminal Block X2		
1	DI1	START/STOP
2	DI2	Not defined
3	DI3	FAULT RESET
4	DI4	SPEED REF SW2
5	DI5	ACC/DEC 1/2 SEL
6	DI6	Not defined
7	DI7	
8	DI8	
9	DI9	
10	DI10	
11	DI11	
12	DI12	Control Voltage Output
13	+24 DV	
14	+24 DV	
15	+24 DV	
16	DGND	Digital Ground
Terminal Block X4		
1	+24 V	Auxiliary Voltage Output
2	DGND	0 V
Terminal Block X5		
1	+24 DV	Control Voltage Input
2	DO1	ACT SPEED=0
3	DO2	RUNNING
4	DO3	FAULT (-1)
5	DO4	ACT SPEED=REF
6	DGND	Digital Ground
Terminal Block X8		
1	UENC+	Power Supply
2	SENSE+	Sense+
3	SENSE-	Sense-
4	UENC-	0 V
5	A+	Channel A+
6	A-	Channel A-
7	B+	Channel B+
8	B-	Channel B-
9	Z+	Channel Z+
10	Z-	Channel Z-
Terminal Block X7		
1	RO1 NCC	1 Relay Output, READY Signal
2	RO1 CM	
3	RO1 NOC	

**NIOC and NIOCP  
Board Specifications**

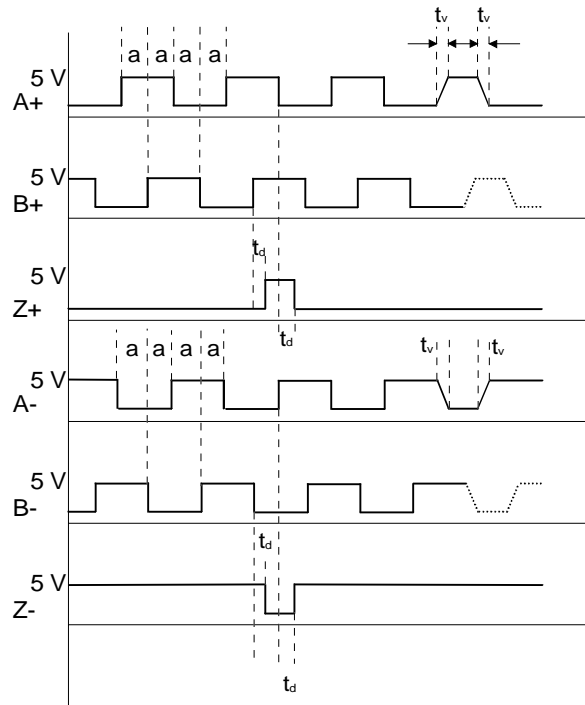
Data of the external control connection boards of the ACS 600 product family are given below.

	<b>ACS/ACC/ACP 600 NIOC-01 Board</b>	<b>ACP 600 NIOCP-01 Board</b>
<p><b>Analog Inputs</b></p> <p>The advantage of the differential analog input is that the ground potential of the device or transmitter sending an analog signal can differ up to <math>\pm 15</math> V from the ground potential of the ACx 600 chassis without disturbing the signal. Differential input also efficiently attenuates common mode disturbances coupled to control cables.</p>	<p><b>ACS 600: Two Programmable Differential Current Inputs:</b> 0 (4) to 20 mA, <math>R_{in} = 100 \Omega</math></p> <p><b>ACC 600: Two Differential Current Inputs:</b> 0 to 20 mA, <math>R_{in} = 100 \Omega</math></p> <p><b>ACP 600: One Programmable Differential Current Input:</b> 0 to 20 mA, <math>R_{in} = 100 \Omega</math></p> <p><b>ACS/ACP 600: One Programmable Differential Voltage Input:</b> ACS 600: 0 (2) to 10 V, <math>R_{in} &gt; 200 \text{ k}\Omega</math>; ACP 600: 0 to 10 V, <math>R_{in} &gt; 200 \text{ k}\Omega</math></p> <p><b>ACC 600: One Differential Voltage Input:</b> 0 to 10 V, <math>R_{in} &gt; 200 \text{ k}\Omega</math></p> <p><b>Common Mode Voltage:</b> <math>\pm 15</math> VDC, max.</p> <p><b>Common Mode Rejection Ratio:</b> <math>\geq 60</math> dB at 50 Hz</p> <p><b>Resolution:</b> 0.1 % (10 bit)</p> <p><b>Inaccuracy:</b> <math>\pm 0.5\%</math> (Full Scale Range) at 77 °F(25°C). Temperature Coefficient: <math>\pm 200 \text{ ppm}/^\circ\text{C}</math>, (110ppm/°F) max.</p> <p><b>Input Updating Time:</b> 12 ms (ACS 600), 44 ms (ACC 600), 1 ms (ACP 600)</p>	<p><b>Two Bipolar Differential Voltage Inputs:</b> <math>\pm 10</math> V, <math>R_{in} = 30 \text{ k}\Omega</math></p> <p><b>Common Mode Voltage:</b> <math>\pm 20</math> VDC, max.</p> <p><b>Common Mode Rejection Ratio:</b> <math>\geq 60</math> dB at 50 Hz</p> <p><b>Resolution:</b> 0.02 % (12 bit)</p> <p><b>Accuracy:</b> 11 bit</p> <p><b>Inaccuracy:</b> <math>\pm 0.1\%</math> (Full Scale Range) at 77 °F(25°C) Temperature Coefficient: <math>\pm 100 \text{ ppm}/^\circ\text{C}</math> (56ppm/°F), max.</p> <p><b>Input Updating Time:</b> 1 ms</p>
<p><b>Constant Voltage Output</b></p>	<p><b>Voltage:</b> 10 VDC <math>\pm 0.5\%</math> (Full Scale Range) at 77 °F(25°C). Temperature Coefficient: <math>\pm 100 \text{ ppm}/^\circ\text{C}</math>, max.</p> <p><b>Maximum Load:</b> 10 mA</p> <p><b>Applicable Potentiometer:</b> 1 k<math>\Omega</math> to 10 k<math>\Omega</math></p>	<p><b>Voltage:</b> <math>\pm 10</math> VDC <math>\pm 0.5\%</math> (Full Scale Range) at 77 °F(25°C). Temperature Coefficient: <math>\pm 100 \text{ ppm}/^\circ\text{C}</math> 56ppm/°F), max.</p> <p><b>Maximum Load:</b> 10 mA</p> <p><b>Applicable Potentiometer:</b> <math>\geq 1 \text{ k}\Omega</math></p>
<p><b>Auxiliary Power Output</b></p>	<p><b>Voltage:</b> 24 VDC <math>\pm 10\%</math> Short circuit proof</p> <p><b>Maximum Current:</b> 250 mA (130 mA with NLMD-01 option)</p>	<p><b>Voltage:</b> 24 VDC <math>\pm 10\%</math> Short circuit proof</p> <p><b>Maximum Current:</b> 250 mA</p>
<p><b>Analog Outputs</b></p>	<p><b>ACS/ACC 600: Two Programmable Current Outputs:</b> 0 (4) to 20 mA, <math>R_L \leq 700 \Omega</math></p> <p><b>ACP 600: One Programmable Current Output:</b> 0 to 20 mA, <math>R_L \leq 700 \Omega</math></p> <p><b>Resolution:</b> 0.1 % (10 bit)</p> <p><b>Inaccuracy:</b> <math>\pm 1\%</math> (Full Scale Range) at 77 °F (25 °C). Temperature Coefficient: <math>\pm 200 \text{ ppm}/^\circ\text{C}</math>, max.</p> <p><b>Output Updating Time:</b> 24 or 100 ms (ACS 600), 44 ms (ACC 600), 8 ms (ACP 600)</p>	<p><b>One Bipolar Programmable Voltage Output:</b> <math>\pm 10</math> V, <math>R_L \geq 2 \text{ k}\Omega</math></p> <p><b>Resolution:</b> 0.02% (12 bit)</p> <p><b>Accuracy:</b> 10 bit</p> <p><b>Inaccuracy:</b> <math>\pm 0.1\%</math> (Full Scale Range) at 77 °F (25 °C). Temperature Coefficient: <math>\pm 200 \text{ ppm}/^\circ\text{C}</math>, max.</p> <p><b>Output Updating Time:</b> 2 ms</p> <p><b>Output Rising Time:</b> 3 ms</p>

