

PRODUCT BROCHURE

Medium voltage AC drive
ACS2000, 300-3000 HP, 4kV





ACS2000 – flexible and reliable motor control

The ACS2000 medium voltage AC drive provides reliable motor control for a wide range of applications.

The ACS2000 is designed for high reliability, easy installation and fast commissioning, reducing the total cost of ownership.

With the integration of an Active Front End (AFE) combined with multilevel control, the ACS2000 is an Ultra Low Harmonic (ULH) design that minimizes line side harmonics. This technology eliminates expensive, specialized transformers, while offering the added benefit of a smaller overall package.

With its compact packaging, the ACS2000 can be retrofitted to control standard induction motors via a direct connection to the line supply (direct-to-line). Alternatively, a simple two-winding input isolation transformer can be applied to allow for connection to various line side supply voltages.

The ACS2000 direct-to-line configuration combines the cost savings of a transformerless variable speed drive system with the benefits of Voltage Source Inverters (VSIs), including excellent availability and reliability, high and constant power factor and superior dynamic control performance.

The heritage of ABB's VSI topology, along with a patented HV-IGBT-based multi-level control, provides a proven track record for reliable and motor friendly medium voltage AC drive performance.

Key product features

- Suitable for use with or without an input isolation transformer
- Meets IEEE 519 and IEC 61000-2-4
- Direct-to-line configuration (transformerless) allows 3 in and 3 out power cabling for quick and easy installation
- Multi-level switching topology and built-in dv/dt filtering enables use with new or existing induction motors
- Regenerative option and ability to maintain near unity power factor across the entire speed range provides additional energy savings
- Modular construction provides high reliability and low maintenance costs

Fields of application

Industries	Applications
HVAC	Chilled water pumps, chillers
Water	Pumps, aeration blowers
Cement, mining and minerals	Conveyors, crushers, mills, mine hoists, fans and pumps
Power generation	Fans, pumps, conveyors and coal mills
Chemical, oil and gas	Pumps, compressors, extruders, mixers and blowers
Metals	Fans and pumps
Pulp and paper	Fans, pumps, refiners, vacuum pumps and chippers
Other applications	HVAC, Test stands, wind tunnels and sugar mills

Key features

The ACS2000 general purpose drive offers unique features which provide superior application flexibility with a standard solution.

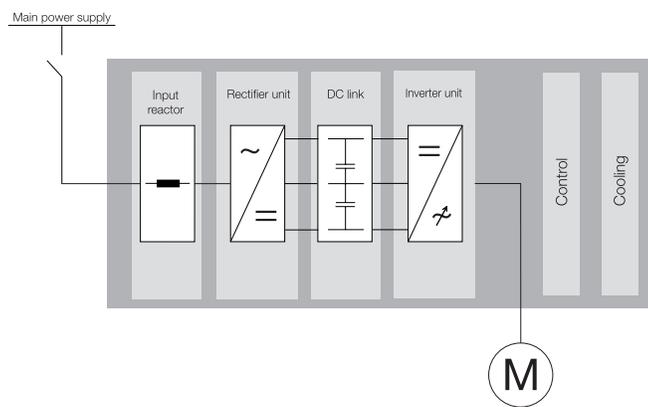
Direct-to-line

The ACS2000 direct-to-line features an Active Front End (AFE), which enables transformerless operation. This can lower investment costs substantially. Due to its compact size and lighter weight compared to a drive requiring a transformer, it also results in lower transportation costs and needs less space in the electrical room. The ACS2000 can be retrofitted to fixed speed motors while the direct-to-line technology results in quick and easy installation and commissioning.

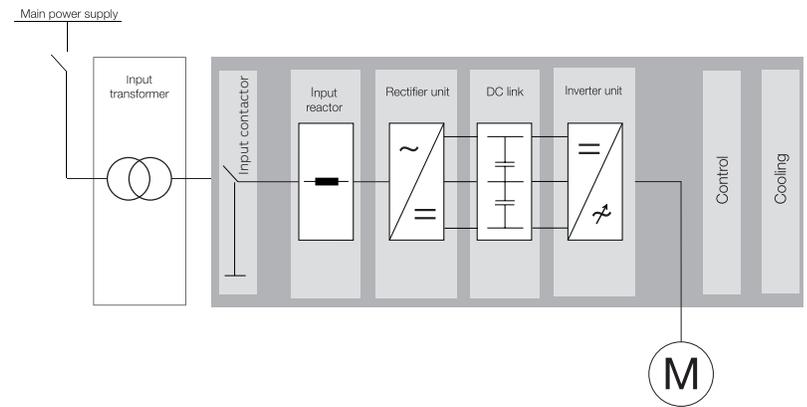
For operation with transformer

For applications where a voltage-matching input transformer is needed or galvanic isolation from the power supply is required, the ACS2000 can be connected to a standard distribution transformer.

