ACS 600

Supplement

This manual includes
- Safety
- Product Information
- Dimensional Drawings

ACS/ACC 624 Drive Modules 75 to 315 kW (75 to 350 HP)

ACS 600 SingleDrive Manuals (English Originals)

GENERAL MANUALS (appropriate hardware manual is included in the delivery)

ACS/ACC/ACP 601 Hardware Manual EN 61201360
2.2 to 110 kW
- Safety instructions
- Cable selection
- Mechanical and electrical installation
- Maintenance
- Technical data
- Dimensional drawings

ACS/ACC/ACP 611 Supplement EN 61504443
(included in ACx 611 deliveries only)
- Safety instructions
- Installation
- Maintenance
- Fault tracing
- Parameters
- Technical data
- Dimensional drawings

ACS/ACC/ACP 604/607/627 Hardware Manual
EN 61201394, 55 to 630 kW
- Safety instructions
- Cable selection
- Mechanical and electrical installation
- Maintenance
- Technical data
- Dimensional drawings

Converter Module Installation in User-defined Cabinet
EN 61264922 (included in modules deliveries only)
- Safety instructions
- Cabinet design
- Wiring
- Installation checks
- Dimensional drawings

ACS/ACC 624 Drive Modules Supplement EN 64186477
(included in ACx 624 module deliveries only)
- Safety instructions
- Technical data
- Dimensional drawings

FIRMWARE MANUALS FOR DRIVE APPLICATION PROGRAMS (appropriate manual is included in the delivery)

Standard EN 61201441
- Control Panel use
- Standard application macros with external control connection diagrams
- Parameters of the Standard Application Program
- Fault tracing
- Fieldbus control

Note: a separate Start-up Guide is attached

Motion Control EN 61320130
- Control Panel use
- Start-up
- Operation
- Parameters
- Fault tracing
- Fieldbus control

Crane Drive EN 3BSE 011179
- Commissioning of the Crane Drive Application Program
- Control Panel use
- Crane program description
- Parameters of the Crane Drive Application Program
- Fault tracing

System EN 63700177
- Commissioning of the System Application Program
- Control Panel use
- Software description
- Parameters of the System Application Program
- Fault tracing
- Terms

Application Program Template EN 63700185
- Commissioning of the Drive Section
- Control Panel use
- Software description
- Parameters
- Fault tracing
- Terms

OPTION MANUALS (delivered with optional equipment)

Fieldbus Adapters, I/O Extension Modules, Braking Choppers etc.
- Installation
- Programming
- Fault tracing
- Technical data

ACS/ACC 624 Drive Modules
75 to 315 kW
(75 to 350 HP)

Supplement

This manual is a supplement to *ACS/ACC/ACP 604/607/627 Hardware Manual* and *Converter Module Installation in User-defined Cabinet*. This supplement concerns ACS 624 and ACC 624 drive modules. In the text, they are collectively referred to as ACx 624.

3BFE 64186477 R0125 REV B
EN
EFFECTIVE: 31.3.2000
SUPERSEDES: 30.12.1999

Appendix B: 30.12.1999

Safety Instructions

Overview

The safety instructions given in the manuals delivered with the drive module (see inside of the front cover) must be followed when installing, operating and servicing the ACx 624. If neglected, physical injury and death may follow, or damage may occur to the frequency converter, the motor and driven equipment. The instructions given for ACx 604 converter modules also apply to ACx 624 modules.

Table of Contents

Appendix B – ACx 624 Dimensional Drawings

Chapter 1 – Introduction

Overview of the Manual

Study this supplement carefully before installing, commissioning, operating or servicing the ACx 624. We expect that you have a basic knowledge of physical and electrical fundamentals, electrical wiring practices, electrical components and electrical schematic symbols.

The ACx 624 is a 12-pulse drive module. This supplement covers:

- System, hardware and control descriptions of the ACx 624. The descriptions provide information needed to assemble the ACx 624 in an user-defined cabinet.
- Data giving information concerning the ratings, fuses, cooling requirements, power losses etc.

Control Panel Use

The use of the Control Panel is described in detail in *ACS 600 Firmware Manual* (for Standard, Crane Drive or System Application Program).

Supply Check List

The following items are delivered from ABB Helsinki factory:

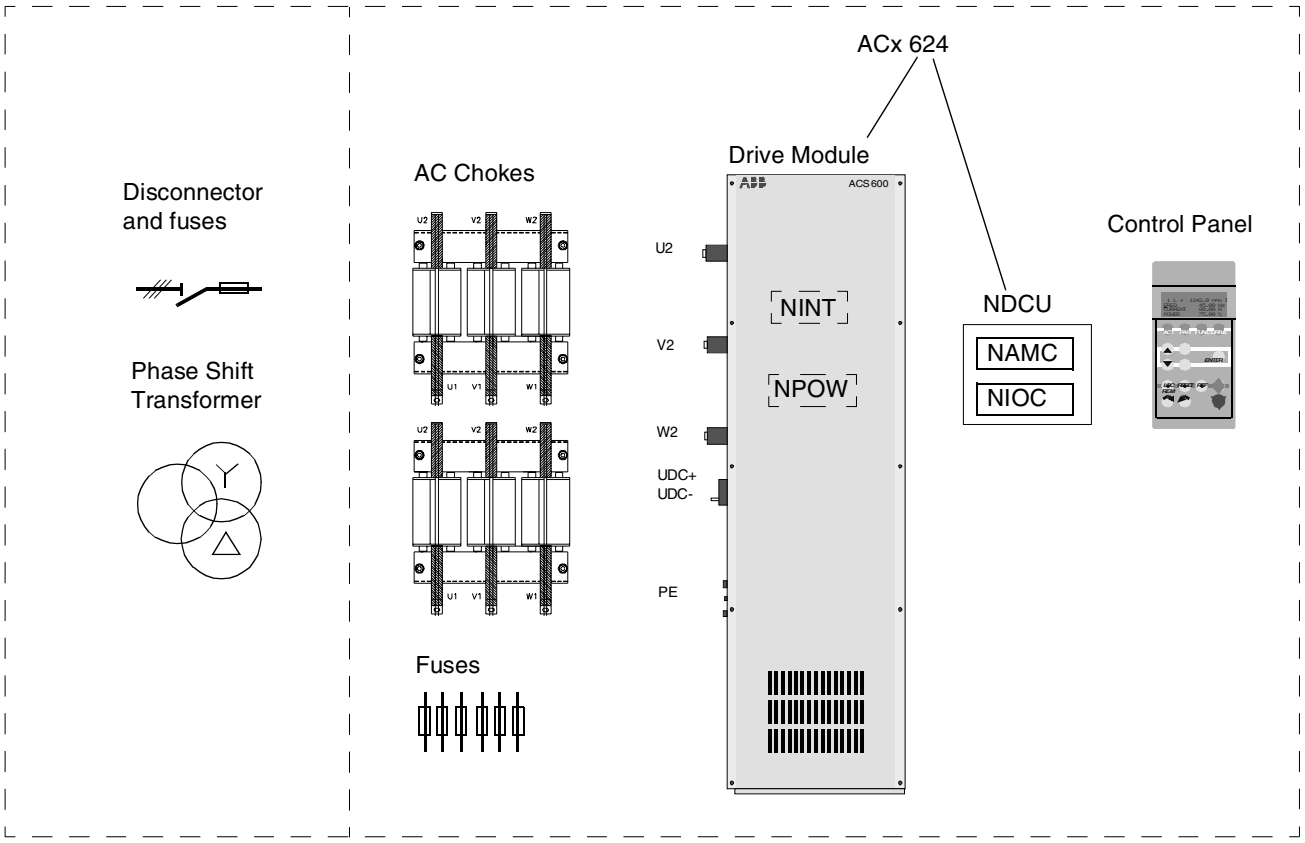
- ACx 624 drive module
- NDCU Drive Control Unit
- A pair of fibre optic cables
- CDP 312 Control Panel Mounting Platform kit (optional) or CDP 312 Control Panel (optional) and a 3 m cable (optional)
- A pair of AC chokes (optional)
- Earth fault protection kit (optional)
- Circuit diagrams
- Manuals (see the inside of the front cover)

The Main Components of Drive

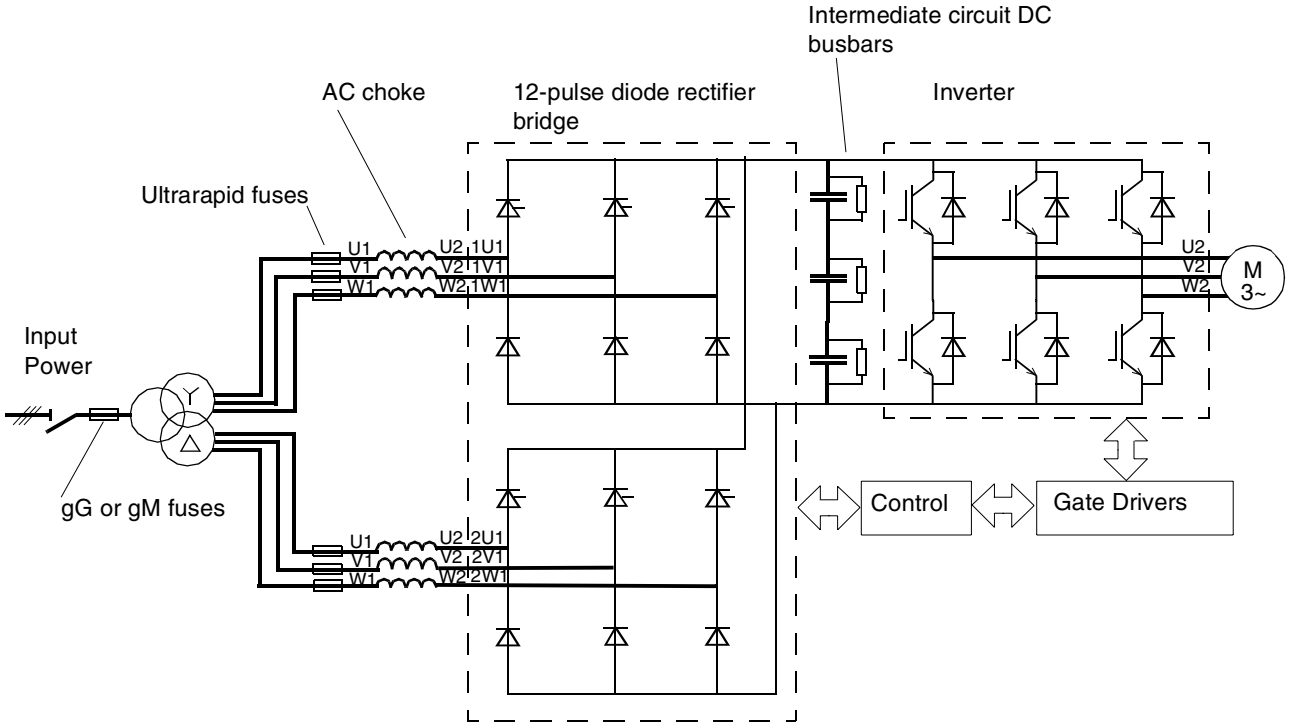
The main components of an AC drive equipped with the ACx 624 are shown below. Optional AC chokes are available from ABB. The control boards of the Drive Control Unit (NDCU) are connected to the Main Circuit Interface Board (NINT) and supplied from the Power Supply Board (NPOW) both inside the drive module.