	<b>ACS/ACC/ACP 600 NIOC-01 Board</b>	<b>ACP 600 NIOCP-01 Board</b>
<b>Digital Inputs</b>	<p><b>ACS/ACP 600: Six Programmable Digital Inputs (Common Ground):</b> 24 VDC, -15% to +20%</p> <p><b>ACC 600: Six Digital Inputs (Common Ground):</b> 24 VDC, -15% to +20%</p> <p><b>Logical Thresholds:</b> &lt; 8 VDC <math>\hat{=}</math> "0", &gt; 12 VDC <math>\hat{=}</math> "1"</p> <p><b>Input Current:</b> DI1 to DI 5: 10 mA, DI6: 5 mA</p> <p><b>Filtering Time Constant:</b> 1 ms</p> <p><b>Thermistor Input:</b> 5 mA, &lt; 1.5 k<math>\Omega</math> <math>\hat{=}</math> "1" (normal temperature), &gt; 4 k<math>\Omega</math> <math>\hat{=}</math> "0" (high temperature), Open Circuit <math>\hat{=}</math> "0" (high temperature)</p> <p><b>Internal Supply For Digital Inputs (+24 VDC):</b> Short circuit proof, group isolated</p> <p><b>Isolation Test Voltage:</b> 500 VAC, 1 minute</p> <p><b>Input Updating Time:</b> 12 ms (ACS 600), 44 ms (ACC 600), 4 ms (ACP 600)</p> <p><b>An external 24 VDC supply can be used instead of the internal supply.</b></p>	<p><b>12 Programmable Digital Inputs (Common Ground):</b> 24 VDC, -15% to +20%</p> <p><b>Logical Thresholds:</b> &lt; 8 VDC <math>\hat{=}</math> "0", &gt; 12 VDC <math>\hat{=}</math> "1"</p> <p><b>Filtering Time Constant:</b> <math>\leq</math> 50 <math>\mu</math>s</p> <p><b>DI 11 and DI 12 can be used for time measurement between two external events (PROBE1 and PROBE2).</b></p> <p><b>Internal Supply For Digital Inputs (+24 VDC):</b> Short circuit proof, group isolated</p> <p><b>Isolation Test Voltage:</b> 500 VAC, 1 minute</p> <p><b>Input Updating Time:</b> 1 ms</p> <p><b>An external 24 VDC supply can be used instead of the internal supply.</b></p> <p><b>Filtering Time Constant:</b> <math>\leq</math> 100 <math>\mu</math>s</p>
<b>Digital Outputs</b>	-	<p><b>Four Programmable Digital Outputs:</b> Short circuit proof, Overload protection</p> <p><b>Maximum Load:</b> 10 mA with internal 24 V supply, 100 mA with external supply</p> <p><b>Output Updating Time:</b> 2 ms</p>
<b>Relay Outputs</b>	<p><b>Three Programmable Relay Outputs</b></p> <p><b>Switching Capacity:</b> 8 A at 24 VDC or 250 VAC, 0.4 A at 120 VDC</p> <p><b>Minimum Continuous Current:</b> 5 mA rms at 24 VDC</p> <p><b>Maximum Continuous Current:</b> 2 A rms</p> <p><b>Contact Material:</b> Silver Cadmium Oxide (AgCdO)</p> <p><b>Isolation Test Voltage:</b> 4 kVAC, 1 minute</p> <p><b>Output Updating Time:</b> 100 ms (ACS 600), 44 ms (ACC 600), 8 ms (ACP 600)</p>	<p><b>One Relay Output</b></p> <p><b>Switching Capacity:</b> 8 A at 24 VDC or 250 VAC, 0.4 A at 120 VDC</p> <p><b>Minimum Continuous Current:</b> 5 mA rms at 24 VDC</p> <p><b>Max Continuous Current:</b> 2 A rms</p> <p><b>Contact Material:</b> Silver Cadmium Oxide (AgCdO)</p> <p><b>Isolation Test Voltage:</b> 4 kVAC, 1 minute</p> <p><b>Output Updating Time:</b> 2 ms</p>
<b>DDCS Fiber Optic Link</b>	<b>Protocol:</b> DDCS (ABB Distributed Drives Communication System)	

	ACS/ACC/ACP 600 NIOC-01 Board	ACP 600 NIOCP-01 Board
<b>Encoder Input</b>		<p><b>One Encoder Input:</b> 3 channel differential, +5 V encoder supply, frequency <math>\leq 200</math> kHz, supply cable resistance compensation. COMBICON connector, 15 pins. Meets the EIA standard RS 422.</p> <p><b>Required Encoder Type:</b> Contact ABB Application Engineer or your local ABB representative for assistance</p> <p><b>Encoder Signals:</b> Signal level/Load capacity: 5 V rectangular-pulse signals; Time between edges: <math>a &gt; 0,8 \mu\text{s}</math> at <math>f_{\text{max}}</math>; Edge steepness: <math>t_v \leq 120</math> ns; Delay of reference signal Z (zero pulse): <math>t_d \leq 60</math> ns; Sampling frequency: <math>f_{\text{max}} = 200</math> kHz.</p>

**Encoder Signals** Characteristic of incremental encoder signals in applications using the incremental encoder (for clockwise rotation, viewed from the drive end) is presented below.



**Enclosures, Space Requirements**

The cabinets, degrees of protection and free space requirements of ACx 600 types are given below.

ACx 600 Type	Enclosure	Degree of Protection <sup>5)</sup>	Space above		Space below		Space on left/right		Space in front/back	
			mm	in	mm	in	mm	in	mm	in
604 <sup>2)</sup>	frame R7	IP 22	300	12	300	12	50/50	2/2	20/0	0.8/0
604 <sup>3)</sup>	frames R8 and R9	IP 00	400	16	0	0	0/50	0/2	100/0	4/0
607	Drives-MNS cabinet	IP 21 <sup>4)</sup> /22 IP 42/54	200	8	0	0	0	0	200/0	8/0

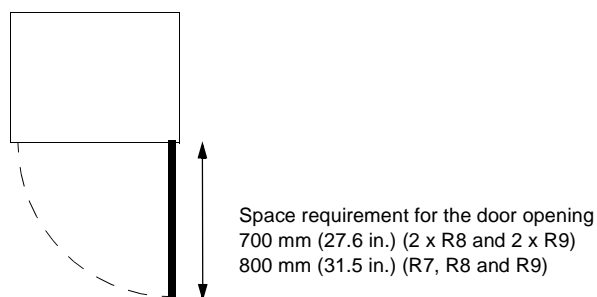
1) ACx 604-0100-3, -0120-3, -0120-5, -0140-5, -0100-6, -0120-6

2) ACx 604-0140-3 to -0320-3 & -0170-5 to -0400-5, -0140-6 to -0400-6

3) not for frame sizes 2xR8 and 2xR9

4) The degrees of protection is specified by listing the IEC standard IP (Ingress Protection) number. The first digit of the IP number specifies the protection against solid objects and dirt. The second digit specifies the protection against liquids. IP 00 is an open chassis. NEMA 1 enclosures are comparable to approximately IP 20 to IP 33. NEMA 3R enclosures are comparable to IP 32. NEMA 12 and NEMA 13 enclosures are comparable to IP 54 to IP 65. NEMA 4 enclosures are comparable to IP 65 or IP 66.

	First digit of IP number (protection against solid objects)	Second digit of IP number (protection against liquids)
0	Not protected	Not protected
1	Protected against solid objects larger than 50 mm (2 in.) dia.	Protected against dripping water
2	Protected against solid objects larger than 12 mm (1/2 in.) dia.	Protected against downward sprays of water up to 15 degrees from vertical.
3	Protected against solid objects larger than 2.5 mm (0.1 in.) dia.	Protected against downward sprays of water up to 60 degrees from vertical.
4	Protected against solid objects larger than 1.0 mm (0.04 in.) dia.	Protected against light sprays or splashing water from all directions - water shall not enter the enclosure in harmful quantities.
5	Dust protected - dust shall not enter the enclosure in sufficient quantity to interfere with satisfactory operation of equipment.	Protected against low pressure sprays of water from all directions - water shall not enter the enclosure in harmful quantities.
6	Dust tight	Protected against heavy seas on shipdecks or strong sprays of water from all directions - water shall not enter the enclosure in harmful quantities.





**Cooling Air Flow Requirements**

Cooling air flow requirements are given below.