Topology of the ACS2000 for direct-to-line connection



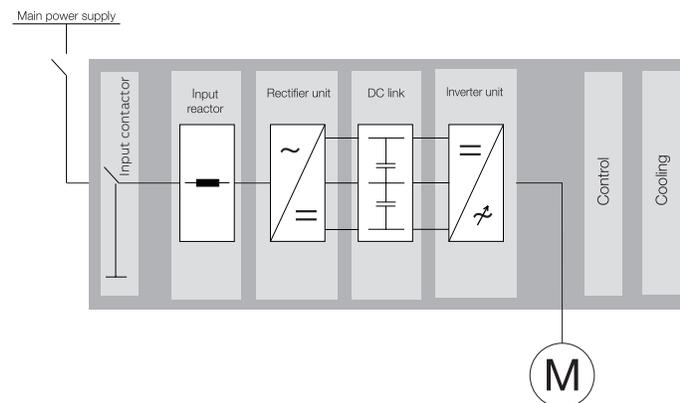
Topology of the ACS2000 for operation with an external transformer



Fused Disconnect / Contactor Option

The ACS2000 is available with a fused disconnect / vacuum contactor option which eliminates coordination with upstream equipment. It includes a visible blade disconnect switch, vacuum contactor and Kirk key interlocking.

Topology of the ACS2000 with direct-to-line connection with configurable disconnect



Powerful performance with DTC

Precise and reliable process control, together with low energy consumption, results in top performance. The ACS2000 drive control platform uses ABB's award-winning Direct Torque Control (DTC), resulting in the highest torque and speed performance as well as the lowest losses ever achieved in medium voltage AC drives. Control of the drive is immediate and smooth under all conditions.

Motor friendly output waveform for use with new or existing motors

The ACS2000 provides near sinusoidal current and voltage waveforms making it compatible for use with standard motors and cable insulation. This is achieved with ABB's patented multilevel topology which utilizes one DC link enabling a multilevel output waveform with a minimum number of power components.

Low harmonic signature

A low harmonic solution is available which meets the most stringent requirements for harmonic distortion as defined by relevant standards. This avoids the need for harmonic analysis or the installation of network filters.

Regeneration

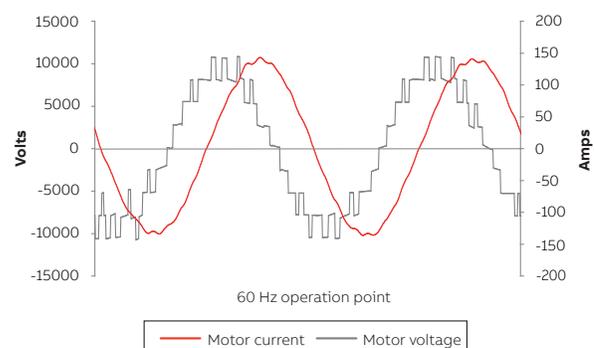
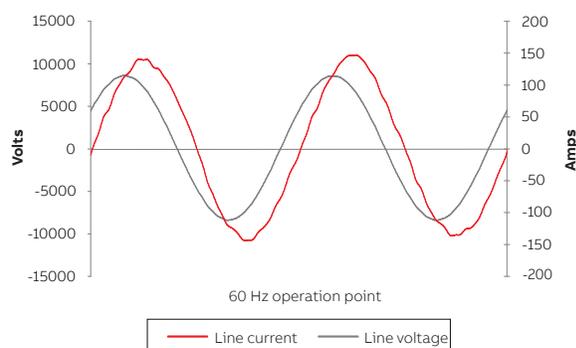
For applications with high braking energy, the ACS2000 is available with optional regeneration capability, which feeds back braking energy to the line supply. This further reduces the overall energy consumption.

Regeneration is especially suitable for applications with frequent starts and stops. It allows energy efficient continuous braking of applications such as downhill conveyors or expanders in gas pipelines.

Power factor correction

For applications where other loads connected to the same line supply cause leading or lagging power factor, the ACS2000 is available with a static VAR compensation option. With static VAR compensation, a smooth line supply voltage profile can be maintained and reactive power penalties can be avoided.

Line and motor current and voltage



ACS2000

The air-cooled general purpose drive provides simple and reliable motor control for a wide range of applications.

