ABB high performance machinery drives

ACSM1, 0.75 to 45 kW / 1 to 60 hp

Technical catalogue

Contents

Type code structure:

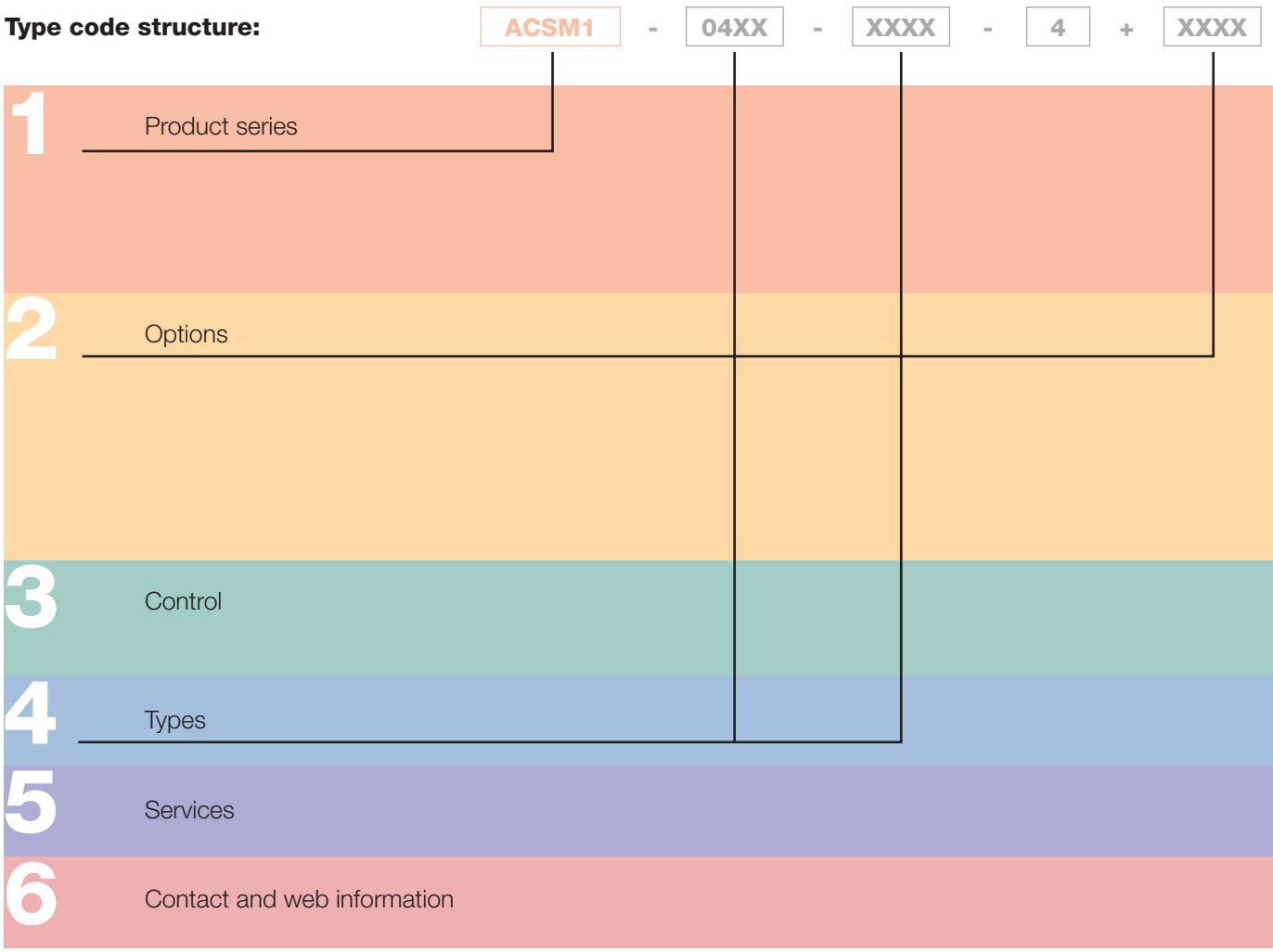


ABB high performance machinery drives, ACSM1

ABB high performance machinery drives

ACSM1 - 04XX - XXXX - 4 + XXXX

ABB high performance machinery drives

ABB high performance machinery drives provide speed, torque and motion control for demanding machines. They can control induction, synchronous and asynchronous servo and high torque motors with various feedback devices. The compact hardware and programming flexibility ensure the optimum solution. The innovative memory unit concept enables flexible drive configuration.