<b>ACx 60x</b> 60x = 604/607	<b>Flow</b> <b>m<sup>3</sup>/h</b>	<b>h<sup>3</sup>/m</b>
ACx 60x-0100-3/0120-5/0100-6	660	390
ACx 60x-0120-3/0140-5/0120-6	660	390
ACx 60x-0140-3/0170-5/0140-6/0170-6	1640	1000
ACx 60x-0170-3/0210-5/0210-6	1640	1000
ACx 60x-0210-3/0260-5/0260-6	1640	1000
ACx 60x-0260-3/0320-5/0320-6	1840	1100
ACx 60x-0320-3/0400-5/0400-6	1840	1100
ACx 607-0400-3/0490-5/0490-6	3580	2100
ACx 607-0490-3/0610-5/0610-6	3980	2300
ACx 607-0610-3/0760-5/0760-6	3980	2300

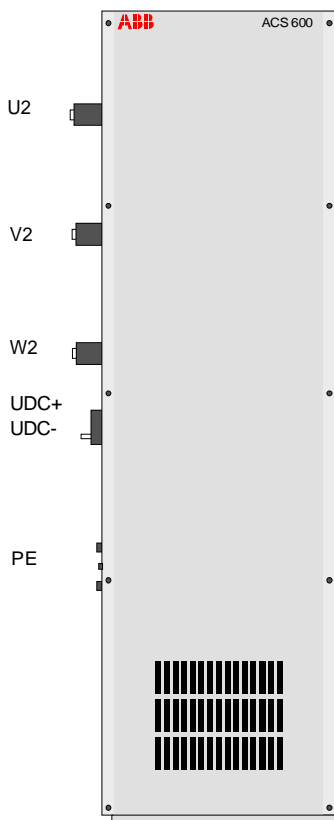
**Heat Dissipation Requirements**

ACx 607 drives are self-cooled. The table below gives the heat dissipated into the hot air exhausted from the drives. If the drives are installed in a confined space, the heat must be removed from the area by ventilation or air conditioning equipment.

<b>ACx 607 Type</b>	<b>Heat Dissipation</b>	
	<b>Watts</b>	<b>BTU/Hr</b>
<b>ACx 607-0100</b>	3000	10200
<b>ACx 607-0120</b>	3600	12300
<b>ACx 607-0140</b>	4200	14300
<b>ACx 607-0170</b>	5100	17400
<b>ACx 607-0210</b>	6300	21500
<b>ACx 607-0260</b>	7800	26600
<b>ACx 607-0320</b>	9600	32800
<b>ACx 607-0400</b>	12000	40900
<b>ACx 607-0490</b>	14700	50200
<b>ACx 607-0610</b>	18300	62400
<b>ACx607-0760</b>	22800	77800

**Dimensions and Weights (ACx 604)**

Dimensions and weights of the ACx 604s are given below.



ACS 604 Type			Height mm (in)	Width mm (in)	Depth mm (in)	Weight kg (lbs)
0100-3	0120-5	0100-6	860 (33.86)	480 (18.89)	428 (16.85)	88 (194)
0120-3	0140-5	0120-6	860 (33.86)	480 (18.89)	428 (16.85)	88 (194)
0140-3	0170-5	0140-6/ 0170-6	1250 (49.2)	462*/524 (18.19/20.63)	407 (16)	135 (297)
0170-3	0210-5	0210-6	1250 (49.2)	462*/524 (18.19/20.63)	407 (16)	140 (308)
0210-3	0260-5	0260-6	1250 (49.2)	462*/524 (18.19/20.63)	407 (16)	140 (308)
0260-3			1600 (63)	462*/524 (18.19/20.63)	407 (16)	166 (365)
0320-3			1600 (63)	462*/524 (18.19/20.63)	407 (16)	166 (365)
	0320-5	0320-6	1600 (63)	462*/524 (18.19/20.63)	407 (16)	171 (376)
	0400-5	0400-6	1600 (63)	462*/524 (18.19/20.63)	407 (16)	171 (376)
0400-3	0490-5	0490-6	2 x Dimensions of ACx 604-0210-3			
0490-3	0610-5	0610-6	2 x Dimensions of ACx 604-0260-3			
0610-3	0760-5	0760-6	2 x Dimensions of ACx 604-0320-3			

Width marked with \* does not include motor cable terminals, Ground PE terminal or DC bus terminals.

## ACS 607 Enclosure Size and Style

The ACS 607 enclosure size and style is determined by the following product and option selection items as indicated by the Type Code. The ACS 600 Type Codes are explained in detail in Chapter 2.

Product and Option Selection Item	Type Code Character No.
Power Rating	7 - 10
Voltage Rating	11
Enclosure degree of protection (IP No.)	17
EMC (RFI) Filters	20
Braking chopper and cabling direction	21

The dimension and weight table on the following page lists power and voltage rating type codes and provides dimensions for each listing. The Height column contains two sets of figures, one for the IP 21 / IP 22 / IP 42 version and one for the IP 54 version. Several columns are provided to show the enclosure widths for the various combinations of EMC filter and braking options. The letters A), B) etc. included in the width columns indicate the applicable dimension drawings in Appendix B as listed in the table notes below.

### Notes for the ACS 607 Dimension Table

#### Notes:

- 1) Height of the IP 21 / IP 22 / IP 42 version.  
Height including IEC cable glands for top entry/exit is 2132 (83.9 in).
- 2) Height of the IP 54 version.
- 3) Weight of the IP 21 / IP 22 / IP 42 version
- 4) Weight of the 690 V unit with dv/dt filter

#### Applicable Dimension

#### Drawings in Appendix B:

- A) 3AFE 61417184
- B) 3AFE 61417206
- C) 3AFE 61417214
- D) 3AFE 61477390
- E) 3AFE 61417222
- F) 3AFE 61477381
- G) Refer to factory

### Dimensions and Weights (ACx 607)

ACS 607 Type Code			Frame Size	Height <sup>1)</sup> mm (in)	Width mm (in) with:						Depth mm (in)	Weight <sup>3)</sup> kg (lbs)
					No EMC Filter or Braking	EMC Filter	Braking Chopper	Braking Chopper and Resistors	EMC Filter and Braking Chopper	EMC Filter, Braking Chopper & Resistors		
0100-3	0120-5	0100-6	R7	2078 <sup>1)</sup> /2316 <sup>2)</sup> (81.8)/(91.2)	830 <sup>A)</sup> (32.7)	830 <sup>A)</sup> (32.7)	830 <sup>A)</sup> (32.7)	1230 <sup>C)</sup> (48.4)	830 <sup>A)</sup> (32.7)	1630 <sup>D)</sup> (64.2)	644 (25.35)	275/300 <sup>4)</sup> (605)/(660)
0120-3	0140-5	0120-6	R7	2078 <sup>1)</sup> /2316 <sup>2)</sup> (81.8)/(91.2)	830 <sup>A)</sup> (32.7)	830 <sup>A)</sup> (32.7)	830 <sup>A)</sup> (32.7)	1230 <sup>C)</sup> (48.4)	830 <sup>A)</sup> (32.7)	1630 <sup>D)</sup> (64.2)	644 (25.35)	275/300 <sup>4)</sup> (605)/(660)
0140-3	0170-5	0140-6 0170-6	R8	2078 <sup>1)</sup> /2316 <sup>2)</sup> (81.8)/(91.2)	830 <sup>A)</sup> (32.7)	1230 <sup>B)</sup> (48.4)	1230 <sup>C)</sup> (48.4)	1230 <sup>C)</sup> (48.4)	1630 <sup>D)</sup> (64.2)	1630 <sup>D)</sup> (64.2)	644 (25.35)	340/390 <sup>4)</sup> (748)/(858)
0170-3			R8	2078 <sup>1)</sup> /2316 <sup>2)</sup> (81.8)/(91.2)	8830 <sup>A)</sup> (32.7)	1230 <sup>B)</sup> (48.4)	1230 <sup>C)</sup> (48.4)	1530 <sup>E)</sup> (60.2)	1630 <sup>D)</sup> (64.2)	1930 <sup>F)</sup> (76)	644 (25.35)	345/390 <sup>4)</sup> (749)/(858)
	0210-5	0210-6	R8	2078 <sup>1)</sup> /2316 <sup>2)</sup> (81.8)/(91.2)	8830 <sup>A)</sup> (32.7)	1230 <sup>B)</sup> (48.4)	1230 <sup>C)</sup> (48.4)	1230 <sup>C)</sup> (48.4)	1630 <sup>D)</sup> (64.2)	1630 <sup>D)</sup> (64.2)	644 (25.35)	345/390 <sup>4)</sup> (749)/(858)
0210-3	0260-5	0260-6	R8	2078 <sup>1)</sup> /2316 <sup>2)</sup> (81.8)/(91.2)	830 <sup>A)</sup> (32.7)	1230 <sup>B)</sup> (48.4)	1230 <sup>C)</sup> (48.4)	1530 <sup>E)</sup> (60.2)	1630 <sup>D)</sup> (64.2)	1930 <sup>F)</sup> (76)	644 (25.35)	345/390 <sup>4)</sup> (749)/(858)
0260-3			R9	2078 <sup>1)</sup> /2316 <sup>2)</sup> (81.8)/(91.2)	830 <sup>A)</sup> (32.7)	1230 <sup>B)</sup> (48.4)	1230 <sup>C)</sup> (48.4)	1530 <sup>E)</sup> (60.2)	1630 <sup>D)</sup> (64.2)	1930 <sup>F)</sup> (76)	644 (25.35)	370 (814)
0320-3			R9	2078 <sup>1)</sup> /2316 <sup>2)</sup> (81.8)/(91.2)	830 <sup>A)</sup> (32.7)	1230 <sup>B)</sup> (48.4)	1230 <sup>C)</sup> (48.4)	1530 <sup>E)</sup> (60.2)	1630 <sup>D)</sup> (64.2)	1930 <sup>F)</sup> (76)	644 (25.35)	370 (814)
	0320-5	0320-6	R9	2078 <sup>1)</sup> /2316 <sup>2)</sup> (81.8)/(91.2)	830 <sup>A)</sup> (32.7)	1230 <sup>B)</sup> (48.4)	1230 <sup>C)</sup> (48.4)	1530 <sup>E)</sup> (60.2)	1630 <sup>D)</sup> (64.2)	1930 <sup>F)</sup> (76)	644 (25.35)	375/435 <sup>4)</sup> (825)/(957)
	0400-5	0400-6	R9	2078 <sup>1)</sup> /2316 <sup>2)</sup> (81.8)/(91.2)	830 <sup>A)</sup> (32.7)	1230 <sup>B)</sup> (48.4)	1230 <sup>C)</sup> (48.4)	1530 <sup>E)</sup> (60.2)	1630 <sup>D)</sup> (64.2)	1930 <sup>F)</sup> (76)	644 (25.35)	375/435 <sup>4)</sup> (825)/(957)
0400-3	0490-5	0490-6	2xR8	2065/2215 (81.3)/(87.2)	2130 <sup>G)</sup> (83.9)	G)	2930 <sup>G)</sup> (115.4)	G)	G)	G)	644 (25.35)	710 (1562)
0490-3	0610-5	0610-6	2xR9	2065/2215 (81.3)/(87.2)	2130 <sup>G)</sup> (83.9)	G)	2930 <sup>G)</sup> (115.4)	G)	G)	G)	644 (25.35)	870 (1914)
0610-3	0760-5	0760-6	2xR9	2065/2215 (81.3)/(87.2)	2130 <sup>G)</sup> (83.9)	G)	2930 <sup>G)</sup> (115.4)	G)	G)	G)	644 (25.35)	870 (1914)