Application and Motor Control Board = NAMC

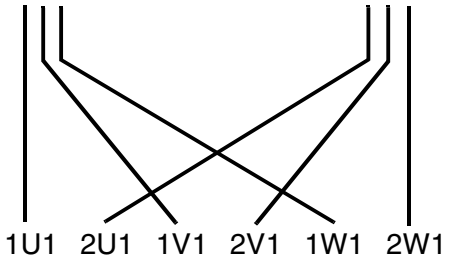
I/O Control Board = NIOC



Main Circuit Diagram The main circuit diagram of the ACx 624 drive system is shown below. The ACx 624 consists of 12-pulse diode rectifier bridge and an inverter of six insulated gate bipolar transistors with free wheeling diodes. In a 12-pulse rectifier the input voltage of the second 6-pulse rectifier is displaced by 30 degrees from the input voltage of the first 6-pulse rectifier by the supplying transformer. This causes certain harmonics opposite in phase and magnitude to cancel each other out and remarkably decreases the harmonics feed back to the supply network. When to use AC chokes is described in *Chapter 2*. For control board connections refer to circuit diagrams delivered with the unit.



Note: The actual connection order of the input cables to the module terminals is shown below.



Optional Earth Fault Protection

This chapter contains the descriptions of the optional earth fault protection solutions in floating network available for the ACS 624:

- overvoltage relay

  or

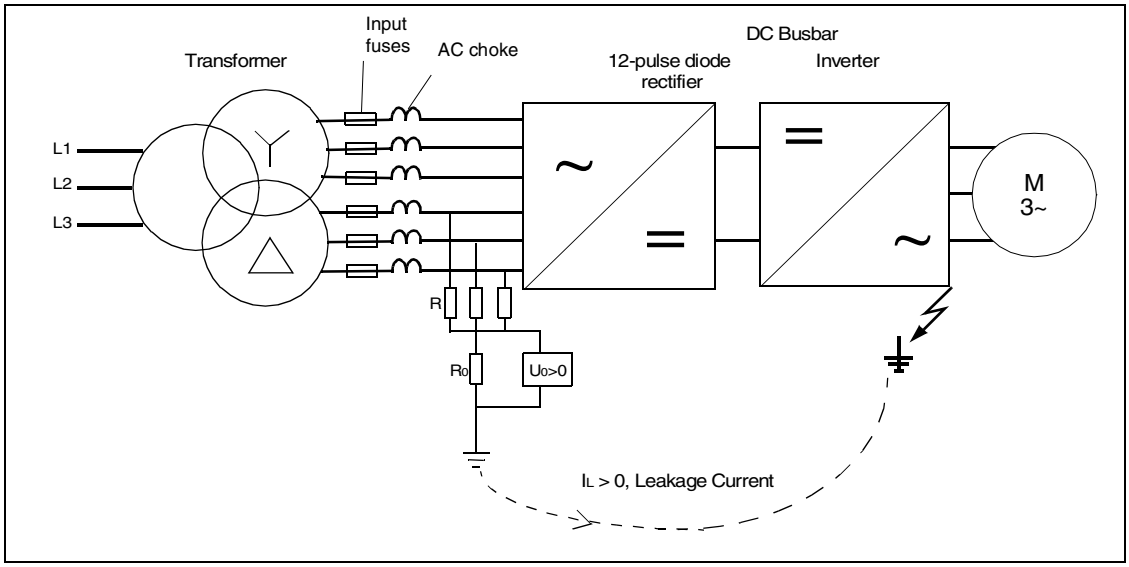
- insulation monitoring device.

Note: With other commercial Earth Fault Protection solutions, see the manufacturers description.

Overvoltage Relay

Diagram

A diagram of earth fault protection implemented with an overvoltage relay is shown below.



Description

Earth fault supervision is implemented by means of an artificial neutral point achieved with three resistors, R, connected to the 3-phase system at one end and connected together at the other end.

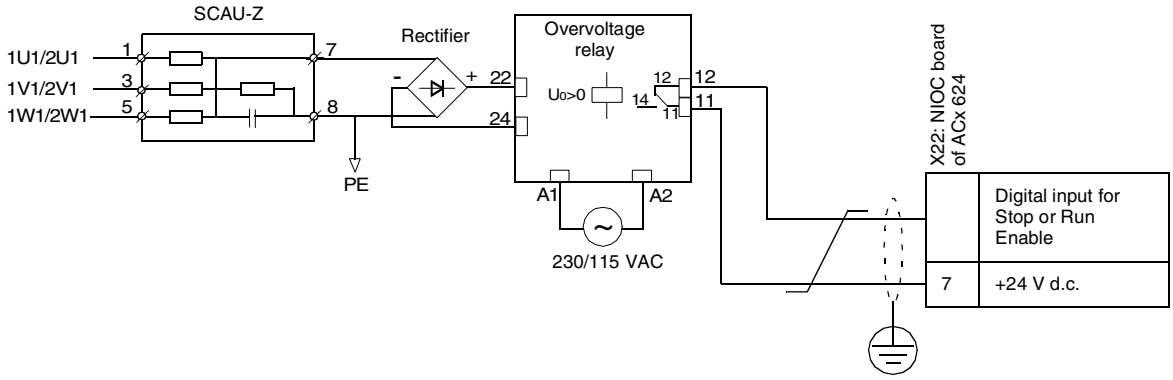
An overvoltage relay is used to detect an earth current through a resistance R_0 that is connected between the artificial neutral point and earth.

In Case of an Earth Fault

In case of an earth fault a LED on the overvoltage relay illuminates. If the overvoltage relay is wired to control the main contactor or air circuit breaker open, it is recommended to stop the ACx 624 as well with motor coasting to stop. A stop signal can be connected to the ACx 624 e.g. via a digital input. For configuring the digital inputs see *ACS 600 Firmware Manual*.

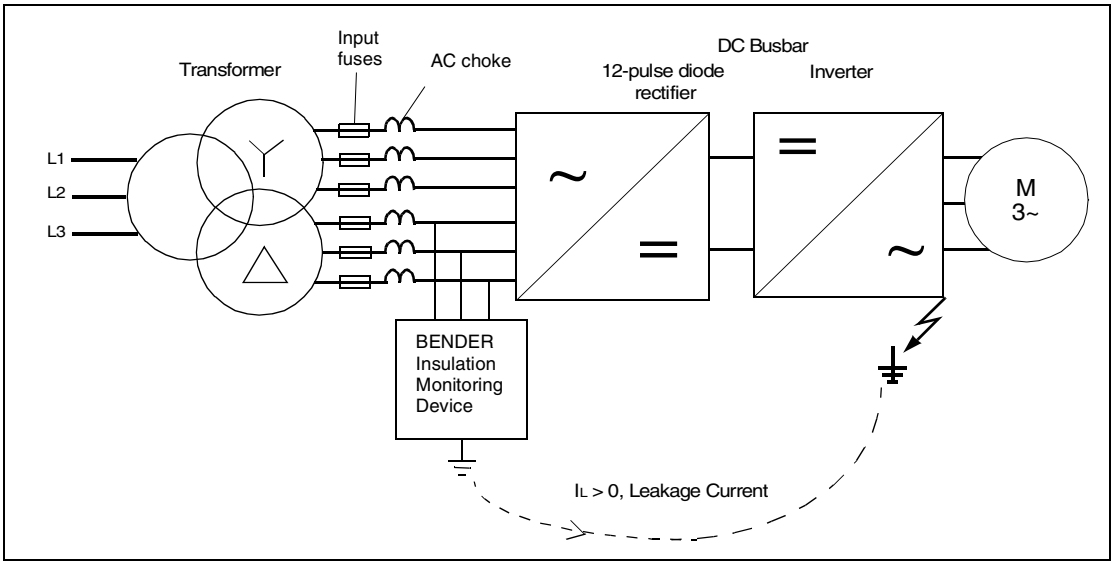
Connection Example A connection example of an overvoltage relay to the ACx 624 is shown below.

WARNING! The digital inputs of the ACx 624 are configurable by parameters. Ensure that the digital input for Stop or Run Enable is not double-selected for any other signal (e.g. constant speed).



Insulation Monitoring Device The details show instructions for use of the Bender insulation monitoring device. Use Bender software version 2.6-4 (or more recent). Follow the manufacturers instructions with other suppliers.

Diagram A diagram of earth fault protection implemented with an insulation monitoring device is shown below.



Description

The monitoring device is connected between the unearthed system and the equipotential bonding conductor (PE).

A pulsating AC measuring voltage is superimposed on the system (measuring principle *Adaptive Measuring Pulse, AMP* is developed by BENDER, patent pending). The measuring pulse consists of positive and negative pulses of the same amplitude. The period depends on the respective leakage capacitances and the insulation resistance of the system to be monitored.

The setting of the response values and other parameters can be carried out via the function keys. The parameters are indicated on the display and they are stored in a non-volatile memory after setting.

With Bender's insulation monitoring device it is possible to set up two response values: ALARM1 and ALARM2. Both values have an own alarm LED, which illuminates if reading is below these selected response values.

In Case of an Earth Fault

An earth fault closes the measuring circuit. An electronic evaluation circuit calculates the insulation resistance which is indicated on a Liquid Crystal Display or an external ohmmeter after the response time.

The alarm actions depend on the electric connection: for example ALARM1 may only give a warning and ALARM2 may trip the device.