DTC DIRECT TORQUE CONTROL

Industries and applications

The high performance machinery drives are ideal for

- Plastics and rubber
  - Extruders
  - Calenders
  - Injection moulding machines
  - Winders & unwinders
  - Blow moulding machines
- Printing
  - Sheet-fed printing
  - Commercial printing
  - Label printing
  - Web printing
  - Bindery machines
- Paper & paperboard, film & foil converting
  - Calendering
  - Slitter
  - Coating
  - Sheeter
  - Laminating
  - Winders
- Material handling
  - Cranes
  - Automatic storage
  - Elevators
  - Pick and place systems
  - Conveyors
  - Palletising
- Textile
  - Knitting/weaving machines
  - Needle punching machines
  - Non-woven machines
  - Fibre processing machines
  - Spinning/speeder machines
  - Textile coating machines
- Other industries and applications
  - Woodworking machinery
  - Plywood and chipboard industry
  - Flying and rotary shear
  - Packaging machinery
  - Wire & cable drawing machines
  - Food and beverage

Highlights

- For demanding machinery applications
- For synchronous and induction motors
- Wide range of feedback interfaces
- Solution programming to extend drive functions
- Modular and compact design
- Memory unit for easy drive management
- Safe Torque Off

Features

Features	Benefits	Notes
Control and performance		
For synchronous and induction motors	As a standard feature almost any kind of motor type can be controlled in open or closed loop mode.	Asynchronous motors (standard induction, servo) and synchronous motors (servo, high torque).
Two control variants	Optimum selection for each machine control philosophy from centralized to decentralized and between.	Speed and torque control Motion control
High performance	Suitable for demanding machinery applications.	High bandwidth of torque, speed and position control.
Solution programs	When application-specific functionality is needed in the drive, then ready-made solution programs can be used.	An alternative solution is to use a suitable function block library and develop your own solution programs.
Drive-to-drive link as standard	Enables fast and time-synchronized communication between different drive units.	Multiple drives connected in daisy chain.
Wide range of feedback interfaces	Optimal feedback interface set-up can be chosen for different applications.	Each feedback interface option has two inputs and one output. Also fast DIs included for touch probe function.
I/O extensions as inbuilt options	In addition to the extensive standard offering, different I/O extensions can be plugged in to increase analogue and digital inputs/outputs.	
Different communication options for master communication	The optimum communication can be selected.	
Modular and compact design		
Size	Four compact frame sizes.	
Modular design	The drive has three main parts: power unit, control unit, memory unit.	Control unit and memory unit always have the same hardware, so the control and configuration interface is always the same.
Integrated braking chopper	Included as standard, compact design.	
Several assembly and cooling options	Optimized for various cabinet design and lay-outs.	DIN-rail, back plate, side-by-side, cold plate.
User interface and programming		
Memory unit for easy drive management	Drive functionality can be easily defined, modified or updated with the memory unit. Also enables easy and fast after-sales service.	Complete drive configuration and settings are stored in memory unit.
Simple and flexible human-machine interface	7-segment display shows the drive status messages. DriveStudio PC-programs enable easy access to drive programming and start-up. Advanced control panel can be used for general service routines.	
Drive programming	Function block programming provides an easy and innovative method for extending the functionality of the drive firmware.	
Safety as standard	Integrated Safe Torque Off (STO) function as standard.	SIL 3/IEC 61508, Cat. 4/EN 954-1, EN ISO 13849-1: PL e.

Technical specification

ACSM1 - 04XX - XXXX - 4 + XXXX

Main connections

Supply voltage	3-phase 380 to 480 V +10 /- 15%
Frequency	50 to 60 Hz +/- 5%
Total harmonic distortion (THD)	With optional mains choke (external) to meet limits acc. to EN 61000-3-2, Draft IEC 61000-3-12, IEC 61000-3-4

DC connection

DC voltage level	436 to 712 V DC
Charging	Internal

Motor connection

Motor types	Asynchronous motors (standard induction, servo) and synchronous motors (servo, high torque)
Output frequency	0 to 500 Hz
Switching frequency	2 to 16 kHz, 4 kHz as default. Output current derating above 4 kHz

Braking power connection

Braking chopper	As standard in all types
Braking resistor	External resistor connected to drive