Table notes are on the previous page

**Application Programs** Various application programs are available for the ACS 600 drives. Not all selections are available for all types. One application program at a time can be loaded in the memory of the drive.

ACS 600 Application Programs
Standard
Pump and Fan Control (PFC)
Master/Follower (M/F)
CraneDrive
MotionControl
Spinning Control
System

**Application Macros** The macros of the application programs are introduced below.

Standard	CraneDrive	MotionControl
FACTORY for basic industrial applications	CRANE for normal crane drive	SPEED CONTROL for closed loop speed control
HAND/AUTO for local and remote operation	M/F CTRL for two crane drive applications with Master/Follower operation	POSITIONING for point-to-point positioning
PID CONTROL for closed loop processes	USER MACRO 1 & 2 for user's own customized parameter settings	SYNCHRONIZING for positioning to moving target
TORQUE CONTROL for processes that require torque control		TORQUE CONTROL for processes that require torque control
SEQUENTIAL CONTROL for operation at preset constant speeds		USER MACRO 1 & 2 for user's own customized parameter settings
USER MACRO 1 & 2 for user's own customized parameter settings		
<b>Pump and Fan Control</b>		
HAND/AUTO for local and remote operation		
PFC CONTROL for pump and fan station control		
<b>Master/Follower</b>		
MASTER/FOLLOWER for drives which are coupled to each other + macros included in Standard Application program		
<b>Spinning Control</b>		
SPINNING CONTROL for running motor rotating bobbins in ring frame machines		

**Macro/Language Combinations** Languages and application macros included in each ACx 600 application program are shown below. Not all selections are available for all types.

Applic. Program	Type code character no. 15	Application Macros	Languages
Standard	B*	Factory, Hand/Auto, PID Control, Torque Control, Sequential Control	English (UK & Am), French, Spanish, Portuguese
	C	Factory, Hand/Auto, PID Control, Torque Control, Sequential Control	English (UK & Am), German, Italian, Dutch
	D	Factory, Hand/Auto, PID Control, Torque Control, Sequential Control	English (UK & Am), Danish, Swedish, Finnish
	E	Factory, Hand/Auto, PID Control, Torque Control, Sequential Control	English (UK & Am), French, Spanish, Portuguese
Pump and Fan Control	F	PFC (Pump and Fan Control)	English (UK & Am), German, Italian, Dutch
	G	Pump and Fan Control, Hand/Auto	English (UK & Am), Danish, Swedish, Finnish
	H	Pump and Fan Control, Hand/Auto	English (UK & Am), French, Spanish, Portuguese
Master/Follower	J	Master/Follower + Macros included in selection C	English (UK & Am), German, Italian, Dutch
	K	Master/Follower + Macros included in selection D	English (UK & Am), Danish, Swedish, Finnish
	L	Master/Follower + Macros included in selection E	English (UK & Am), French, Spanish, Portuguese
	M*	Master/Follower + Macros included in selection B	English (UK & Am), French, Spanish, Portuguese
System	N	System application (ACS 600 MultiDrive)	English
Motion Control	P	ACP 600: Torque Control, Speed Control, Positioning, Synchronising	English, German
	Q	ACP 600: Torque Control, Speed Control	English, German
Crane Drive	S	ACC 600	English
Spinning Control	V	Spinning control application program	English
Custom	T	Application program template (FCB Programmable)	English
	Y	Special application program	English

\*This selection is for the North American market. The default parameter settings in the standard application macros include minor changes to fulfil the local regulations, such as 3-wire start/stop.

**Protection Features** Application program dependent features of the ACx 600 are listed below. ● available as standard, ○ optional

Preprogrammed Faults	Programmable Fault Functions				Program. Supervision Functions									
	Standard PFC, M/F	CraneDrive	MotionControl	System	Standard PFC, M/F	CraneDrive	MotionControl	System						
ACx 600 temperature	●	●	●	●	Analog input below minimum value	●			Speed	2			2	
Overcurrent	●	●	●	●	Loss of Control Panel	●	●		●	Motor current	●			●
Short circuit	●	●	●	●	External fault	●	●	●	●	Motor torque	2			2
DC overvoltage	●	●	●	●	Motor overtemperature	●	●	●	●	Motor speed	●			●
Supply phase	●	●	●	●	Thermistor/Pt 100	●	●	●	●	Reference 1	●			
DC undervoltage	●	●	●	●	Motor stalled	●		●	●	Reference 2	●			
Overfrequency	●	●		●	Motor underload	●		●	●	Actual value 1	●			
Overspeed			●		Loss of motor phase	●	●	●	●	Speed threshold				●
Internal fault	●	●	●	●	Ground fault	●	●	●	●	Torque threshold				●
Internal fault on the I/O control board	●	●	●	●	Speed measurement			●		Position error				●
Ambient temperature	●	●	●	●	Motor overspeed		●			Position threshold				●
User Macro	●	●	●		Torque		●			Joystick		●		
Braking chopper (in fieldbus mode)		●			Torque proving		●			Brake long falling time		●		
Inverter overload		●			Brake		●							
No motor data	●				Communication test		●							
ID Run fail	●				Following error			●						
					Position limits			●						
					Maximum speed alteration			●						
					Speed difference			●						
					Communication error	○	○	●	○					
					Encoder interface module	○	○	●	○					

**Preprogrammed Warnings:** ACS 600 temperature, Motor Identification Run, Drive Identification Number change, User Macro, Target position (ACP), Positioning speed (ACP).

**Programmable Automatic Reset Functions** (ACS 600 Standard Application Program only): after overcurrent, overvoltage, undervoltage and analog input below minimum value

**Information Functions:** ACx 600 control software version, ACx 600 application software version, ACx 600 test date.

**Applicable Standards**

The ACS 600 complies with the following standards:

- EN 60204-1: 1992 + Corr. 1993 (IEC 204-1). Safety of machinery. Electrical equipment of machines. Part 1: General requirements. *Provisions for compliance:* The final assembler of the machine is responsible for installing
  - an emergency-stop device
  - a supply disconnecting device (ACx 601 and ACx 604)
  - the ACx 604 (IP 00) into a separate casing.
- EN 60529: 1991 (IEC 529), IEC 664-1: 1992. Degrees of protection provided by enclosures (IP code).
- EN 61800-3 (1996): EMC product standard including specific test methods.