Further Information

Further information about the insulation monitoring device is available in *IRDH265 Operating Manual (code TGH1249)* published by the manufacturer, BENDER companies.

Tuning the Earth Fault Protection

This section describes the tuning of the earth fault protection options for the ACx 624 assembled in an user-defined cabinet. The tuning will be done after the installation and commissioning of the drive are completed.

WARNING! This section includes instructions for checking/measuring circuits under voltage. Only a qualified person is allowed to do the work. Appropriate and approved meter must be used. The *Safety Instructions* on the first pages of the *ACS/ACC/ACP 604/607/627 Hardware Manual* must be followed. Negligence of the safety instructions can cause injury or death.

IF IN DOUBT, DO NOT PROCEED!

	Action	Information
	FLOATING NETWORK (IT NETWORK)	
1.	Earth Fault Protection Based on an Overvoltage Relay	
☐	The earth fault protection overvoltage relay can be tuned as follows. • Adjust the overvoltage relay trip level to the maximum. • Select a suitable tuning resistor (typically 2 to 5 kohm). ***Tuning example*** Main voltage is 400 VAC. Phase voltage is then $400 / (\sqrt{3}) = 230$ VAC. Earth fault alarm is wanted at 150 mA earth-fault current. The tuning resistor is selected as follows: Resistance value: 230 V/150 mA = 1533 ohm Power rating: 230 V · 150 mA = 35 W • Switch the voltage off. • Connect the tuning resistor after the input fuses of ACx 624 (in the secondary side of the phase shift transformer) between one phase and the cabinet frame. • Switch the voltage on. The earth-fault current now flows through the resistor. • Decrease the overvoltage relay tripping level to a value just about to trip (see the LED on the relay). • Switch off the voltage, and disconnect the tuning resistor.	This is an optional feature (SCAU-3ZAI system).
2.	Earth Fault Protection Based on an Insulation Monitoring Device	
☐	Check the tuning of the insulation monitoring device for the earth fault protection (Bender) according to the *IRDH265 Operating Manual* by Bender (code: TGH1249).	This is an optional feature (IRDH 265-x).

Chapter 2 – Cabinet Design

Overview

Guide lines for cabinet construction are described in *ACS 600 Converter Module Installation in User-defined Cabinet* (EN code: 61264922). The instructions given for the ACx 604 apply to the ACx 624. Additional instructions for the ACx 624 are given in this chapter. Follow both instructions.

Cooling

To ensure satisfactory operation an adequate cooling air flow is mandatory. See cooling instructions in *Converter Module Installation in User-defined Cabinet.* The losses of the ACx 624 are approximately three percent of the nominal power of the unit. For the losses of the optional AC chokes see *Appendix A*. When examining the ventilation requirements also the losses of associate devices such as control transformers, contactors, relays and fuses must be taken into account.

When cabinets are installed in a switch room close to each other, there can also be problems with air re-circulation outside the cabinet. In these circumstances consideration should be given to common discharge ductwork to remove the heated air from the locality.

Heat Exchangers

Care must be taken when sizing heat exchangers to ensure that an adequate differential temperature is available. Maximum air inlet temperature for the drive is normally 40 °C, and design temperature rise for cooling air is 15 °C.

Cubicle Heater

A cubicle heater is required, if there is risk to humidity to be condensed in the cabinet. Drying is the primary function of a cubicle heater. Of course, if there is a risk of cabinet temperature to be below 0 °C after installation, a heater is required for heating. See limits for the ambient conditions in the *ACS/ACC/ACP 604/607/627 Hardware Manual*.

When placing the heater, follow the instructions given by the heater manufacturer. Ensure that localised heating of the ACx 624 is avoided.

Input Fuses & Mains Supply Disconnecting Device

The mains supply for the ACx 624 drive modules must be equipped with appropriate input fuses and an external supply disconnecting device. See diagram on page 1-3. For recommended ultrarapid input fuse types see *Appendix A*.

With 12-pulse systems it is normal to provide short circuit protection for the phase shift transformer primary by gG or gM type fuses, however, ultrarapid fuses are required to protect the rectifiers. Ultrarapid fuses must be placed between phase shift transformer and the rectifiers to avoid blowing the fuses by the inrush current of the phase shift transformer when connecting the mains supply.

When selecting a fuse switch or carrier it is important to note that semiconductor protection fuses have higher losses than conventional gG fuses.

The supply disconnecting device must be of a type specified by EN-60204-1, Chapter 5.3.2, or by local safety regulations.

Mains Fuse Supervision

An additional mains fuse supervision is required since there is no internal detection of the blowing of a single fuse. For example three-phase monitoring relays can be connected to release on interruption of one of the phases. It is recommended to stop the ACx 624 in case of losing one phase with motor coasting to stop. A stop signal can be connected to the ACx 624 e.g. via a digital input. For configuring the digital inputs see *ACS 600 Firmware Manual*.

WARNING! The digital inputs of the ACx 624 are configurable by parameters. Ensure that the digital input for Stop or Run Enable is not double-selected for any other signal (e.g. constant speed).

Optional AC Chokes

Additional AC chokes may be placed between the phase shift transformer and the rectifiers to balance the currents of the parallel rectifiers. AC chokes attenuate voltage spikes and reduce current distortion in the transformer primary. AC chokes are recommended if remote transformer (a transformer locating 20 metres or more apart) is used or the transformer meets only miniumum requirements (see section *Phase Shift Transformer*). Chokes have similar temperature rise characteristics to integrated transformers and due care must be taken to avoid radiated and conducted heat causing problems.

Optional AC chokes must be installed rigidly. Air clearances around live parts must be according to local regulations. Chokes must have enough free space to ensure sufficient cooling. At least 50 mm (2 in.) free space must be left around the chokes and hot air re-circulation must be prevented.

Phase Shift Transformer

Minimum requirements for the transformer are:

- Connection: Dy 11 d0
- Voltage difference between secondaries < 0.3 %
- Short circuit impedance of secondaries > 5 %
- Short circuit impedance difference between secondaries < 3 %.
- The transformer is designed for rectifier supplies, with appropriate derating for non-sinusoidal load. The current distortion (THD) does not exceed 50 % in secondary, and 12 % in primary.
- The transformer secondaries are dimensioned to at least 55 % of primary power.

- Where primary is at medium voltage (1 kV to 35 kV) an earthed screen between windings is required for safety in ungrounded network in some countries. Obey local legislation.

If the transformer is to be mounted inside the same cabinet with the converter it should be of dry type. Dry type transformers will typically have a maximum temperature of 155 °C and must be segregated from the inverter and feeding components to avoid radiated and conducted heat causing problems.

Adequate cooling for the transformer must be provided in accordance with instructions of the transformer supplier.

The phase shift transformer also requires electrical protection for overtemperature and short circuit.

Additional Requirements

AC chokes are not needed if the transformer fulfills additional requirements to above:

- Transformer short circuit impedance $Z_k \geq 5.5$ %
- Impedance between secondaries > 150 percentage of Z_k

Exception: With a transformer locating 20 metres or more from the ACx 624 additional AC chokes are recommended.

Cables

Internal cables should be selected in accordance with the manufacturers design data, taking into account the prospective temperature in the appropriate enclosure section. Power cables should be sized on the basis of the total rms current in the appropriate conductor, including any harmonic current loading.

It is important to note the high temperatures likely to be encountered in the transformer compartment when assessing cables. For a 12-pulse system the supply cables between the phase shift transformer and the rectifier should be designed for at least 55 % of the nominal incoming current.

The outgoing mains, motor and control cables must be selected according to the specifications in the *ACS/ACC/ACP 604/607/627 Hardware Manual*. Also, observe the cable routing and length instructions.

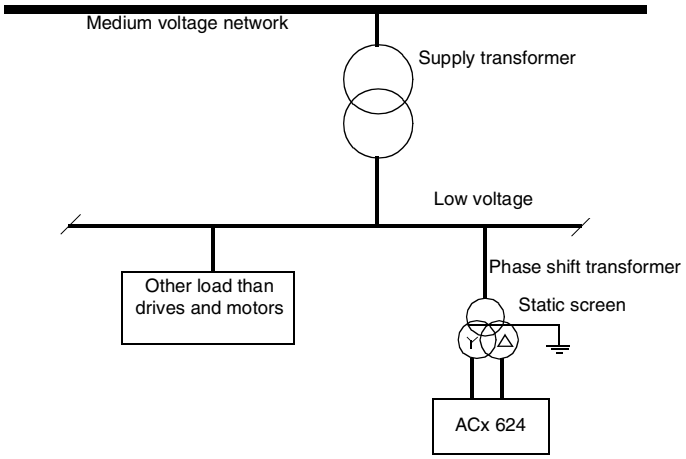
Control Boards

It is not allowed to install the control boards (e.g. NDCU) near a main circuit or hot parts. See the environmental limits in Appendix A (Ambient Conditions) of the *ACS/ACC/ACP 604/607/627 Hardware Manual*.

Compliance with the EMC Directive

See *Converter Module Installation in User-defined Cabinet* for general requirements for the cabinet.

Additional line filters are not usually needed with the ACx 624. The ACx 624 is supplied with a dedicated transformer. In some cases, the natural suppression in transformers and cables is sufficient to ensure that no excessive emission is propagated to neigbouring low-voltage networks. If in doubt, the supply transformer with static screening between the primary and secondary windings can be used.



WARNING! A line filter **must not** be fitted in a floating (ungrounded) network. The mains becomes connected to earth potential through the filter capacitors. In floating networks this may cause danger or damage the unit.

With a 12-pulse system filters must never be fitted between the phase shift transformer and the rectifier.

Earth (Ground) Fault Protective Function

The internal earth fault protective function of the ACS 600 is not used in 12-pulse rectifier units.

WARNING! The earth fault related parameters are not in use in the 12-pulse rectifier units. Earth fault is not indicated by the application program.

It is normal practice to operate a 12-pulse rectifier as an “IT” ungrounded system and earth leakage protection in accordance with local regulations must be used. It is not recommended to use earth fault protection based on artificial neutral point connection and overvoltage relay if the disturbance level is high due to long motor cables (over 100 metres). In this case use of Bender insulation monitoring device is recommended.

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 6xx drive does not generate an emergency stop of the motor or separate the drive from dangerous potential.

Power Factor Compensation Capacitors

Power factor compensation capacitors and surge absorbers must not be connected to the motor cables.These devices are not designed to be used with frequency converters, and will degrade motor control accuracy. They can cause permanent damage to the ACx 6xx drive or themselves due to the rapid changes in the ACx 6xx output voltage.