Operating conditions

Degree of protection	IP20 acc. to EN 60529; Open Type acc. to UL 508.
Ambient temperature	-10 to +55 °C, derating above 40 °C
Installation altitude	0 to 4000 m, derating above 1000 m
Relative humidity	max. 95%
Climatic/environmental conditions	Class 3K3, 3C2 acc. to EN 60721-3-3. Oil mist, formation of ice, moisture condensation, water drops, water spray, water splashes and water jets are not permissible (EN 60204, Part 1).
Vibration	Class 3M4 acc. to EN 60721-3-3
EMC (According to EN 61800-3)	Noise emission: - Standard: No filtering - With filter: Category C2
Functional safety	Safe Torque Off function (STO acc. Draft EN 61800-5-2). IEC 61508: SIL 3 EN 954-1: Category 4 IEC 62061: SILCL 3 EN ISO 13849-1: PL e
Compliance	CE, UL, cUL, CSA, C-Tick

ACSM1 drive

High performance machinery drives

The ACSM1 series of high performance machinery drives offers versatile features for machinery applications. The ACSM1 covers power ratings from 0.75 to 45 kW (2.5 A to 90 A) in four frame sizes.

Designed for machine builders

The ACSM1 is the optimum choice for machine builders. The ACSM1 can control with or without feedback induction motors, asynchronous and synchronous servo motors. It uses proven DTC motor control technology to guarantee high performance. The mechanical design is very compact and drives can be installed side-by-side. In addition to covering standard features there are three slots for control and communication options. Drive tools support commissioning, tuning and programming. The ACSM1 offers optimum selection for each machine control philosophy.

Modular and compact design

- Four compact frame sizes
  - 0.75 kW (1 Hp) to 45 kW (60 Hp) / 380 to 480 V
  - IP20
  - Supply AC or DC input from top
  - Motor and braking resistor connection from bottom
  - Inbuilt braking chopper as standard

- Optimum assembly and cooling solutions
  - Side-by-side installation
  - Air-cooled variant including support for DIN-rail mounting or back plate mounting
  - Cold-plate variant for external cooling method
  - Removable control terminals and power terminals enables fast assembly and maintenance

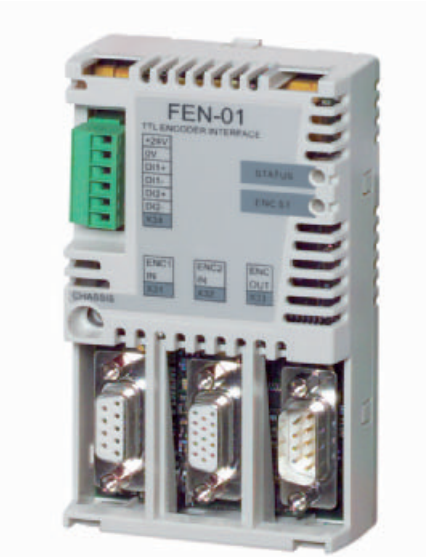
- Flexibility with different external options
  - Mains filters to meet EMC requirements
  - Mains chokes to limit harmonic distortion (THD)
  - Braking resistors for various braking power needs

- Global compatibility with machinery environment and standards
  - Standard approvals for CE, UL, cUL, CSA, C-Tick
  - With external mains filter: EN 61800-3, category C2 (A-limits)
  - Integrated Safe Torque Off (STO) function according to SIL 3/IEC 61508 and Cat. 4/EN 954-1
  - Coated boards as standard to meet environmental requirement