**Materials**

Enclosure (ACx 601)	Thickness of Coating	Color
PS (polystyrene) 3 mm		NCS 1502-Y (RAL 90021 / PMS 420 C)
hot-dip zinc coated steel sheet 1.5 to 2 mm painted with epoxy polyester powder paint	60 µm	NCS 8502-Y (RAL 9004 / PMS 426 C) semigloss
anodised aluminium profile (R2 to R6)		black ES 900
<b>Enclosure (ACx 604/607)</b>		
hot-dip zinc coated steel sheet 1.5 to 2 mm with polyester thermosetting powder coating	60 µm	RAL 7035
<b>Package (ACx 604/607)</b>		
wood or plywood (seaworthy package). Plastic covering of the package: PE-LD, bands PP or steel.		

**Transportation Position**

ACx 604/607 Upright. ACx 604/607 units without dv/dt filters can be transported also on their back in their protective package.

**Disposal**

ACx 600 contains raw materials that should be recycled, thus preserving energy and natural resources. Package materials of ACx 600 units and options are environmentally compatible and recyclable. All metal parts can be recycled. The plastic parts can either be recycled or burned under controlled circumstances, according to local regulations. If recycling is not feasible, all parts excluding electrolytic capacitors can be landfilled. The DC capacitors of the unit contain electrolyte which is classified as hazardous waste. (Location of the electrolytic capacitors is shown on a sticker in the back of the front cover, C11 to C13.) They must be removed and handled according to local regulations.

For further information on environmental aspects, please contact your local ABB distributor.



## **CE Marking**

A CE mark is attached to ACx 601/607 drives to verify that the unit follows the provisions of the European Low Voltage and EMC Directives (Directive 73/23/EEC, as amended by 93/68/EEC and Directive 89/336/EEC, as amended by 93/68/EEC).

## **Compliance with the EMC Directive**

EMC stands for **E**lectromagnetic **C**ompatibility. It is the ability of electrical/electronic equipment to operate without problems within an electromagnetic environment. Likewise, the equipment must not disturb or interfere with any other product or system within its locality.

The EMC Directive defines the requirements for immunity and emissions of electrical equipment used in European Economic Area. The EMC product standard EN 61800-3 covers the requirements stated for drives.

The ACx 607 drives (55 kW to 630 kW) comply with the EMC Directive in industrial low-voltage network, public low-voltage network (restricted distribution) and IT networks (ungrounded power lines) with the following provisions:

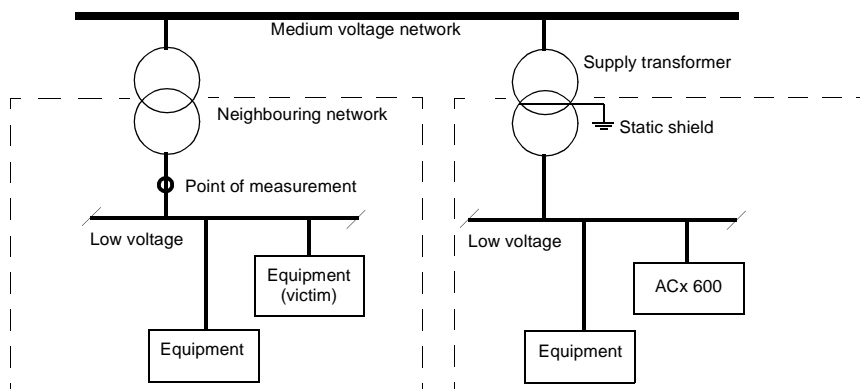
## **Industrial Low-Voltage Network**

1. It is ensured that no excessive emission is propagated to neighboring low-voltage networks. In some cases, the natural suppression in transformers and cables is sufficient. If in doubt, the ACx 600 can be equipped with EMC filtering (refer to Table A-1) or the supply transformer with static shielding between the primary and secondary windings can be used.
2. The ACx 607 is installed with motor and control cables as specified in this manual (for types ACS/ACC 607-0400-3, -0490-3/5/6, -0610-3/5/6 and -0760-5/6 with power cables as specified in *ACS 600 Power Extension Range Supplement*).

**Note:** It is recommended to equip the ACx 600 with the EMC filtering if there is equipment sensitive to conducted emission connected to the same supply transformer as the ACx 600.

Table A-1 The EMC filtering of the ACx 600 units is marked in the type code as follows. \* dv/dt Filters + EMC Filters, \*\* dv/dt Filters + No EMC Filters, \*\*\* EMC Cabinet with EMC Filters.

ACS 600 Type	Type Code		
	Character no.	EMC Filter Selections	No EMC Filter Selections
ACS/ACC/ACP 601	ACxxxxxxxxxxxxxxxxxxxxx ↑ 20	0	9
ACS/ACC/ACP 604	ACxxxxxxxxxxxxxxxxxxxxx ↑ 20	0	9
ACS/ACC/ACP 607 (55 to 630 kW)	ACxxxxxxxxxxxxxxxxxxxxx ↑ 20	0, 3*	5**, 9
ACS/ACC 607 (630 to 3000 kW)	ACxxxxxxxxxxxxxxxxxxxxx... ↑ 26	1, 2***	0,
ACS 600 MultiDrive Supply Section	ACA63xxxxxxxxxxxxx... ↑ 16	1, 2***	0
Drive Section	ACA610xxxxxxxxxxxxx... ↑ 16	1	0



Use of the ACx 600 in Second Environment without EMC filtering (EN 61800-3: second environment includes all establishments other than those directly connected to a low-voltage power supply network which supplies buildings used for domestic purposes.)

**Public Low-Voltage  
Network**

1. The ACx 600 is equipped with EMC filtering (refer to Table A-1).
2. The ACx 607 is installed with motor and control cables as specified in this manual (for types ACS/ACC 607-0400-3, -0490-3/5/6, -0610-3/5/6 and -0760-5/6 with power cables as specified in *ACS 600 Power Extension Range Supplement*).
3. Maximum cable length is 100 metres.

Without considering the EMC requirements, do not use the ACx 600 on a low voltage public network supplying domestic premises. This kind of use might cause radio frequency interference.

**Ungrounded Power Lines  
(IT Network)**

1. It is ensured that no excessive emission is propagated to neighboring low-voltage networks. In some cases, the natural suppression in transformers and cables is sufficient. If in doubt, the supply transformer with static shielding between the primary and secondary windings can be used.
2. The ACx 607 is installed with motor and control cables as specified in this manual (for types ACS/ACC 607-0400-3, -0490-3/5/6, -0610-3/5/6 and -0760-5/6 with power cables as specified in *ACS 600 Power Extension Range Supplement*).

**Note:** The ACx 600 must not be equipped with EMC filtering (refer to Table A-1) when installed to floating networks. The power line becomes connected to ground potential through the EMC filter capacitors. In floating networks this may cause danger or damage the unit.

**Machinery Directive**

ACx 601/604/607 drives comply with the European Union Machinery Directive (89/392/EEC) requirements for an equipment intended to be incorporated into machinery.

**UL/CSA Markings**

The UL/UL<sub>C</sub>/CSA markings of the ACS 600 drives are listed below (x).

ACx 600 Type	UL	UL <sub>C</sub>	CSA
ACS 601 (IP 22) 400 V, 500 V and 600 <sup>1)</sup> V ranges	x	x	x
ACs 601 (IP 54)	x	x	pending
ACS 604 frame sizes R7 to R9 400 V, 500 V and 600 <sup>1)</sup> V ranges	x	x	x
ACS 604 600 V parallel connected units	pending	pending	pending

<sup>1)</sup> the approval is valid up to 600 V

**UL** ACS 600 is suitable for use in a circuit capable of delivering not more than 65 kA rms symmetrical amperes at 480 V maximum (500 V units), and at 600 V maximum (690 V units).

ACS 600 provides overload protection in accordance with the National Electrical Code (US). See *ACS 600 Firmware Manual* for setting. Default setting is off, must be activated at start-up.

ACS 600 drives are to be used in a heated indoor controlled environment. See subsection *Ambient Conditions* for specific limits.

ACS 600 brake chopper - ABB has brake chopper modules that, when applied with appropriately sized braking resistors, will allow the drive to dissipate regenerative energy (normally associated with quickly decelerating a motor). Proper application of the brake chopper is defined in the Brake Chopper Installation Manual (NBRA-6xx; Braking Choppers Installation and Start Up Guide), Appendix A. These guide lines will allow you to size brake choppers to your specific application needs for standard or extended duty cycles. This can be applied to a single drive or multiple drives with DC Bus connected to allow a sharing of regenerative energy.