If there are power factor compensation capacitors in parallel with the ACx 6xx supply ensure that the capacitors and the ACx 6xx are not charged simultaneously to avoid voltage surges which might damage the unit. The capacitors should be detuned from the principle harmonics generated to avoid overloading, and should not be capable of permitting a leading power factor in any circumstances.

Output Contactors and Protective Switches

WARNING! Never connect the mains (line power) to the ACx 6xx output. If frequent bypassing of is required, mechanically connected switches or contactors should be employed to isolate the drive output. Care must be taken to ensure that the drive has stopped switching before any switching is undertaken in the output.

Mains (line) voltage applied to the output can result in permanent damage to the unit. Operation outside the nominal voltage range should not be attempted, as overvoltages can result in permanent damage to the ACx 6xx drive.

Chapter 3 – Installation

Mechanical and Electrical Installation

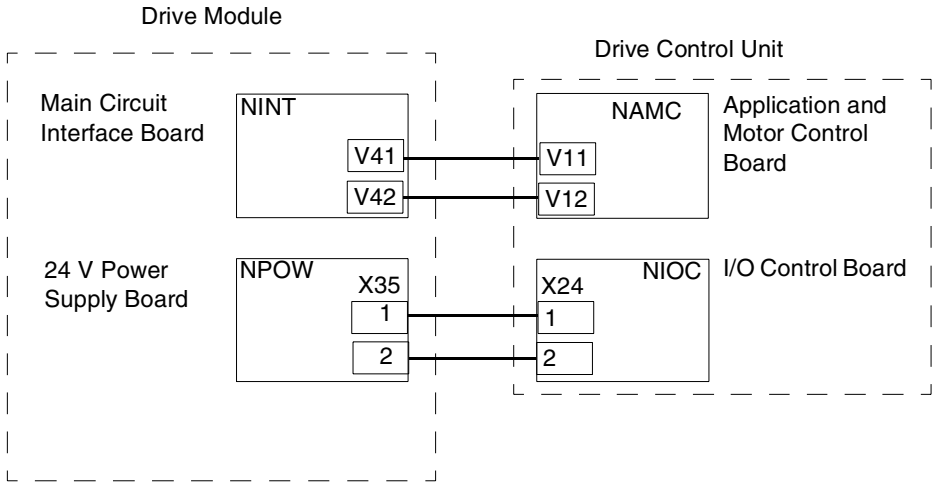
Guide lines for the mechanical and electrical installation of the drive module are described in *ACS 600 Converter Module Installation in User-defined Cabinet*. Additional instructions for the ACx 624 are given in *Chapter 2 – Cabinet Design* in this supplement. Perform the installation according to the instructions. See the required general data from the *ACS/ACC/ACP 604/607/627 Hardware Manual* and the ACx 624 specific data from *Appendix A* in this supplement.

Preventative maintenance of the ACx 624 is described in *ACS/ACC/ACP 604/607/627 Hardware Manual*.

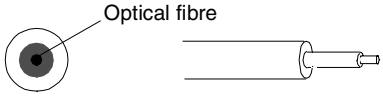
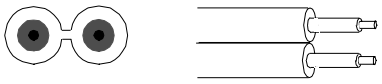
(For the manual codes refer to the inside of the cover sheet of this supplement.)

Connecting Drive Control Unit NDCU-11

The Drive Control Unit (containing control boards NDCO, NAMC and NIOC) is located outside the drive module. Connect the optical fibres as shown below. Refer to circuit diagrams delivered with the unit.



WARNING! Handle the fibre optic cables with care. When unplugging optic cables, always grab the connector, not the cable itself. Do not touch the ends of the fibres with bare hands as the fibre is extremely sensitive to dirt.

Cable Type	Parameter	Minimum	Maximum	Unit
Plastic Optical Cable (POF, fibre core diameter 1 mm): Simplex Optical fibre  Duplex (zipcord) 	Storage and Operating Temperature	-55	+85	°C
	Recommended Operating Temperature	-40	+85	°C
	Installation Temperature	-20	+70	°C
	Short Term Tensile Force		Simplex: 50 Duplex: 100	N
	Short Term Bend Radius	25		mm
	Long Term Bend Radius	35		mm
	Long Term Tensile Load		1	N
	Flexing		1000	cycles

Connection of Optional Modules and DriveWindow

Connect optional modules and Drive*Window* according to the instructions given in *Chapter 3 – Electrical Installation* in *ACS/ACC/ ACP 604/607/627 Hardware Manual.* Install them according to their Installation and Start-up Guides.

Appendix A – ACx 624 Technical Data

IEC Ratings

The IEC ratings for the ACx 624 with 50 Hz and 60 Hz supplies are given below.

Frequency Converter Type	Normal Use					Heavy-duty Use							Frame Type
	Duty Cycle 1/5 min					Duty Cycle 1/5 min		Duty Cycle [1] 2/15 s					
	I_{2N}	I_{2Nmax}	S_N	P_N	P_N	I_{2hd}	I_{2hdmax}	I_{2hd}	I_{2hdmax}	S_{hd}	P_{hd}	P_{hd}	
	4/5 min	1/5 min				4/5 min	1/5 min	13/15 s	2/15 s				
Unit	A	A	kVA	kW	HP	A	A	A	A	kVA	kW	HP	
Three-phase supply voltage 380 V, 400 V, 415 V, 440 V, 460 V, 480 V or 500 V													
ACx 624-0120-5	135	149	120	90	100	112	168	112	224	100	75	75	R7
ACx 624-0140-5	164	180	140	110	125	135	203	135	270	120	90	100	
ACx 624-0170-5	200	220	170	132	150	164	246	164	328	140	110	125	R8
ACx 624-0210-5	240	264	210	160	200	200	300	200	400	170	132	150	
ACx 624-0260-5	300	330	260	200	250	240	360	240	480	210	160	200	
ACx 624-0320-5	365	402	320	250	300	300	450	300	600	260	200	250	R9
ACx 624-0400-5	460	506	400	315	350	365	548	365	730	320	250	300	
Three-phase supply voltage 400 V													
ACx 624-0120-5	135	149	100	75	100	112	168	112	224	80	55	75	R7
ACx 624-0140-5	164	180	120	90	100	135	203	135	270	100	75	100	
ACx 624-0170-5	200	220	140	110	125	164	246	164	328	120	90	100	R8
ACx 624-0210-5	240	264	170	132	150	200	300	200	400	140	110	125	
ACx 624-0260-5	300	330	210	160	200	240	360	240	480	170	132	150	
ACx 624-0320-5	365	402	260	200	250	300	450	300	600	210	160	200	R9
ACx 624-0400-5	460	506	320	250	300	365	548	365	730	260	200	250	
Three-phase supply voltage 525 V, 550 V, 575 V, 600 V, 660 V or 690 V													
ACx 624-0100-6	88	97	100	75	100	65	98	65	98	70	55	75	R7
ACx 624-0120-6	105	116	120	90	125	88	132	88	132	100	75	100	
ACx 624-0140-6	127	140	140	110	150	105	158	105	158	120	90	125	R8
ACx 624-0170-6	150	165	170	132	150	127	191	127	191	140	110	150	
ACx 624-0210-6	179	197	210	160	200	150	225	150	225	170	132	150	
ACx 624-0260-6	225	248	260	200	250	179	269	179	269	210	160	200	
ACx 624-0320-6	265	292	320	250	300	225	338	225	338	260	200	250	R9
ACx 624-0400-6	351	386	400	315	350	265	398	265	398	320	250	300	

continued

The table continues from previous page.

Frequency Converter Type	Pump and Fan Use (Squared Load)		Frame Type
	I_{2Nsq}	P_N	
Unit	A	kW	
Three-phase supply voltage 380 V, 400 V, 415 V, 440 V, 460 V, 480 V or 500 V			
ACS 624-0120-5	164	110	R7
ACS 624-0140-5	193	132	
ACS 624-0170-5	240	160	R8
ACS 624-0210-5	285	200	
ACS 624-0260-5	345	250	
ACS 624-0320-5	460	315	R9
ACS 624-0400-5	490	400 (335)	
Three-phase supply voltage 400 V			
ACS 624-0120-5	164	90	R7
ACS 624-0140-5	193	110	
ACS 624-0170-5	240	132	R8
ACS 624-0210-5	285	160	
ACS 624-0260-5	345	200	
ACS 624-0320-5	460	250	R9
ACS 624-0400-5	490	315 (265)	

The current ratings are the same regardless of the supply voltage within one voltage range. The rated current of the ACS 624 must be higher than or equal to the rated motor current to achieve the rated motor power given in the table. The motor powers are given for the maximum voltage of the voltage range (500 V in 380 V to 500 V power range, and 690 V in 525 V to 690 V range). Motor powers for 400 V supply voltage are given separately.

Note 1: *The maximum allowed motor shaft power is limited to 1.5 · 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 6xx-0120-03 and ACx 6xx-0140-05 units in Pump and Fan Use). See Output Current Temperature Derating in ACS/ACC/ACP 604/607 Hardware Manual.*

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

( ) typically achieved motorpower with I_{2Nsq}

Normal use (10 % overload capacity):

I_{2N}	rated rms output current
I_{2Nmax}	rms overload current (allowed for one minute every 5 minutes): I_{2Nmax} (1/5 min) = 1.1 · I_{2N} I_{2Nmax} (2/15 s) = 1.5 · I_{2N} (400 and 500 VAC units)
S_N	rated apparent output power
P_N	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_{2hd}	rated rms output current
I_{2hdmax}	rms overload current (allowed for one minute every 5 minutes or 2 seconds every 15 seconds) Maximum current depends on parameter setting, refer to *Firmware Manual*. I_{2hdmax} (1/5 min) = 1.5 · I_{2hd} I_{2hdmax} (2/15 s) = 2.0 · I_{2hd} (400 and 500 VAC units) or 1.5 · I_{2hd} (690 VAC units)
S_{hd}	rated apparent output power
P_{hd}	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_{2Nsq}	rated rms output current

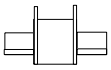
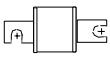
NEMA Ratings

The NEMA ratings for the ACS 624 with 60 Hz supply are below. Symbols are described on previous page.