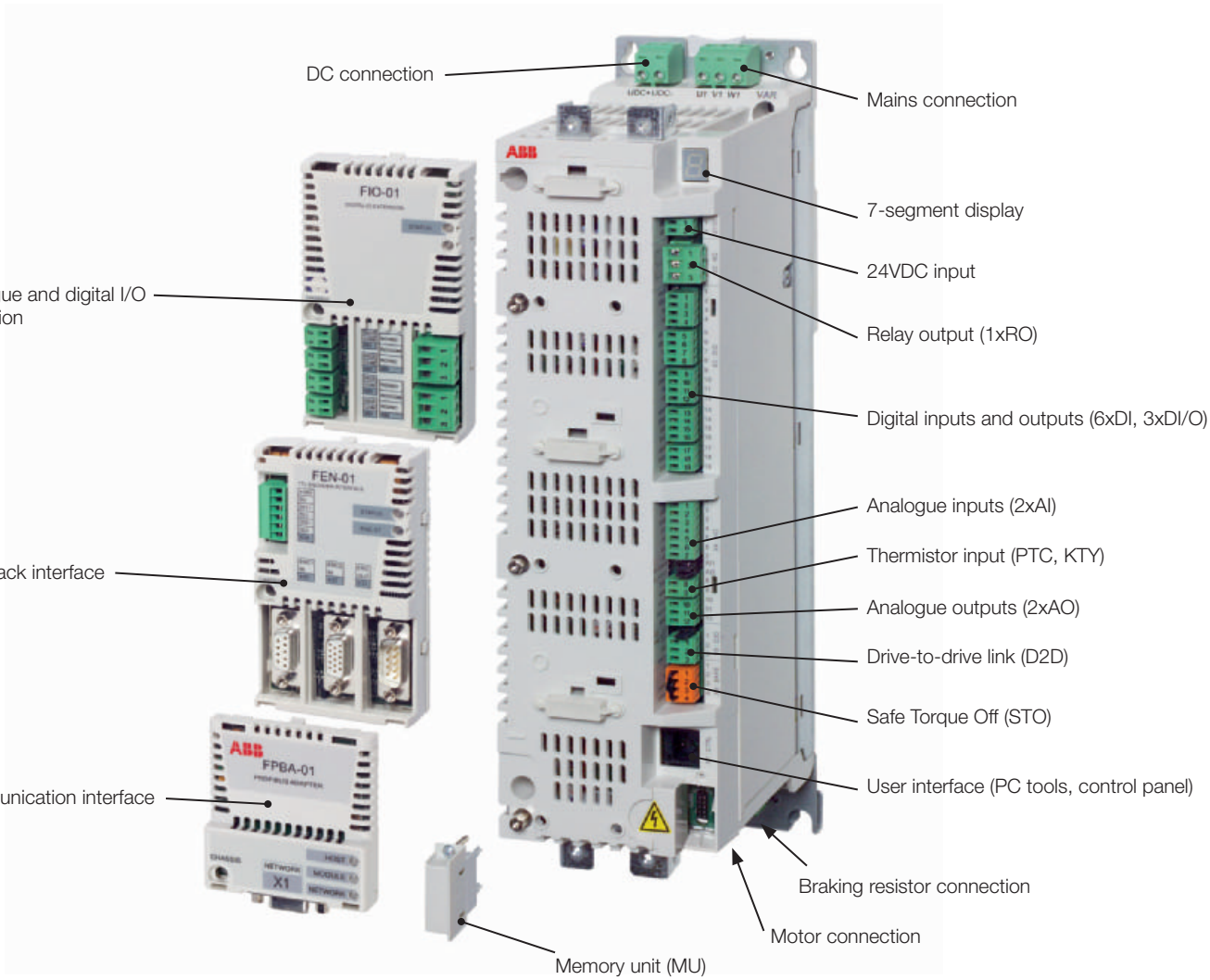
Control and communication

- Control interface with versatile standard connections
  - Digital input/output: 6DI, 3DI/O, 1 relay output
  - Analogue input/output: 2AI + 2AO
  - Motor thermistor input (PTC/KTY)
  - Drive-to-drive communication link
  - Complete drive configuration and settings are stored in memory unit

- Scalability with different plug-in control options
  - Three options slots for control options
  - Analogue and digital I/O extension modules
  - Interfaces for different feedback types (TTL, Resolver, Sin/Cos, Endat, Hiperface, SSI)
  - Master communication via fieldbuses (PROFIBUS, DeviceNet, CANopen and Ethernet)



Options
Internal



Control and communication options

Options	Data	Slot 1	Slot 2	Slot 3
Analogue & digital extension				
FIO-01	4 x DI/O, 2 x RO	○	○	–
FIO-11	3 x AI, 1 x AO, 2 x DO	○	○	–
Feedback interface				
FEN-01	2 inputs (TTL incremental encoder), 1 output	○	○	–
FEN-11	2 inputs (SinCos absolute, TTL incremental encoder), 1 output	○	○	–
FEN-21	2 inputs (Resolver, TTL incremental encoder), 1 output	○	○	–
Communication				
FPBA-01	PROFIBUS	–	–	○
FCAN-01	CANopen	–	–	○
FDNA-01	DeviceNet	–	–	○
FENA-01	Ethernet/IP	–	–	○

○ = option
– = not available

Options
External

Mains choke

The ACSM1 drive does not necessarily need a mains choke for operation. Each individual case should be checked to ascertain whether a mains choke needs to be installed. Mains chokes are typically used to:

- reduce harmonics in the mains current
- achieve a reduction in the r.m.s. mains current
- reduce mains disturbance and low-frequency interference
- increase the allowed DC bus continuous power

A mains choke series is available to meet different system design needs.