**ACS2000 direct-to-line,
Frame 1, 4 kV, 1000 Hp
without fused disconnect/
contactor option**



User-friendly drive control panel for local operation

- Keypad with multi-language display
- Main supply on/off pushbuttons
- Emergency off pushbutton

ACS2000

It is designed for easy installation, fast commissioning and efficient maintenance reducing the total cost of ownership.

**ACS2000 direct-to-line,
Frame 1, 4kV, 1000 HP
with fused disconnect and
vacuum contactor option**



- Optional fused disconnect/vacuum contactor
- Viewing window for visibility to disconnect
 - Optional motor protection relay
 - Kirk key interlock to MV sections of drive

Features and benefits

Features	Advantages	Benefits
Operation without transformer (direct-to-line)		
	No transformer required	Reduces capital expenditure
	Easy retrofit to fixed-speed motors	Minimizes investment
	Easy and fast commissioning	Lowers downtime
	Compact and light drive system	Lowers transportation costs; less space required in electrical room
Operation with transformer		
The ACS2000 is available for operation with an external transformer	Connection to any voltage level	Easy integration into existing infrastructure
	Conventional oil or dry-type input isolation transformer	No special input isolation transformer required
	Galvanic isolation to the line supply	Operation under single ground fault on the primary side of the transformer without impact on the drive
	Separate input isolation transformer can be located outside	Heating losses are not dissipated into electrical room, reducing load on HVAC system
Active Front End (AFE)		
	Power factor adjusted to compensate for reactive power	Reduces energy loss in distribution system, avoiding need for larger cables and utility penalties
	Enables a direct connection to the line supply	Transformer is not required
	Four-quadrant operation (regenerative braking)	Minimizes energy consumption
	Inherent low harmonic signature	Harmonic emissions compliant with all relevant standards
Multilevel topology		
	Patented multilevel topology	Low parts count, which boosts drive availability
	Provides near sinusoidal current and voltage waveforms	Compatible with standard new or existing motors
Voltage Source Inverter (VSI) topology		
	Excellent availability, reliability and efficiency	Higher uptime of plant or process
	High and constant power factor	Eliminates utility penalties, minimizes losses, no system resonance issues
	Superior dynamic control performance	Safe ride through during supply voltage dips and better process control
Direct Torque Control (DTC)		
	Precise and reliable process control with superior performance	Higher productivity
Compact size		
	Requires less space in electrical room	Frees up valuable floor space

Simple drive system integration

Installing a medium voltage AC drive could not be easier with ABB's three in - three out concept. Simply disconnect the direct-on-line cable, connect the drive, and connect the drive to the motor.

Along with its flexible line supply connection options and advanced software tools the ACS2000 allows smooth and simple drive system integration into any industrial environment.

Flexible control interface

ABB offers an open communication strategy, enabling connection to higher-level process controllers. The ACS2000 can be installed with all major fieldbus adapters for smooth integration, monitoring and controlling of different processes, according to customer requirements.

DriveWindow

DriveWindow is a software package, which allows communication between ABB drives and the customer's Windows®-based applications.

Configurable disconnect

ABB offers a configurable disconnect option package for a flexible, self-contained switchgear solution where no control coordination is required upstream. It provides a visible blade switch disconnect and integral input contactor with options such as a motor protection relay, control power transformer and other customer controls.

Maintenance and personal safety

Simple and efficient maintenance is an important factor in keeping operating costs down.



The ACS2000 is designed to maximize uptime as well as to facilitate quick repair. The modular design lends itself to quick and effective replacement of components, resulting in industry leading Mean Time to Repair (MTTR).

Reliable components

ABB drive technologies, such as the multilevel VSI topology, provide a low parts count, which increases reliability, extends Mean Time Between Failures (MTBF) and improves availability.

Easy access

The ACS2000 has been designed to allow easy front access to all drive components.

Redundant cooling

The ACS2000 is available with redundant fans which increases availability.

High personal safety

Your workforce and goods are protected from dangers with ACS2000's integrated DC grounding switch.

Service and support

The ACS2000 is backed by comprehensive service and support, from the customer's initial inquiry throughout the entire life cycle of the drive system.

Installation and commissioning

Proper installation and commissioning of the equipment, done by qualified and certified commissioning engineers, reduces start-up time, increases safety and reliability and decreases life cycle costs. In addition, operators can be given practical training by experienced specialists on site.

With its three in - three out principle, flexible line supply connection options and advanced software tools, such as the commissioning wizard, start-up of the ACS2000 is easy and fast, thereby minimizing plant downtime.

Life cycle management

ABB's drive life cycle management model maximizes the value of the equipment and maintenance investment by maintaining high availability, eliminating unplanned repair costs and extending the lifetime of the drive.