Frequency Converter Type	**Normal Use**			**Heavy-duty Use**					**Frame Type**
	Duty Cycle 1/5 min			Duty Cycle 1/5 min		Duty Cycle 2/15 s			
	I_{2N}	I_{2Nmax}	P_N	I_{2hd}	I_{2hdmax}	I_{2hd}	I_{2hdmax}	P_{hd}	
	4/5 min	1/5 min		4/5 min	1/5 min	13/15 s	2/15 s		
Unit	A	A	HP	A	A	A	A	HP	
Three-phase supply voltage 380 V, 400 V, 415 V, 440 V, 460 V, 480 V or 500 V									
ACS 624-0120-4	156	172	125	113	168	113	224	75	R7
ACS 624-0140-4	180	198	150	141	203	141	270	100	
ACS 624-0170-4	216	238	150	172	246	172	328	125	R8
ACS 624-0210-4	260	286	200	200	300	200	400	150	
ACS 624-0260-4	316	348	250	240	360	240	480	200	
ACS 624-0320-4	414	455	300/350	300	450	300	600	250	R9
ACS 624-0400-4	480	528	400	365	548	365	730	300	

Fuses

The mains supply for the ACx 624 must be equipped with appropriate input fuses. Recommended input fuse (in the secondary side of the phase shift transformer) ratings for the ACx 624 are below. **A** minimum rated current in amperes, **A^2s** maximum I^2t value, **V** rated voltage in volts. Only ultra rapid fuses guarantee proper protection for the rectifier semiconductors.

ACx 604/607 Types	Fuses							
	A	A^2s	V	Manufacturer	Type DIN 43620 	Size	Type DIN 43653 	Size
ACS 624-0120-5 ACS 624-0140-5	160	16000	660	Bussman	170M1569	000	170M1369	000
ACS 624-0170-5 ACS 624-0210-5	250	51500	660	Bussman	170M1571	000	170M1371	000
ACS 624-0260-5	315	80500	660	Bussman	170M1572	000	170M1372	000
ACS 624-0320-5 ACS 624-0400-5	400	105000	660	Bussman	170M3819	1*	170M3019	1*
ACS 624-0100-6 ACS 624-0120-6	100	4650	660	Bussman	170M1567	000	170M1367	000
ACS 624-0140-6 ACS 624-0170-6 ACS 624-0210-6	160	16000	660	Bussman	170M1569	000	170M1369	000
ACS 624-0260-6	200	28000	660	Bussman	170M1570	000	170M1370	000
ACS 624-0320-6 ACS 624-0400-6	315	46500	660	Bussman	170M3817	1*	170M3017	1*

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.

Terminal Sizes and Tightening Torques

Input power and motor cable terminal wire size capabilities (per phase) and tightening torques for the ACx 624. For terms used see *ACS/ACC/ACP 604/607/627 Hardware Manual*.

ACx 600 Type	Mains Terminals			Motor Terminals			Earthing Terminals		Frame
	U1,V1,W1, 2U1, 2V1, 2W1		T	U2,V2,W2		T	Earthing PE	T	
	Cu	Al	Nm	Cu	Al				
ACx 624-0120-5/0100-6	1x(6-70) 5)	1x(6-70) 5)	30	1x(10-120)	1)	30	41 mm^2 2) 3)	30	R7
ACx 624-0140-5/0120-6	1x(6-70) 5)	1x(6-70) 5)	30	1x(10-120)	1)	30	41 mm^2 2) 3)	30	
ACx 624-0170-5/0140-6	1x(10-240) 4)	1x(10-240) 4)	30	3x(12-240)	3x(12-240)	44	M10 (2 pcs)2)	30	R8
ACx 624-0210-5/0170-6	1x(10-240) 4)	1x(10-240) 4)	30	3x(12-240)	3x(12-240)	44	M10 (2 pcs)2)	30	
ACx 624-0260-5/0210-6	1x(10-240) 4)	1x(10-240) 4)	30	3x(12-240)	3x(12-240)	44	M10 (2 pcs)2)	30	
ACx 624-0260-6	1x(10-240) 4)	1x(10-240) 4)	30	3x(12-240)	3x(12-240)	44	M10 (2 pcs)2)	30	
ACx 624-0320-5/0320-6	1x(10-240) 4)	1x(10-240) 4)	30	3x(12-240)	3x(12-240)	44	M10 (2 pcs)2)	30	R9
ACx 624-0400-5/0400-6	1x(10-240) 4)	1x(10-240) 4)	30	3x(12-240)	3x(12-240)	44	M10 (2 pcs)2)	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^2, 3 x phase conductor + PE conductor). Aluminium cable cannot be connected due to cable lug size.
2) This is the earthing terminal for the PE bus and the frame of the ACx 6x4 module. The terminal is to be connected to the PE bus of the cabinet the module is installed in.
3) Cable size: 6 AWG...300 MCM
4) Isolated stud terminal
5) Terminal block

Chokes

Technical data of the AC chokes from ABB for the ACx 624 are given below. Chokes of other manufactures can be used if they meet the ratings given in the table. The saturation curves of the two chokes for one ACx 624 must be similar with 0 to +10 % tolerance to the values given below for even current sharing.

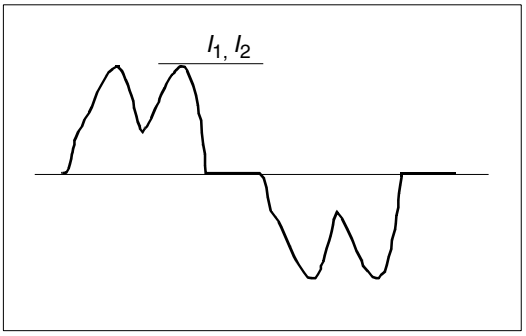
L_1 rated inductance at peak current I_1 (see figures below)

I_1 peak current that specifies L_1 (see figures below)

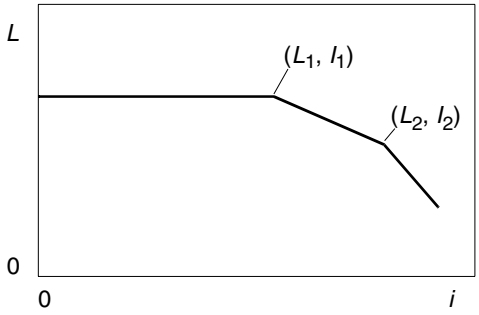
L_2 rated inductance at peak current I_2 (see figures below)

I_2 peak current that specifies L_2 (see figures below)

I_{th} rated thermal rms current



Current wave form of the choke



Saturation curve of the inductance as a function of current

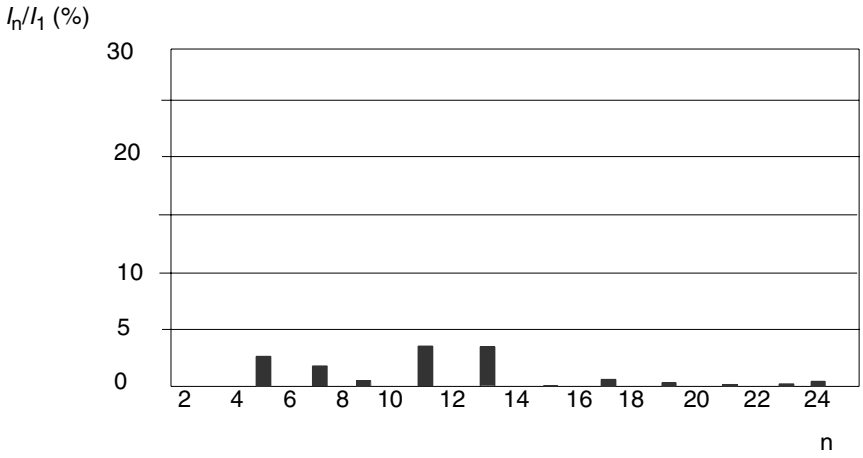
Frequency Converter Type	Choke							
	ABB code	L_1 mH	I_1 A	L_2 mH	I_2 A	I_{th} A	Weight kg	Losses* W
Three-phase supply voltage 380 V, 400 V, 415 V, 440 V, 460 V, 480 V or 500 V								
ACx 624-0120-5	10015294	0.135	242	0.095	331	169	18	270
ACx 624-0140-5	10015294	0.135	242	0.095	331	169	18	270
ACx 624-0170-5	10015308	0.110	298	0.075	402	208	25	325
ACx 624-0210-5	10015316	0.090	363	0.060	493	250	26	400
ACx 624-0260-5	10015324	0.075	439	0.050	594	307	30	500
ACx 624-0320-5	10015332	0.060	549	0.040	737	384	32	625
ACx 624-0400-5	10015341	0.048	668	0.033	915	463	33	665
Three-phase supply voltage 525 V, 550 V, 575 V, 600 V, 660 V or 690 V								
ACx 624-0100-6	10025923	0.400	145	0.28	199	101	17	150
ACx 624-0120-6	10025923	0.400	145	0.28	199	101	17	180
ACx 624-0140-6	10025931	0.270	212	0.19	292	146	20	220
ACx 624-0170-6	10025931	0.270	212	0.19	292	146	20	265
ACx 624-0210-6	10025940	0.190	303	0.13	416	221	25	320
ACx 624-0260-6	10025940	0.190	303	0.13	416	221	25	410
ACx 624-0320-6	10024323	0.130	442	0.09	608	335	33	500
ACx 624-0400-6	10024323	0.130	442	0.09	608	335	33	630

* Losses per choke are given. There are two chokes in one ACx 624.

Harmonic Emission

Typical Total Harmonic Distortion (THD) = 7.5 % and Partial Weighted Harmonic Distortion (PWHD) = 15.6 % (defined according to EN 61800-3) for the ACx 624.

Typical harmonic content of the phase shift transformer primary current of the ACx 624 (with R_{sc} = 50, U_1 = 500 V and harmonic content according to IEC 1000-2-4, transformer meets additional requirements also) is shown below. I_n is harmonic current of order n, I_1 is fundamental input current rms value, n is order number of the harmonic. Harmonic content and total harmonic distortion will be higher if R_{sc} is higher or the transformer meets only minimum requirements or there is voltage distortion in the supply network.