Mains filter (EMC)

The EMC product standard (EN 61800-3 + Amendment A11 (2000)) covers the specific EMC requirements stated for drives (tested with motor and cable) within the EU. The new revision of 61800-3 (2004) product standard can be applied from now on, but latest from 1st October 2007. EMC standards such as EN 55011, or EN 61000-6-3/4, apply to industrial and household equipments and systems including drive component inside. Drive units complying with requirements of EN 61800-3 are always complient with comparable categories in EN 55011 and EN 61000-6-3/4, but not necessarily vice versa. EN 55011 and EN 61000-6-3/4 do not specify cable length nor require a motor to be connected as a load. The emission limits are comparable according to the following table, EMC standards.

EMC standards in general

EN 61800-3/A11 (2000), product standard	EN 61800-3 (2004), product standard	EN 55011, product family standard for industrial, scientific and medical (ISM) equipment
1st environment, unrestricted distribution	Category C1	Group 1 Class B
1st environment, restricted distribution	Category C2	Group 1 Class A
2nd environment, unrestricted distribution	Category C3	Group 2 Class A
2nd environment, restricted distribution	Category C4	Not applicable

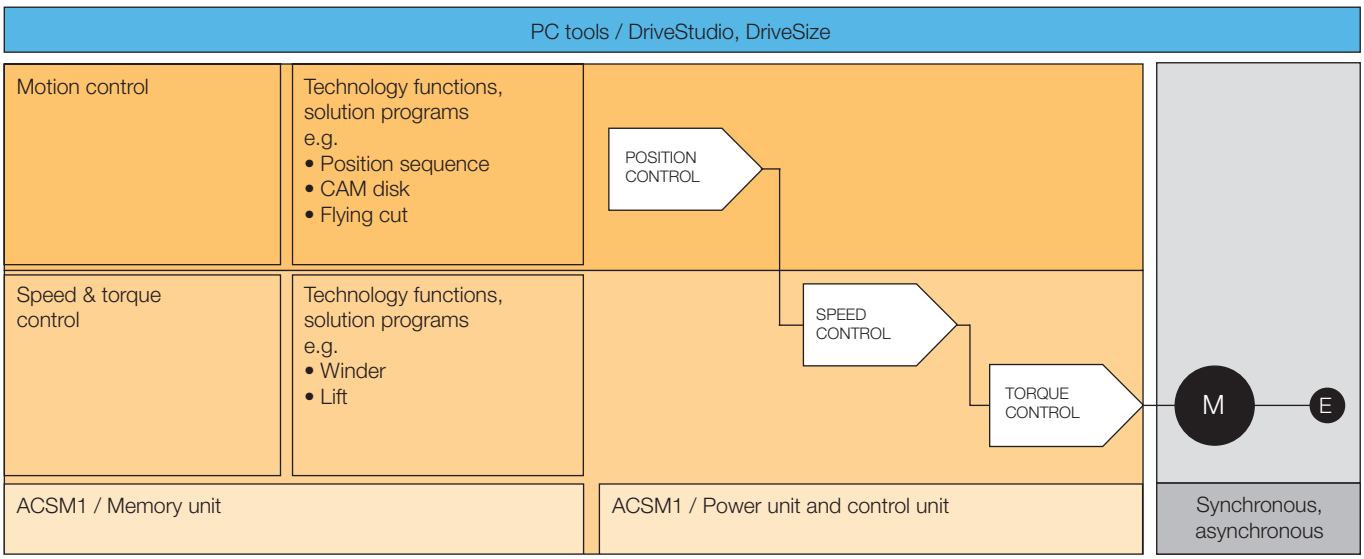
Mains filters are available to meet category C2 level with the ACSM1 drive installation, including a motor with a max. 50 m cable. This level corresponds to the A limits for Group 1 equipment according to EN 55011.

Braking resistors

Depending on the application, an external braking resistor may be needed to convert the kinetic energy generated into thermal energy. A selection of resistors is available for different kinds of pulse duty performance. All braking resistors are equipped with a thermal sensor as standard.