Life cycle management includes:

- providing spare parts and expertise throughout the life cycle
- providing efficient product support and maintenance for improved reliability
- adding functionality to the initial product
- providing a smooth transition to a new technology at the end of the life cycle

Training

ABB provides extensive training for its medium voltage AC drives. A range of training programs is offered from basic tutorials to programs tailored to the customer's specific needs.

Global network, local presence

Aftersales service is an integral part of providing the customer with a reliable and efficient drive system. The ABB Group of companies operates in more than 100 countries and has a worldwide network of service operations.

Services for ABB's medium voltage AC drives

- Supervision of installation and commissioning
- Local support
- Worldwide service network
- Spare parts and logistics network
- Training
- Remote monitoring services
- 24 x 365 technical support
- Preventive maintenance
- Customized service agreements



Data sheet

ACS2000

Inverter type

Voltage Source Inverter (VSI), 9 levels line-to-line, with high voltage IGBT (Insulated Gate Bipolar Transistor) power semiconductors

Motors

Induction motors
300 - 3000 HP (250 – 2,500 kW)

Standards

All common standards
4 kV according to EN, IEC, CE, NEMA, IEEE 1566, UL 347A

Input

5-level self-commutated IGBT active front end (AFE)

Rated input voltages:

4.16 kV, -10% to +10% (-30% with derating)

Input frequency 50 / 60 Hz

BIL (Basic Impulse Level) = 60kV

Maximum feeder available short circuit current - 50kA
Suitable for connection to grounded, low resistance grounded, high resistance grounded and floating networks

Auxiliary supply voltage

400, 440, 480 or 600 VAC, 3-phase, 50 / 60 Hz

UPS / Single phase control supply

If available, an external UPS can be connected for control power supply, 110 – 240 VAC, single phase or 110/220 VDC. Alternatively, the control can be powered via the auxiliary supply voltage or an internal UPS can be provided.

Output frequency

0 to 75 Hz

Rated output voltage

4.0 – 4.16 kV

Efficiency of converter

up to 97.5%

Input power factor

Controlled to 1.0 or adjustable to compensate for reactive power of other loads connected to the same network

Ambient temperature

+1 to 40 °C (higher with derating)

Enclosure classes

IP21 to IP42, NEMA 1

Control interface (optional)

All common fieldbuses including Profibus, Modbus, DeviceNet, Ethernet, ControlNet, BACnet, others

Standard protection functions

Auxiliary voltage fault, overtemperature supervision, overcurrent, short circuit detection, motor overload, motor stall and overspeed protection, communication fault (I/O watchdog), earth fault, main circuit breaker supervision/tripping, emergency off signal supervision

ABB Ability hardware is standard allowing remote monitoring and diagnostics for increased uptime.

Example options

- Motor supervision I/Os
 - Fault/alarm: overtemperature, vibration of bearings
 - PT 100: winding and bearing temperatures
- Motor space heater circuit breaker protection
- Hardwired signals for remote drive control
 - References: start/stop, speed/torque etc.
 - Status feedback signals: ready/running
 - Analog signals: current/voltage/power etc.
- Redundant cooling fans with automatic switch over for duty cycling and upon fan failure
- Drive space heater
- ABB DriveWindow service and diagnostic software
- Fused disconnect / vacuum contactor package