Definitions

Total Harmonic Distortion:

$$THD = \sqrt{\sum_{2}^{40}\left(\frac{I_n}{I_1}\right)^2}$$

Partial Weighted Harmonic Distortion:

$$PWHD = \sqrt{\sum_{14}^{40} n\left(\frac{I_n}{I_1}\right)^2}$$

Ratio of the short circuit power of the supply network (source) to the fundamental apparent power of the equipment at point of common coupling:

$R_{sc} = S_{cc}/S_{equ}$, where

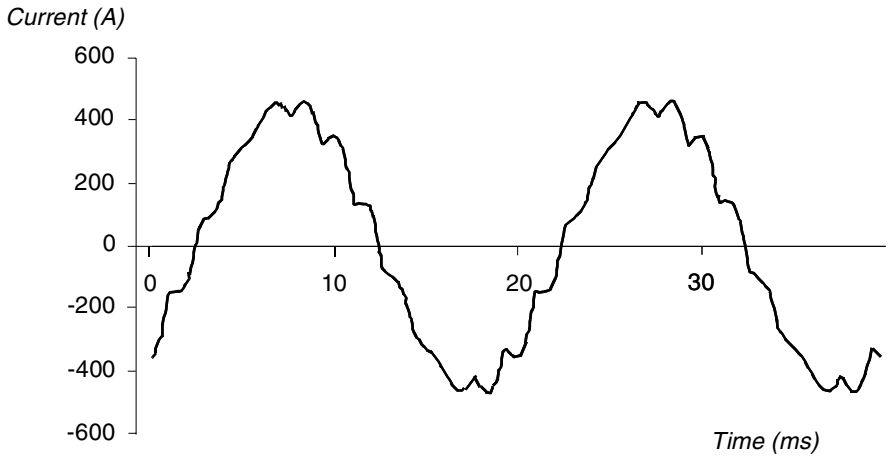
S_{cc} = short circuit power at point of common coupling (PCC),

S_{equ} = apparent power of the equipment calculated with rated rms line current.

I_{sc} = maximum short circuit current at PCC

I_L = maximum demand load current (fundamental frequency component) at PCC

Example An example of line current waveform of the ACx 624 (when THD = 7.5 %) is shown below.



Applicable Standards

The ACx 624 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 6x4)
  - the ACx 6x4 (IP 00) into a separate casing.
- EN 60529: 1991 (IEC 529), IEC 664-1: 1992. Degrees of protection provided by enclosures (IP code).
- IEC 1000-2-4: 1994. Class 2. Compatibility levels in industrial plants for low-frequency conducted disturbances.

Markings

Machinery Directive

ACx 624 drive modules comply with the European Union Machinery Directive (89/392/EEC) requirements for an equipment intended to be incorporated into machinery.

UL/CSA Markings

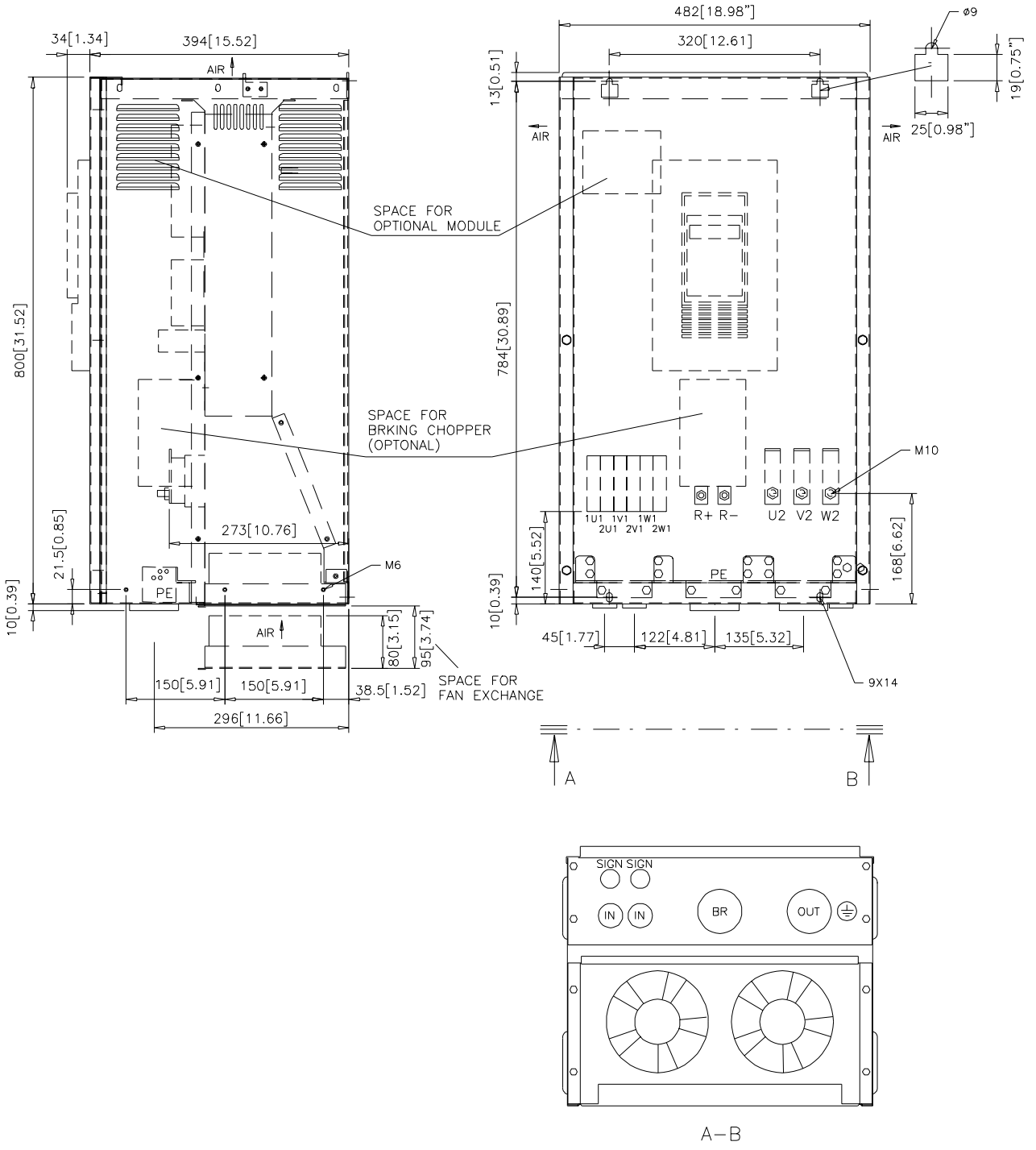
ACx 624 drive modules are UL/UL_C marked. The CSA marking is pending.

Other Technical Data

For technical data not included in this appendix see *Appendix A* in *ACS/ACC/ACP 604/607/627 Hardware Manual*. The data, warranty and liability concerning the ACx 604 apply to the ACx 624.

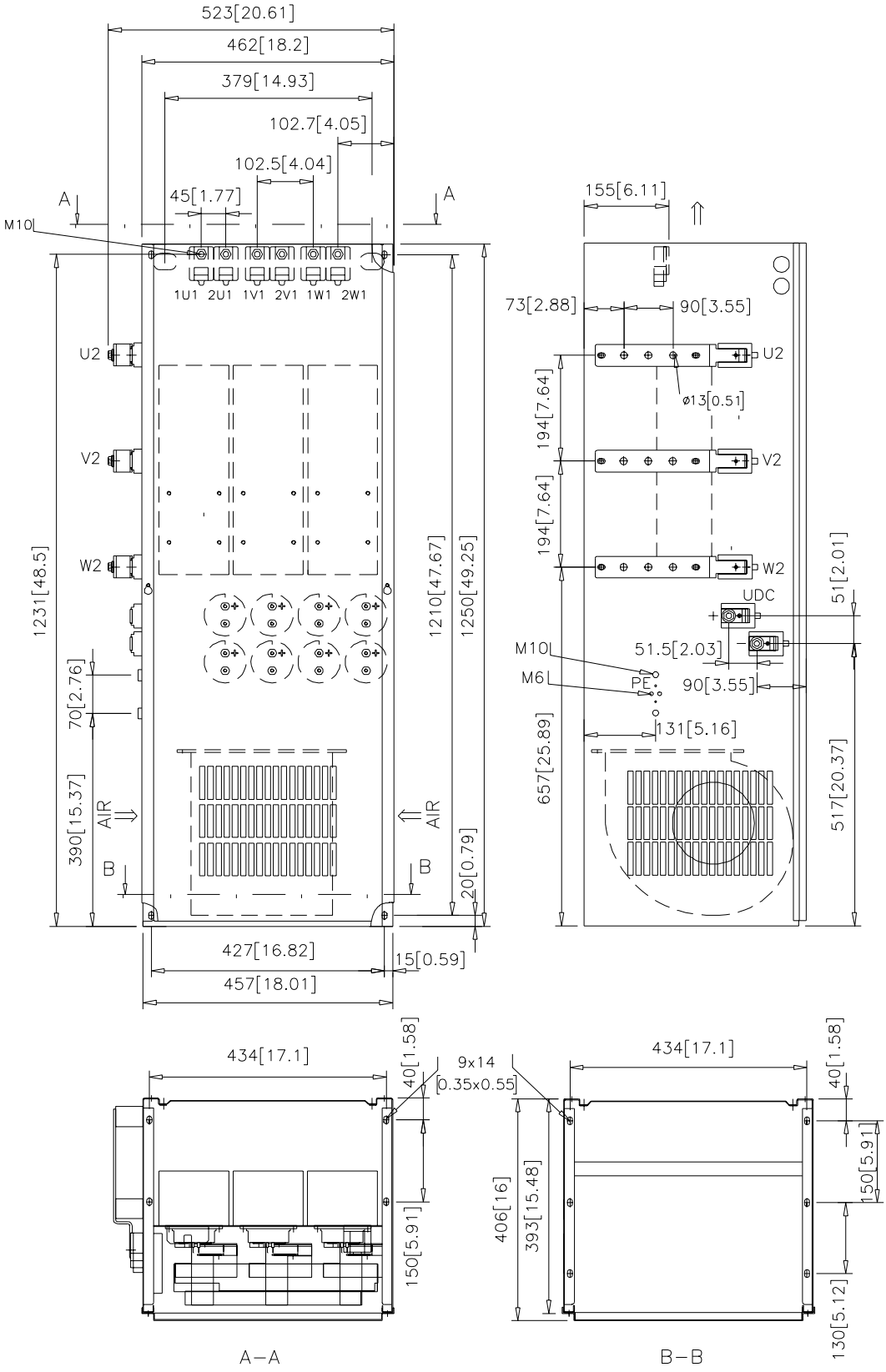
Appendix B – ACx 624 Dimensional Drawings