Control and programming

Scalable control and programming environment



Two control variants

- Speed and torque control
- Motion control

Speed and torque control

- Open and closed loop DTC
- Synchronous and asynchronous motors
- Ideal for high bandwidth of speed or torque control application

Motion control

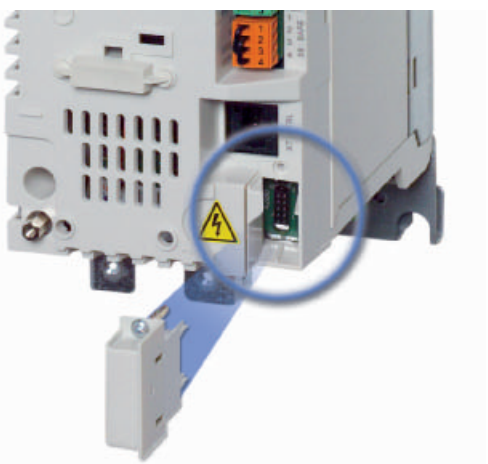
In addition to speed and torque control

- High bandwidth of position and synchronization control
- Point-to-point positioning with extensible positioning profile sets
- Synchronization (encoder feedback or drive-to-drive link)
- Register control based on fast probe inputs
- Multiple homing methods

Solution programming

In addition to multiple parameter programmable speed and position control functions, drive functionality can be easily modified or extended using solution programming.

- Standard function blocks to modify a basic control interface or make extensible PLC-tasks.
- Technology function blocks to meet machine-specific application requirements, e.g. damping filters for demanding mechanical systems. Technology function block libraries are optional.
- Solution programs, ready-made solutions for dedicated applications such as winding, lift control and flying cut applications using the corresponding technology function library. Easy to modify with parameters or additive function blocks.
- Drive functionality is defined and delivered with memory unit.



Drive tools

DriveStudio

User-friendly PC environment both for simple drive commissioning tasks and for the more demanding drive tuning and programming tasks.

Commissioning and tuning tools

- Drive overview screen for fast parameter and function block navigation
- Parameter setting and signal monitoring
- Data logger and on-line signal monitoring for drive tuning (multiple signal channels and triggering conditions)
- Back-up and restore tool for drive parameter cloning and life time support
- Case sensitive helps with detailed drive parameter, event and function descriptions

Solution program composer

- Simple, easy-to-understand function block interface to drive firmware functions for signal monitoring and parameter setting
- Same interface enables the adding of user-defined function block programs even on the fastest time levels of the drive control
- Function block programming with standard function block library
- Optional and changeable technology function block library expands the variety of functions
- Professional programming environment: hierarchy levels, custom circuits, user parameters, copy protection etc.

DriveCAM tool

- Multiple methods for designing axis profile between reference axis and controlled drive axis
- Upload/download to drive memory, multiple profiles

Assistant control panel

The assistant control panel features a multilingual alphanumeric display for easy drive configuration. It is an ideal tool for service engineers providing the following main features:

- A large graphical display
- Extremely easy to navigate
- Soft and convenient keys
- Local control keys (start/stop/reference)
- Parameter setting and monitoring
- Status and history data

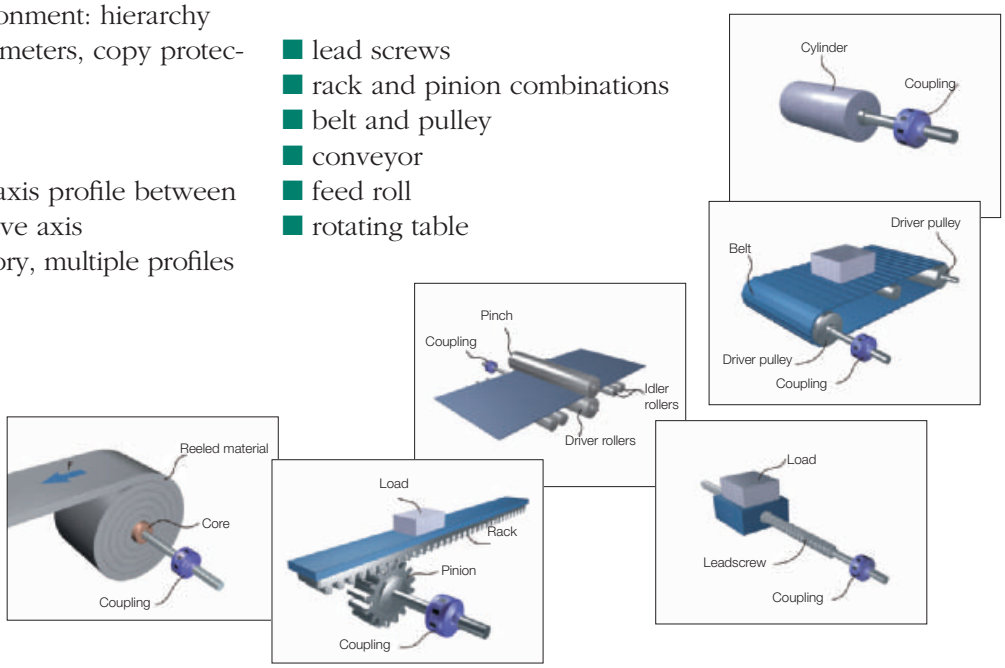
The control panel is an external option and can be connected by cable to the ACSM1 drive. The panel mounting kit enables mounting of control panels on the cabinet doors or inside the control cabinet.