## **Equipment Warranty and Liability**

General: ABB warrants the Equipment supplied by ABB against defects in material and workmanship for a period of twelve (12) months after installation or twenty four (24) months from date of shipment from factory, whichever first occurs.

Should any failure to conform with the applicable warranties appear during the specified periods under normal and proper use and provided the Equipment has been properly stored, installed, operated and maintained, and if given prompt notice by Purchaser, ABB shall correct such nonconformity, at its option; by (1) repair or replacement of the nonconforming equipment or parts thereof. Repairs or replacements pursuant to warranty shall not renew or extend the applicable original equipment warranty period, provided however, that any such repairs or replacement of equipment or parts thereof shall be warranted for the time remaining of the original warranty period or 30 days, whichever is longer.

ABB shall not be responsible for providing working access to the defect, including disassembly and reassembly of equipment or for providing transportation to and from repair or factory facility, all of which shall be at Purchaser's risk and expense.

These warranties shall not apply to any Equipment or parts thereof which (1) have been improperly repaired or altered; (2) have been subjected to misuse, negligence or accident; (3) have been used in a manner contrary to ABB's instructions; (4) are comprised of materials provided or designed stipulated by Purchaser; or (5) are used equipment.

The foregoing warranties are exclusive and in lieu of all other warranties of quality and performance, written, oral or implied, and all other warranties including any implied warranties of merchantability or fitness for a particular purpose are hereby disclaimed by ABB and all equipment manufacturers.

Correction of nonconformities in the manner and for the period of time provided above shall be the Purchaser's exclusive remedy and shall constitute fulfillment of all liabilities of ABB and any Equipment manufacturer (including any liability for direct, indirect, special, incidental or consequential damages) whether in warranty, contract, negligence, tort, strict liability, or otherwise with respect to any nonconformance of or defect or deficiency in the equipment supplied or services furnished hereunder.

## **Limitation of Liability**

**IN NO EVENT SHALL ABB, ITS SUPPLIERS OR SUBCONTRACTORS BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, WHETHER IN CONTRACT, WARRANTY, TORT, NEGLIGENCE, STRICT LIABILITY OR OTHERWISE**, including, but not limited to loss of profits or revenue, loss of use of the Equipment or any associated equipment, cost of capital, cost of substitute equipment, facilities or services, downtime costs, delays, or claims of customers of the Purchaser or other third parties for such or other damages. ABB's liability on any claim whether in contract, warranty, negligence, tort, strict liability, or otherwise for any loss or damage arising out of, connected with, or resulting from the contract or the performance or breach thereof, or from the design, manufacture, sale, delivery, resale, repair, replacement, installation, technical direction of installation, inspection, operation or use of any equipment covered by or in connection therewith, shall in no case exceed the purchase price of the Equipment or part thereof or services which give rise to the Claim.

All clauses of action against ABB arising out of or relating to the contract or the performance or breach hereof shall expire unless brought within one year of the time of accrual thereof.

In no event, regardless of cause, shall ABB assume responsibility for or be liable for penalties or penalty clauses of any description or for indemnification of customer or others for costs, damages, or expenses each arising out of or related to the goods or services of the order.

## *Appendix A – ACS/ACC/ACP 604/607 Technical Data*

Your local distributor or ABB office may hold different guarantee details, which are specified in the sales terms, conditions, or guarantee terms. These terms are available on request.

If you have any questions concerning your ABB drive, please contact the local distributor or ABB office. The technical data, information and specifications are valid at the time of printing. The manufacturer reserves the right to modifications without prior notice.

## Appendix B – ACx 607 Dimensional Drawings

---

### **Drawings**

The following pages contain dimension drawings, cable connection drawings and an assembly drawing. The dimension drawings show the ACS 607 outline and mounting dimensions and various enclosure details. The cable connection drawings show the locations of the input power and motor connection terminals and the recommended arrangement for routing the cables as they enter the enclosure. The assembly drawing shows the location of the optional X2 or 2TB control terminal block and the locations of various option modules.

### **Dimension Drawings**

Refer to *ACS 607 Enclosure Size and Style* on page A-21 for information explaining how to determine the applicable drawings for a particular drive configuration.

The drawings show the location and dimensions of the IEC cable gland plates. NEMA style R7, R8 and R9 frame size drives have blank conduit plates installed over 8.9 x 12.6 inch rectangular openings at the top and bottom of the enclosures. NEMA style drives have 8 as the 20th character of the Type Code.

### **Connection Drawings**

The applicable connection drawings are determined by drive frame size and cabling direction. Drive frame sizes are listed in the table *Dimensions and Weights (ACx 607)* on page A-22. Cabling direction is determined by the 21st character of the ACS 607 Type Code. Refer to the table *ACx 604/607 Type Code* on page 1-2.

IEC units have cable gland plates installed in the top and/or bottom of the enclosure according to the cabling direction specified by the Type Code. NEMA style R7, R8 and R9 frame size units have blank conduit plates installed over 8.9 x 12.6 inch rectangular openings at the top and bottom regardless of the cabling direction specified.

Both IEC and NEMA style units have variations in terminal location and orientation according to the cabling direction specified.

It is generally feasible to change the cabling direction in the field or to install cabling in the direction opposite to the configured direction.

The following drawing package is effective from 10/5/1998.

*Appendix B – ACx 607 Dimensional Drawings*



## Appendix C – IEC Installation

### IEC Installations

This appendix is a supplement to Chapter C – Electrical Installation. It contains additional information to be used in IEC installations. For installations requiring CE compliance, refer also to the section entitled *CE Marking* in Appendix A.

### Power Cables

Symmetrical shielded motor cable must be used (figure below).

Four-conductor system is allowed for mains cabling, but shielded symmetrical cable is recommended. To operate as a protective conductor, the shield conductivity must be at least 50 % of the conductivity of the phase lead.

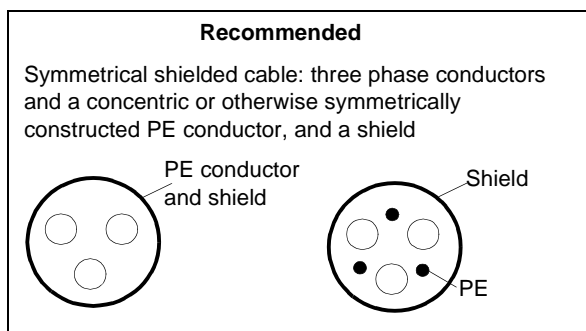
Compared to a four-conductor system, the use of symmetrical shielded cable reduces electromagnetic emission of the whole drive system as well as motor bearing currents and wear.

Compared to a four-conductor system, the use of symmetrical shielded cable reduces electromagnetic emission of the whole drive system as well as motor bearing currents and wear.

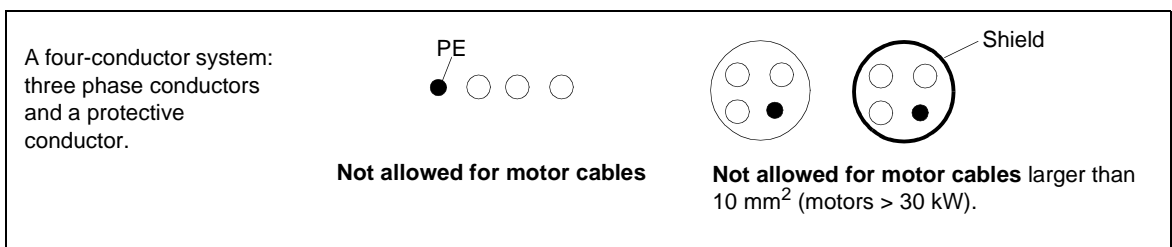
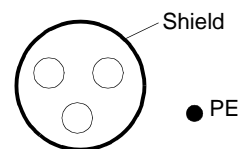
The motor cable and its PE pigtail should be kept as short as possible in order to reduce electromagnetic emission as well as capacitive current.

### Alternative Power Cable Types

Power cable types that can be used with ACx 600 are represented below.

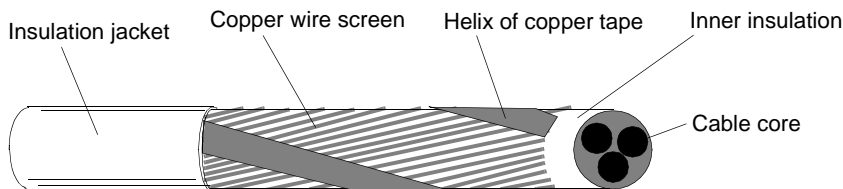


A separate PE conductor is required if the conductivity of the cable shield is < 50 % of the conductivity of the phase conductor.