Frame R7 All dimensions in milllimetres and [inches]

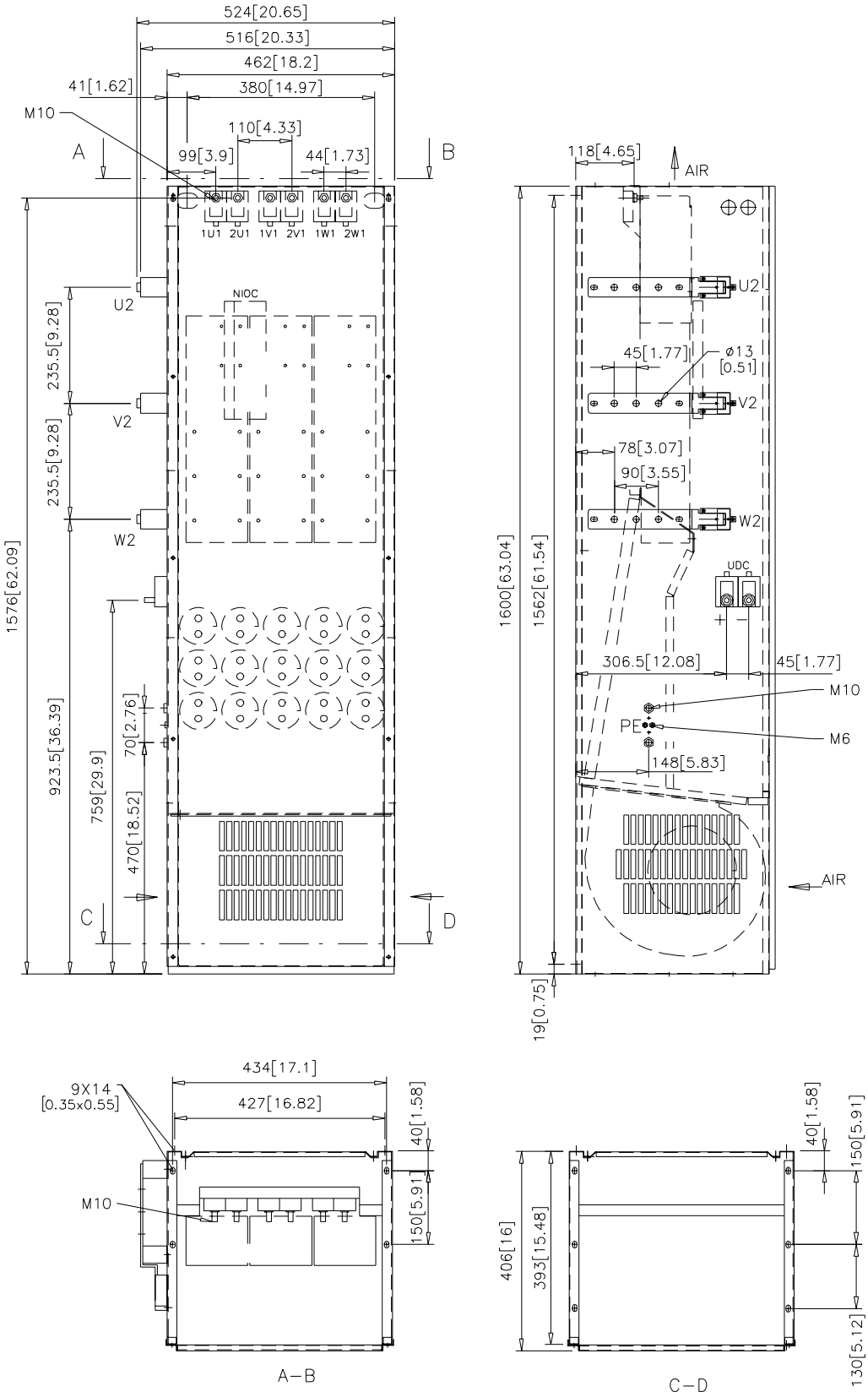


Frame R8

All dimensions in milllimetres and [inches]

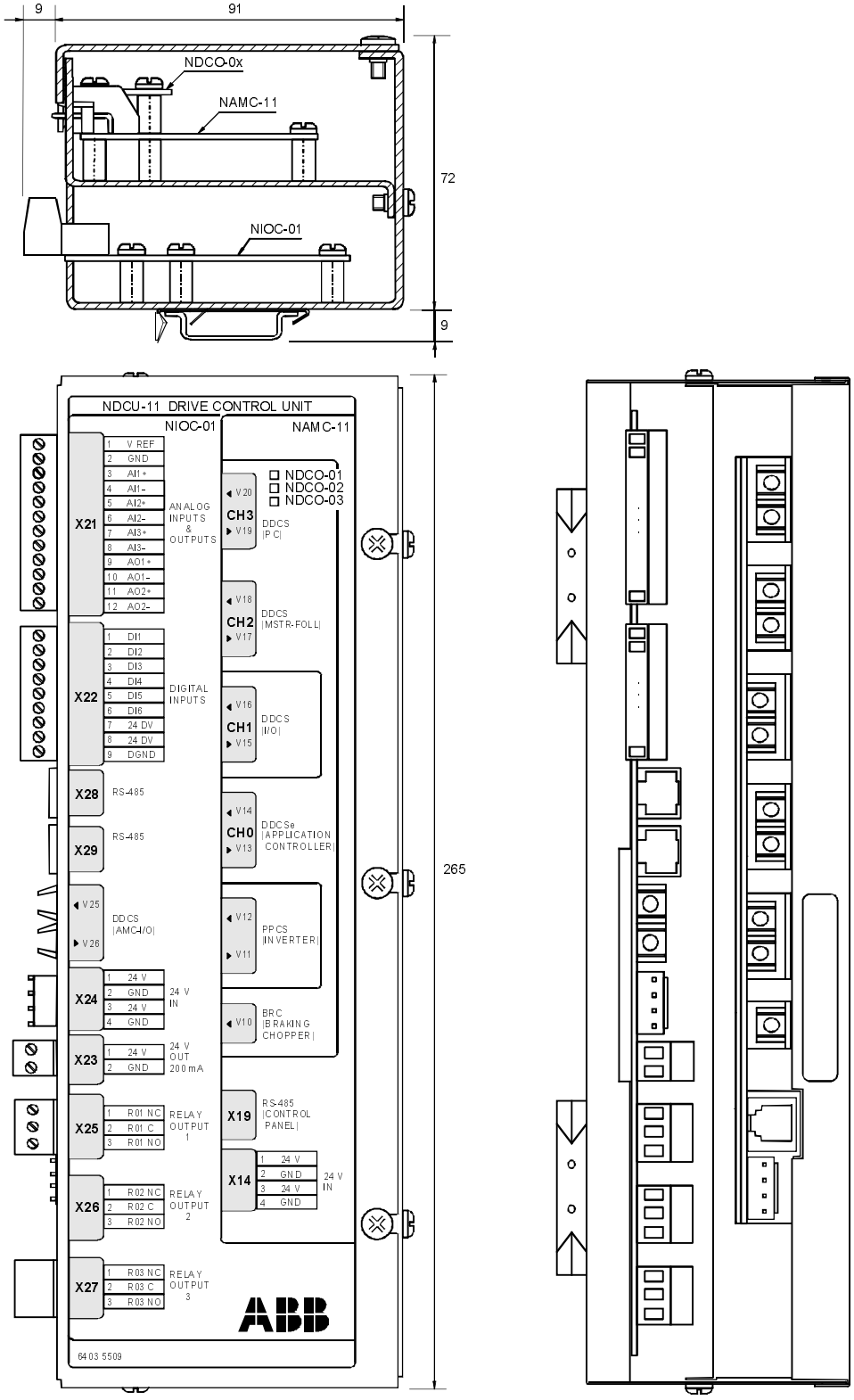


Frame R9 All dimensions in milllimetres and [inches]

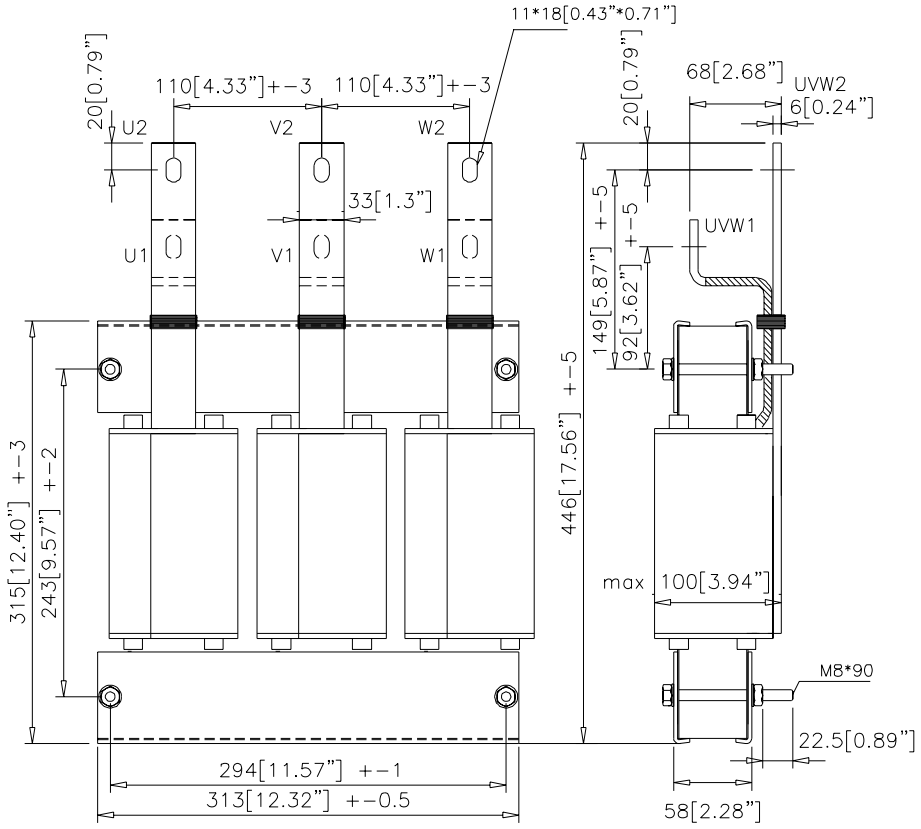


Drive Control Unit NDCU-11 *(NIOC-01 + NAMC-11)*

For the electrical connections refer to circuit diagrams delivered with the ACx 624.