Sizing tool

DriveSize helps the machine designer to select the optimum ACSM1 drive, motor and gear combination for the required motion and speed profiles, and for typical mechanical applications.

Ready defined input sheets make it very easy to specify the dimensions of different kinds of linear or rotary movement mechanisms such as

- lead screws
- rack and pinion combinations
- belt and pulley
- conveyor
- feed roll
- rotating table



Types, ratings and dimensions

ACSM1 - 04XX - XXXX - 4 + XXXX

Feature / frame size	A	B	C	D
Current & Power				
Nominal current	2.5 - 7.0 A	9.5 - 16 A	24 - 46 A	60 - 90 A
Maximum current	5.3 - 14.7 A	16.6 - 28 A	42 - 81 A	105 - 158 A
Typical motor power	0.75 - 3 kW	4 - 7.5 kW	11 - 22 kW	30 - 45 kW
Braking chopper	●	●	●	●
Braking resistor	□	□	□	□
Mains choke	□	□	□	□
Mains filter (EMC)	□	□	□	□
Mounting and cooling				
Removable power connectors	●	●	–	–
Removable control connectors	●	●	●	●
Air-cooled variant	■	■	■	■
- Back plate mounting	●	●	●	●
- DIN-rail mounting	●	●	–	–
Cold plate variant	–	–	■	■

● = standard
■ = product variant
□ = option, external
– = not available

Ratings

Ratings				Type code	Frame size	$I_{2cont4k}$ [6] 4 kHz	$I_{2cont8k}$ [7] 8 kHz	$I_{2cont16k}$ [8] 16 kHz
P_N [1] kW	P_N [1] hp	I_{2N} [2] A	I_{2max} [3] A			A	A	A
0.75	1	2.5	5.3	ACSM1-04x[4]x[5]-02A5-4	A	3	2.5	2
1.1	1.5	3	6.3	ACSM1-04x[4]x[5]-03A0-4	A	3.6	3	2.2
1.5	2	4	8.4	ACSM1-04x[4]x[5]-04A0-4	A	4.8	4	2.4
2.2	3	5	10.5	ACSM1-04x[4]x[5]-05A0-4	A	6	5	2.5
3	3	7	14.7	ACSM1-04x[4]x[5]-07A0-4	A	8	5.5	3
4	5	9.5	16.6	ACSM1-04x[4]x[5]-09A5-4	B	10.5	9.5	5
5.5	7.5	12	21	ACSM1-04x[4]x[5]-012A-4	B	14	12	6
7.5	10	16	28	ACSM1-04x[4]x[5]-016A-4	B	18	13	7.5
11	15	24	42	ACSM1-04x[4]x[5]-024A-4	C	27	24	18
15	20	31	54	ACSM1-04x[4]x[5]-031A-4	C	35	31	20
18.5	25	40	70	ACSM1-04x[4]x[5]-040A-4	C	44	35	22
22	30	46	81	ACSM1-04x[4]x[5]-046A-4	C	50	38	24
30	40	60	105	ACSM1-04x[4]x[5]-060A-4	D	65	55	28
37	50	73	128	ACSM1-04x[4]x[5]-073A-4	D	80	60	31
45	60	90	150	ACSM1-04x[4]x[5]-090A-4	D	93	65	34

[1] P_N: Typical motor power. A and B frame sizes with or without mains choke, C and D frame sizes with mains choke.
[2] I_{2N}: Nominal output current.
[3] I_{2max}: Maximum short time output current.
[4] x[4]) A = Air-cooling
C = Cold plate
[5] x[5]) = Control (torque, speed, motion)
[6] $I_{2cont4k}$: Continuous output current at a switching frequency of 4 kHz at 40 °C (104 °F).
[7] $I_{2cont8k}$: Continuous output current at a switching frequency of 8 kHz at 40 °C (104 °F).
[8] $I_{2cont16k}$: Continuous output current at a switching frequency of 16 kHz at 40 °C (104 °F).