**Motor Cable Shield**

To effectively suppress radiated and conducted radio-frequency emissions, the shield conductivity must be at least 1/10 of the phase conductor conductivity. One way of evaluating the effectiveness of the shield is the shield inductance, which must be low and only slightly dependent on the frequency. These requirements are easily met with a copper or aluminium shield/armour. The minimum requirement of the motor cable shield of the ACx 600 is shown below. It consists of a concentric layer of copper wires with an open helix of copper tape. The better and tighter the shield is, the lower is the emission level and the bearing currents.



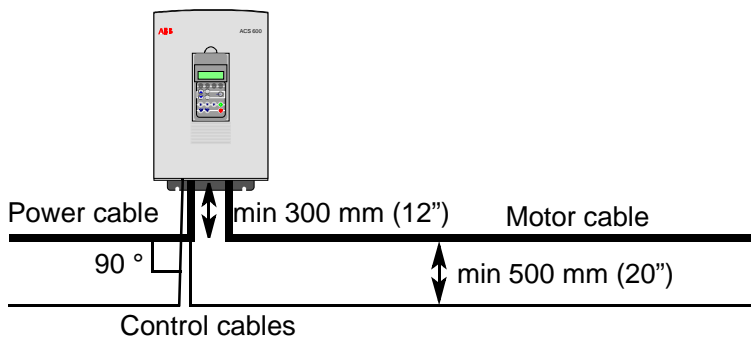
**Cable Routing**

The motor cable should be installed away from other cable routes. Motor cables of several frequency converters can be run in parallel installed next to each other. It is recommended that the motor cable, mains cable and control cables be installed on separate trays (minimum distance 500 mm). Long parallel runs of motor cable with other cables should be avoided in order to decrease electromagnetic interference caused by the rapid changes in the frequency converter output voltage.

Where control cables must cross power cables make sure they are arranged at an angle as near to 90 degrees as possible. Extra cables should not be run through the ACx 600.

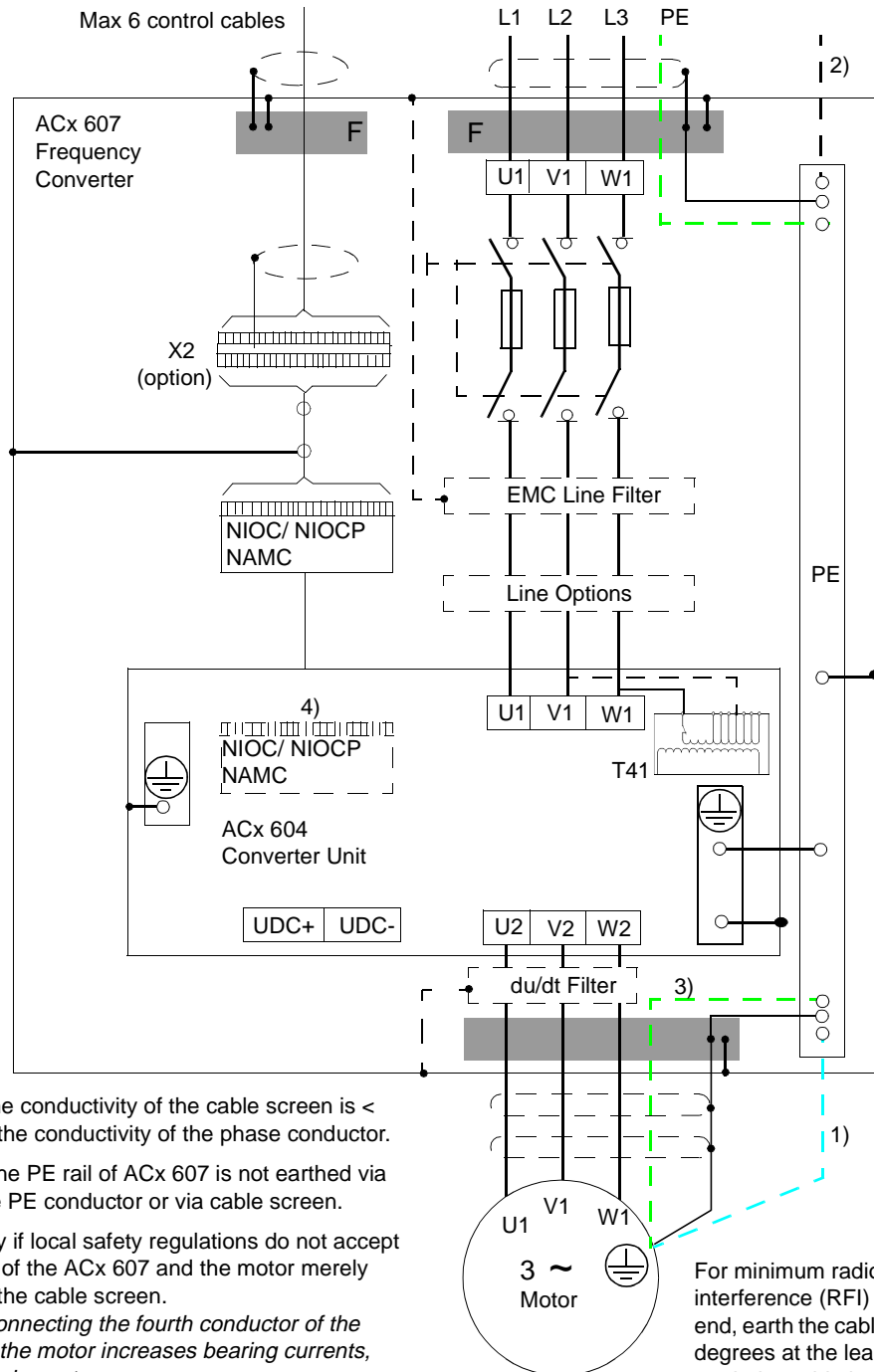
The cable trays shall have good electrical bonding to each other and to the earthing electrodes. Aluminium tray systems can be used to improve local equalizing of potential.

Below is a diagram of cable routing.



**Mains, Motor and Control Cable Connection**

A view of the recommended earthing, mains and motor cable connections of the ACx 607 is presented below. F denotes a 360 degrees earthing.



- 1) used if the conductivity of the cable screen is < 50 % of the conductivity of the phase conductor.
- 2) used if the PE rail of ACx 607 is not earthed via separate PE conductor or via cable screen.
- 3) used only if local safety regulations do not accept earthing of the ACx 607 and the motor merely through the cable screen.  
**Note:** Connecting the fourth conductor of the cable at the motor increases bearing currents, thus causing extra wear.
- 4) The NIOC/NIOCP board is located inside the module in ACx 604 deliveries.

For minimum radio frequency interference (RFI) at the motor end, earth the cable screen 360 degrees at the lead-through or earth the cable by twisting the screen (flattened width  $\geq 1/5 \cdot$  length).



---

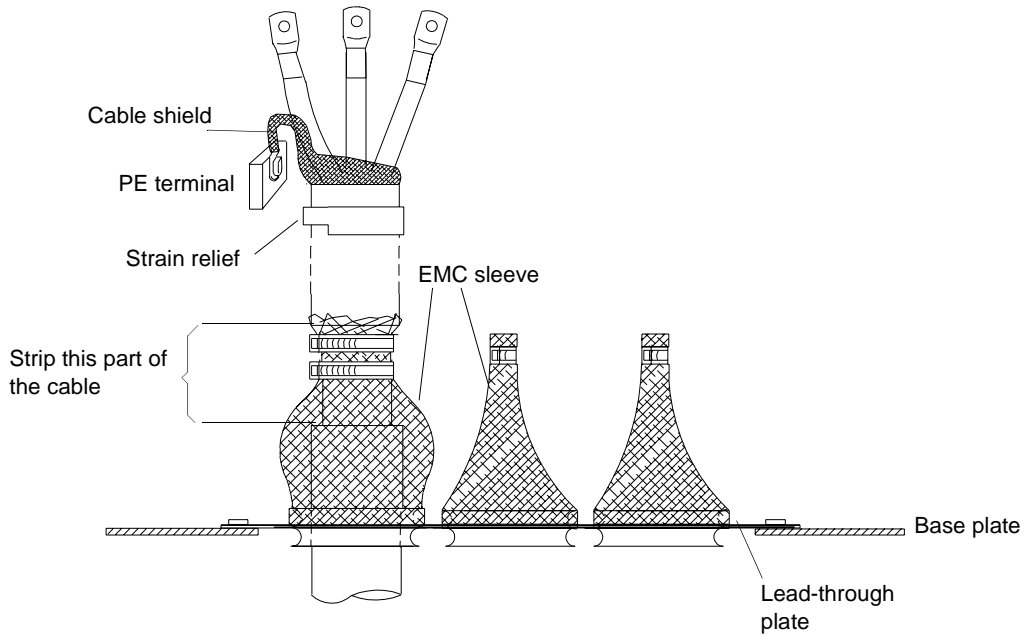
**WARNING!** This work should only be carried out by a qualified electrician. The *Safety Instructions* on the first pages of this manual must be followed. Negligence of these instructions can cause injury or death.