3-phase AC Choke ABB codes 10015332 and 10015341



3-phase AC Choke ABB codes 10015294, 10025923

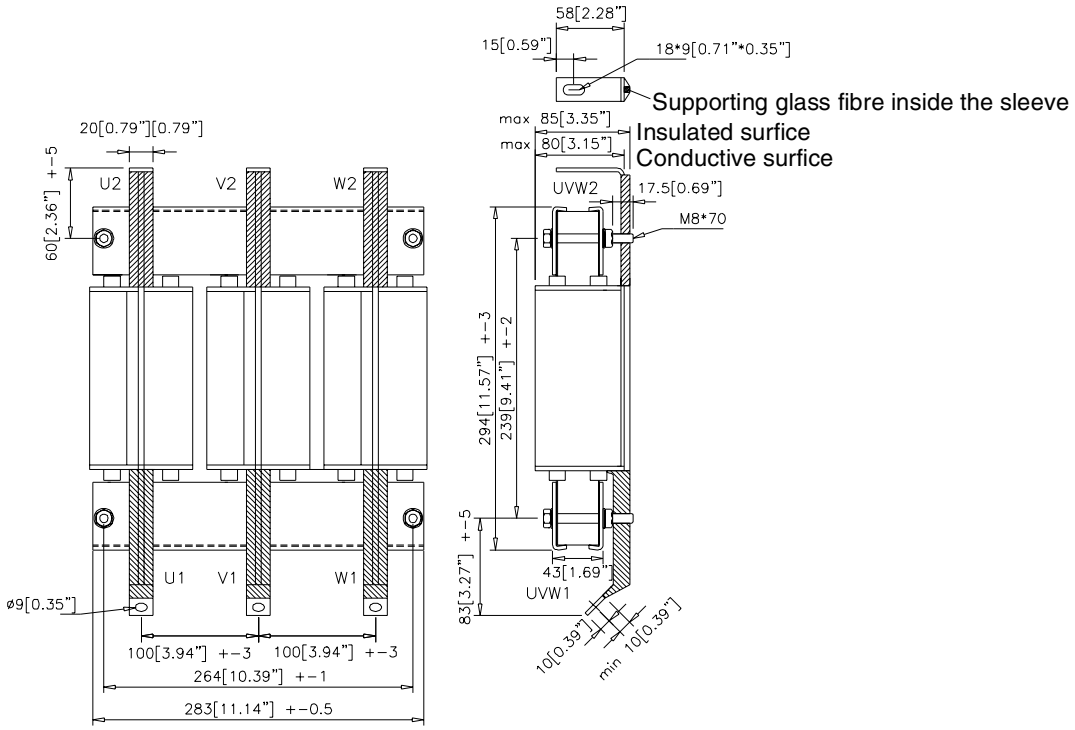
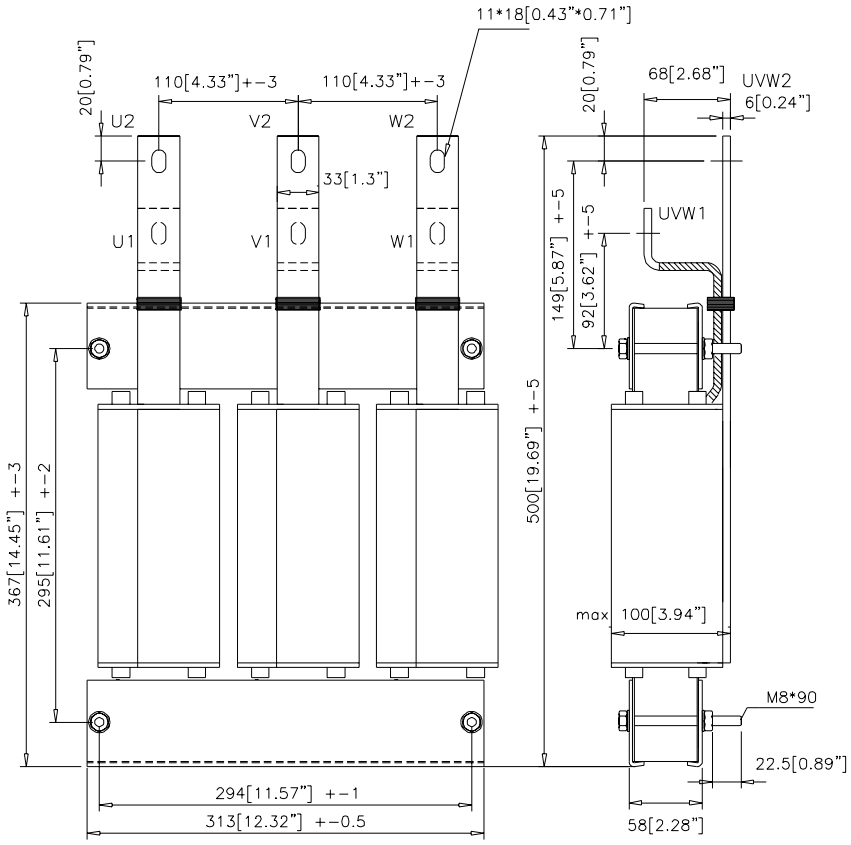


ABB code 10024323



3-phase AC Choke

ABB codes 10015324, 10025940

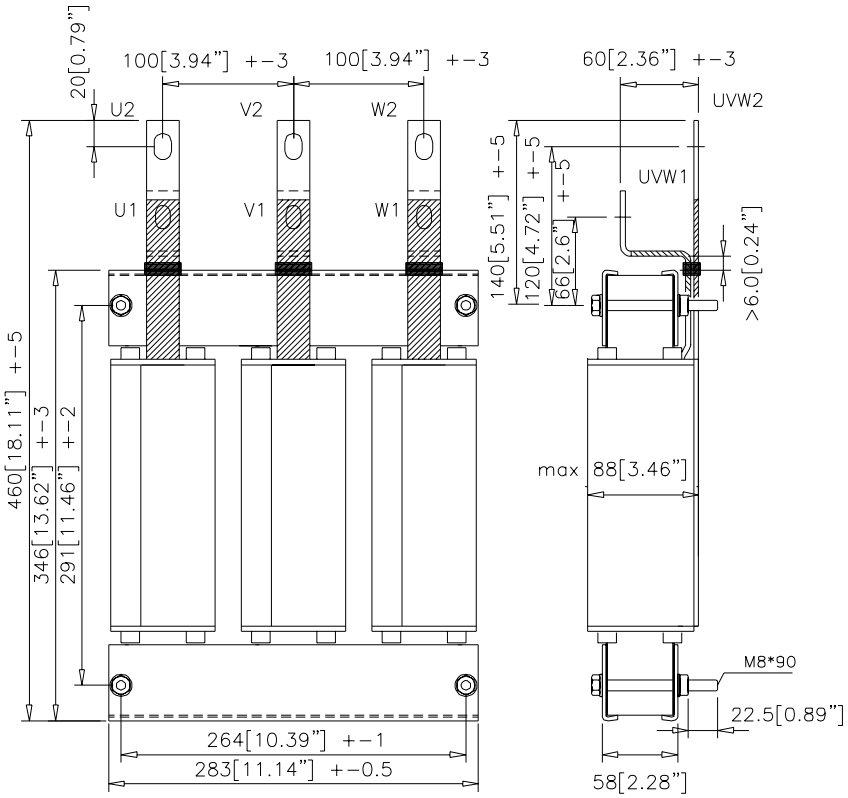
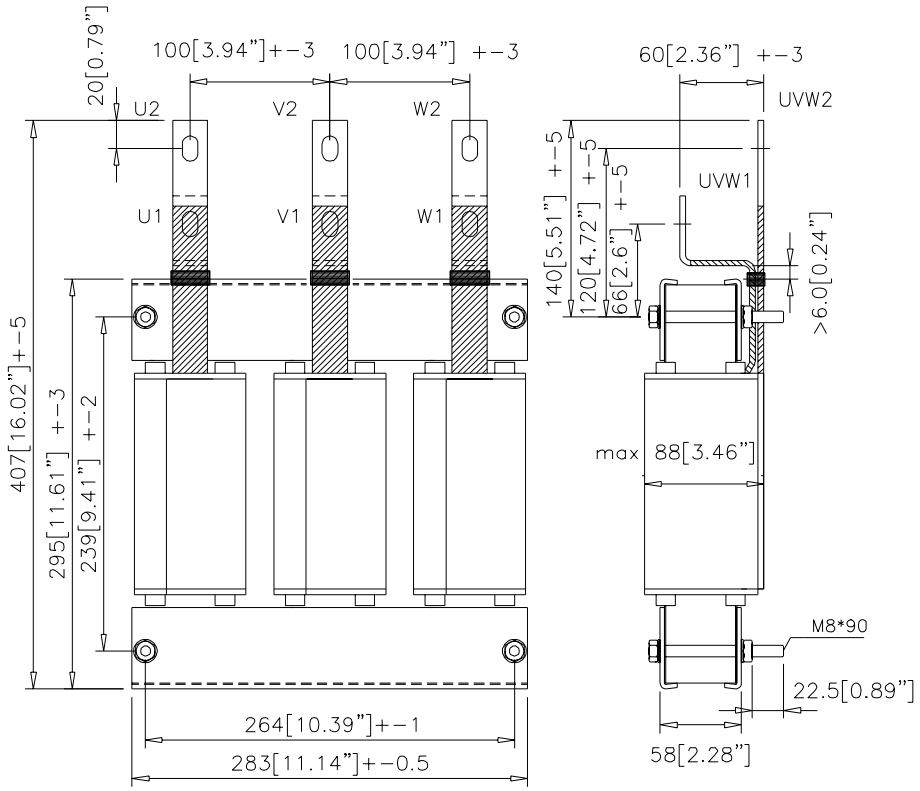


ABB codes 10015308, 10015316, 10025931



3BFE 64186477 R0125 REV B
EFFECTIVE: 31.3.2000 EN
Appendix B: 30.12.1999

ABB Industry Oy
Drives
P.O. Box 184
FIN-00381 HELSINKI
FINLAND
Telephone +358 10 22 2000
Telefax +358 10 22 22681
Internet http://www.abb.com/automation

ABB Automation Inc.
Drives
16250 West Glendale Drive
New Berlin, WI 53151
USA
Telephone 262 785-3416
800 243-4384
Telefax 262 785-8525
Internet http://www.abb-drives.com