Dimensions

Frame size	Height [1] mm	Width mm	Depth [2] mm	Weight kg
A	364	90	146	3
B	380	100	223	5
C	467	165	225	10
D	467	220	225	17

Notes
All dimensions and weights are without options.
[1] Height is the maximum measure without clamping plates.
[2] Depth will increase by 23 mm with options. Additionally, 50 mm should be reserved for feedback cabling if FEN-xx options are used.

Services

With its large variety of drive lifecycle services and worldwide service network ABB aims for high drive availability and a long lifetime.

Training and learning

The ABB University provides e-learning modules enabling people to gain familiarity with all ACSM1 features, ranging from product specification to installation and commissioning. In addition to drive-specific items, basic training for motion control applications and related engineering is also extensively covered. Hands-on training courses are run in local training centers.

On-site services

ABB's professional on-site service uses certified engineers to install and adjust ABB drives according to the application requirements as well as to instruct the user on how to best operate the drive.

Supportline services

The support line network provides fast and efficient support to ABB drive users. The service is available via e-mail and telephone.

Lifecycle management

The ABB drive product lifecycle management model provides solutions in all lifecycle phases to ensure drive availability, operation and performance in your machine. This four-phase model provides not only optimum support to you but also a smooth transition to a new drive when the service life of your current drive ends. It also provides ABB with a well-structured means of managing different drive generations. With complete lifecycle support, you will always be aware of the support plans for your valuable assets.

Spare part services

Genuine ABB factory-certified drive parts are delivered quickly worldwide. They guarantee full compatibility and are available throughout the drive lifetime following the drive lifecycle model.

Drives product lifecycle management

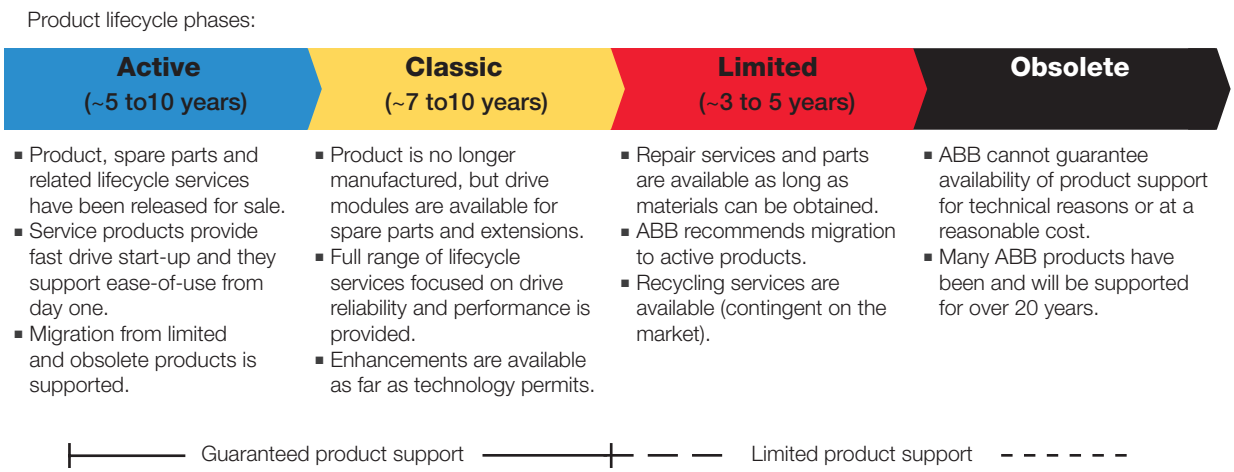


ABB is following a four-phase model for managing lifecycles of its drives for enhanced customer support and improved efficiency. Many ABB products have been and will be supported.

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ABB Oy
Drives
P. O. Box 184
FI - 00381 Helsinki
Finland
Telephone +358 10 22 11
Telefax +358 10 22 22681
Internet www.abb.com/motors&drives

UK Distributor

MOTION CONTROL PRODUCTS LTD.
11-15 Francis Avenue
Bournemouth, Dorset, UK BH11 8NX
Tel.: +44 (0)1202 599922
Fax: +44 (0)1202 599955
www.motioncontrolproducts.com