Data sheet

ACS2000, 4.0 – 4.16 kV, low harmonic drive

Motor Data ⁽¹⁾				Converter data		Converter length and weight (approx. values)					
						direct-to-line		for operation with external transformer		with integrated transformer	
Normal duty		Heavy duty		Type code	Power	Length ¹	Weight	Length	Weight	Length	Weight
P _N	I _N	P _{hd}	I _{hd}								
hp (kW)	A	hp (kW)	A								
4,000 – 4,160 V ⁽²⁾											
300 (224)	40	220 (164)	30	ACS2000-040-A01A-L1-010	280	77.5 (1,968)	4,570 (2,073)	77.5 (1,968)	4,570 (2,073)	n/a	n/a
350 (261)	47	257 (191)	35	ACS2000-040-A01B-L1-010	326	77.5 (1,968)	4,570 (2,073)	77.5 (1,968)	4,570 (2,073)	n/a	n/a
400 (298)	54	293 (219)	39	ACS2000-040-A01C-L1-010	373	77.5 (1,968)	4,570 (2,073)	77.5 (1,968)	4,570 (2,073)	n/a	n/a
450 (336)	61	330 (246)	44	ACS2000-040-A01D-L1-010	420	77.5 (1,968)	4,570 (2,073)	77.5 (1,968)	4,570 (2,073)	n/a	n/a
500 (373)	67	367 (274)	49	ACS2000-040-A01E-L1-010	466	77.5 (1,968)	4,570 (2,073)	77.5 (1,968)	4,570 (2,073)	n/a	n/a
600 (448)	81	440 (328)	59	ACS2000-040-A01F-L1-010	560	77.5 (1,968)	4,570 (2,073)	77.5 (1,968)	4,570 (2,073)	n/a	n/a
700 (522)	94	513 (383)	69	ACS2000-040-A01G-L1-010	653	77.5 (1,968)	4,570 (2,073)	77.5 (1,968)	4,570 (2,073)	n/a	n/a
800 (597)	108	587 (438)	79	ACS2000-040-A01H-L1-010	746	77.5 (1,968)	4,570 (2,073)	77.5 (1,968)	4,570 (2,073)	n/a	n/a
900 (671)	121	660 (492)	89	ACS2000-040-A01J-L1-010	839	77.5 (1,968)	4,570 (2,073)	77.5 (1,968)	4,570 (2,073)	n/a	n/a
1000 (746)	135	733 (547)	99	ACS2000-040-A01K-L1-010	933	77.5 (1,968)	4,570 (2,073)	77.5 (1,968)	4,570 (2,073)	n/a	n/a
1250 (933)	168	916 (684)	123	ACS2000-040-A02A-L1-010	1,166	114.8 (2,916)	6,750 (3,672)	114.8 (2,916)	6,750 (3,672)	n/a	n/a
1500 (1119)	202	1100 (821)	148	ACS2000-040-A02B-L1-010	1,399	114.8 (2,916)	6,750 (3,672)	114.8 (2,916)	6,750 (3,672)	n/a	n/a
1750 (1306)	236	1283 (957)	173	ACS2000-040-A02C-L1-010	1,632	114.8 (2,916)	6,750 (3,672)	114.8 (2,916)	6,750 (3,672)	n/a	n/a
2000 (1492)	269	1467 (1094)	197	ACS2000-040-A02D-L1-010	1,865	114.8 (2,916)	6,750 (3,672)	114.8 (2,916)	6,750 (3,672)	n/a	n/a
2250 (1679)	303	1650 (1231)	222	ACS2000-040-A03A-L1-010	2,099	137.2 (3,486)	9,000 (4,082)	137.2 (3,486)	9,000 (4,082)	n/a	n/a
2500 (1865)	337	1833 (1368)	247	ACS2000-040-A03B-L1-010	2,332	137.2 (3,486)	9,000 (4,082)	137.2 (3,486)	9,000 (4,082)	n/a	n/a
2750 (2052)	370	2,017 (1504)	272	ACS2000-040-A03C-L1-010	2,565	137.2 (3,486)	9,000 (4,082)	137.2 (3,486)	9,000 (4,082)	n/a	n/a
3000 (2238)	404	2200 (1641)	296	ACS2000-040-A03D-L1-010	2,798	137.2 (3,486)	9,000 (4,082)	137.2 (3,486)	9,000 (4,082)	n/a	n/a

Notes:

* Indicative information referring to typical 4-pole motor, under nominal supply voltage conditions. The ratings apply at 40°C. At higher temperatures (up to 50°C) the derating is 1.5% / 1°C.

Light-overload use (normal duty)

P_N: Typical motor power in light-overload use.

I_N: Continuous current rating of particular sub-frame allowing 110% I_N at 40°C for 1 minute every 10 minutes.

Heavy-duty use

P_{hd}: Typical motor power in heavy-duty use.

I_{hd}: Continuous current rating of particular sub-frame allowing 150% I_{hd} at 40°C for 1 minute every 10 minutes.

** 4.16 kV, +10% to -10%

Dimensions (h x l x d) includes standard fan

Frame 1 Dimensions

inches: 90.0 x 77.5 x 46.8
mm: 2285 x 1968 x 1190

Frame 2 Dimensions

inches: 98.0 x 114.8 x 46.8
mm: 2489 x 2916 x 1190

Frame 3 Dimensions

inches: 98.0 x 137.2 x 46.8
mm: 2489 x 3486 x 1190

1) With fused disconnect / contactor option, add 28 in (698 mm) to length.

Data sheet

ACS2000, 4.0 – 4.16 kV, regenerative drive

Motor Data ⁽¹⁾				Converter data		Converter length and weight (approx. values)					
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Normal duty		Heavy duty		Type code	Power	Length ¹	Weight	Length	Weight	Length	Weight
P _N	I _N	P _{hd}	I _{hd}								
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Notes

Notes



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