---

**ACx 607** The mains and motor cables connect to the ACx 607 in the left part of the cabinet. Mains, motor and control cable lead-through is from below or from above. To locate the terminals see the dimensional drawings (*Appendix B*). To connect the mains and motor cables to the ACx 607, carry out the following procedure.

1. **Make sure that the ACx 607 is disconnected from the mains network during installation. Wait for 5 minutes if the ACx 607 is already connected to the mains after disconnecting mains power.**
2. Open the cabinet door.
3. Open the hinged assembly plate to gain access to the mains and motor cable terminals.
4. **Measure the voltage between each input terminal (U1, V1, W1) and earth with a multimeter (impedance at least 1 M $\Omega$ ) to ensure that the frequency converter is discharged.**
5. Lead the cables inside the cabinet through the EMC sleeves.  
If cable entry is not possible otherwise, remove the lead-through plate and slide it onto the cable. After the earthing connections are done, fasten the lead-through plate. *IP 54 and cable entry from above:* Remove the rubber grommets from the lead-through plates and cut them to adequate diameter for the mains and the motor cable. To ensure proper sealing, cut along the diameter marking that corresponds to the cable diameter. Slide the grommet onto the cable.
6. Strip the cable according to figure below. (For IP 54 units, add a rubber grommet on the cable under the lead-through plate.)
7. Tighten the EMC sleeve on the bare cable screen with cable ties.
8. Twist the screen wires together to a pigtail and connect to the PE terminal of the cabinet.

*Earthing Connections*

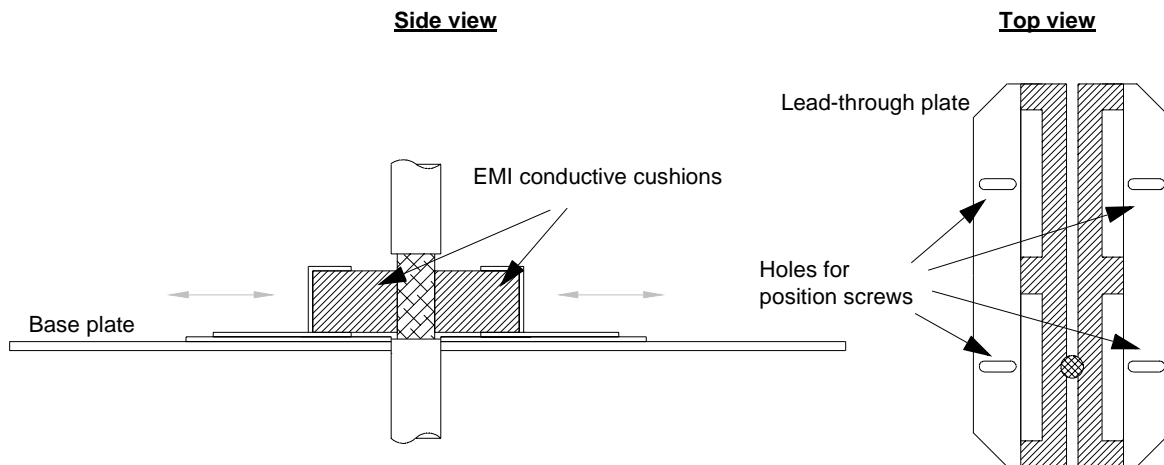


9. Earth the other end of the mains cable screen at the distribution board.
10. Earth the motor cable screen 360 degrees on the motor side.
11. Connect the additional PE conductors (if present) of the mains and motor cables to the PE terminal of the cabinet.
12. Connect the separate PE conductor (if used) to the PE terminal of the cabinet.
13. Connect the phase conductors of the mains cable to the U1, V1 and W1 terminals and the phase conductors of the motor cable to the U2, V2 and W2 terminals.
14. Check that the earthing is still OK.
15. Close the hinged assembly plate.

*Mains and Motor Cable Connections*

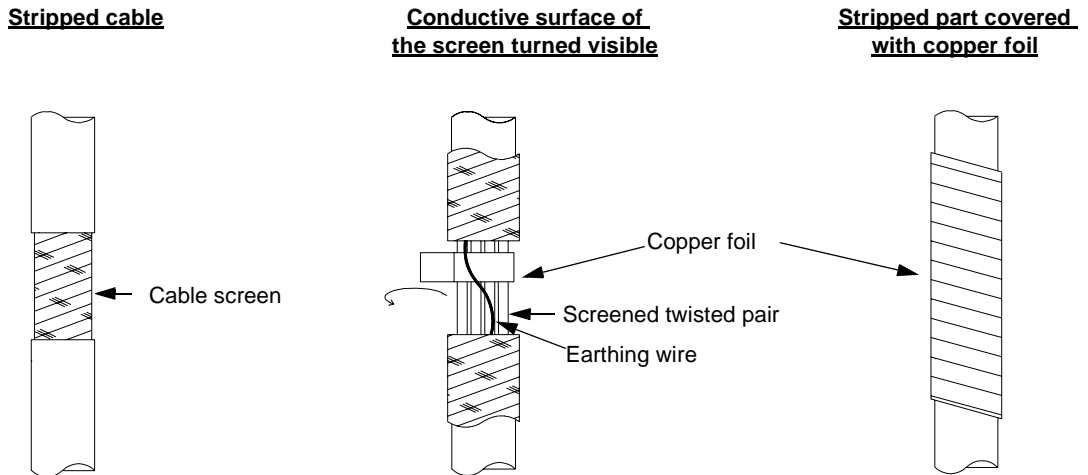
**Control Cable  
Connecting Procedure**

To connect the control cables for ACx 607 carry out the following procedure:



1. Loosen the *lead-through plate position screws*. Pull the two parts apart.
2. Lead the cable inside the cabinet through the *EMI conductive cushions*.
3. Strip off the cable plastic sheath above the *base plate* (only a distance wide enough to ensure proper connection of the bare screen and the *EMI conductive cushions*).
4. Earth the screen between the *EMI conductive cushions*:
  - a. If the outer surface of the screen is conductive:
    - Push the two parts of the *lead-through plate* together so that the *EMI conductive cushions* press tightly round the bare screen.

- b. If the outer surface of the screen is covered with non-conductive material (figure below)



- Cut the screen in the middle of the bare part. Be careful not to cut the conductors.
  - Turn the conductive surface of the screen visible.
  - Cover the turned screen and the stripped cable with copper foil to keep the shielding continuous. **Note:** The earthing wire (if present) must not be cut.
  - Push the two parts of the *lead-through plate* together such that the *EMI conductive cushions* press tightly round the screen.
5. Lock the two parts of the *lead-through plate* by tightening the *position screws*.
  6. Connect the control cables in appropriate terminal to NIOC/NIOCP board (or optional terminal block X2/2TB, or other options on the DIN rail). Refer to *Appendix A* and *Firmware Manual*. Tighten screw to secure connection. Connect the twisted screen (as short as possible) to the earthing rail  $\oplus$  of the terminal.
  7. Close the cabinet door if no other cables are to be connected.

### Components Connected to Digital/ Analogue Inputs



**WARNING!** IEC 664 requires double or reinforced insulation between live parts and the surface of accessible parts of electrical equipment which are either non-conductive or conductive but not connected to the ground (PE).

To fulfil this requirement, the connection of a thermistor (and other similar components) to the digital inputs of ACx 600 can be implemented in three alternate ways:

1. There is double or reinforced insulation between the thermistor and live parts of the motor.
  2. Circuits connected to all digital and analogue inputs of the ACx 600
    - are protected against contact, and
    - insulated with basic insulation (the same voltage level as the converter main circuit) from other low voltage circuits.
  3. An external thermistor relay is used. The insulation of the relay must be rated for the same voltage level as the converter main circuit.
-







---

ABB Industrial Systems, Inc.  
16250 West Glendale Drive  
New Berlin, WI 53151  
USA  
Telephone: 414 785-3200  
800 243-4384  
Fax: 414 785-8525

ACS607-5.0-US-04  
3AJA489002B4974 R0101 REV A  
EFFECTIVE: 10/1/98

SUPERSEDES: None