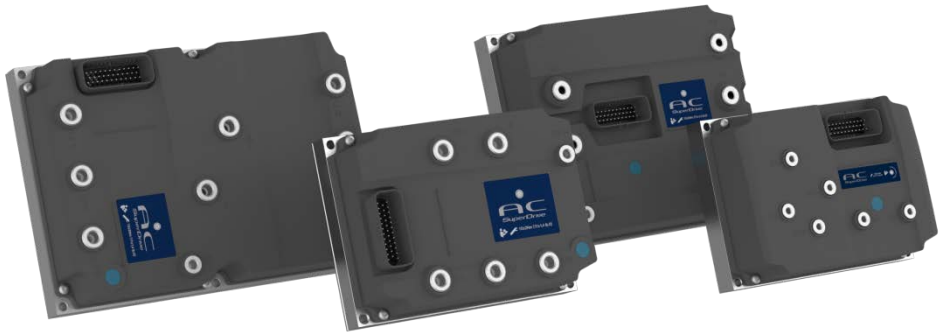
ACS GEN7

The 7th generation ACS motor controllers

Inmotion is the premier global supplier of AC drives and related products to the vehicle industry. AC Superdrive (ACS) is a family of drives with power levels from 10 to 80 kVA, for system voltages between 24 V and 96 V. The ACS is designed with traction, hydraulic pump and generator applications in mind which makes it an ideal choice for most battery-powered electric vehicles.

With ACS GEN7 Inmotion offers very high power density and unparalleled flexibility in application customization together with compliance to demanding functional safety requirements.

In addition to CAN bus communication, all ACS models are available with optional vehicle control I/O to facilitate distribution of vehicle control functionality in a larger control system, or for stand-alone operation.



PRODUCT FEATURES

- **Best in class quality and reliability** achieved through superior design and manufacturing processes
- **Rugged design** suitable for the demanding environment of electric vehicles. Protected against ingress of dust and water
- **Powerful ARM processor** and operating system allows parallel execution of customized vehicle control tasks and motor control tasks
- **I/O version** allows vehicle control to reside in the ACS, directly interfacing vehicle sensors and actuators
- Software Quality is assured through development and review processes designed for compliance with **Automotive SPICE®** and **ISO 13849-1**
- Industry standard **CANopen** (**Slave** or **Master**) and **J1939** protocols for reliable communication in the vehicle
- Extensive and powerful event handling and data logging simplifies troubleshooting and ensures **minimized vehicle down time**
- Supports **AC induction, AC synchronous** and **brushless DC motors**.
- Standard firmware with built-in support for **traction**, **pump** or **generator applications** in electric/hybrid vehicles, including functions such as hill-hold, programmable braking/acceleration characteristics, and dual traction
- **Auto tuning** functionality for pairing the controller with a motor already installed in a vehicle
- Limitation of the output as a function of **motor speed,** motor and controller **temperature, battery voltage, DC power, DC current** and/or **motor torque** to protect powertrain components
- State of the art vector control with **optimal efficiency** throughout the full speed range
- **Dual CPUs** and **dual feedback** channels for redundant cross monitoring and supervision allows **ISO13849-1, cat. 3** implementation of safety functions to achieve PL=c/d

GENERAL

Motor type	Induction AC, Synchronous AC, Brushless DC
Communication	CAN (CANopen, J1939)
Switching frequency	4, 8, 12, 16 kHz
Operating stator frequency	0-599 Hz
Control mode	Speed (rpm), Torque (Nm), Current (ARMS) or Voltage (VDC)
Connector	AMP SEAL 23-pin or AMP SEAL 35-pin
Operating temperature	-40°C to + 55°C (-40°F to +131°F)
Storage temperature	-40°C to +85°C (-40°F to +185°F)
Protection class	IP65
Standards	UL 583 and EC declaration of incorporation of partly completed machinery according to directive 2006/42/EC and 2014/30/EU i.e. C-standard EN 1175-1 and EN 12895

I/O SUMMARY

ACS GEN7 comes with an option of I/O to optimally suit most applications. The 23 pin interface (23P) is optimized for slave units in a CAN network, with limited I/O capacity. The 35 pin interface (35P) features a larger number of I/O to be used by the application software for standalone operation, vehicle control, or as distributed I/O in a vehicle network. The dual inverter I/O (35P-D) requires more motor interface pins and is thus slightly different. Below is an outline of the various I/O options of ACS GEN7.

	ACS 23 pin basic	ACS 35 pin premium	ACS Dual 35 pin
Dedicated HW ID	2	-	-
Multifunction I/O*	3	5	5
Digital inputs	-	9	5
Analog inputs	-	2	-
High side in/out	1	1	1
Sensor supply	1	2	2
Current control output	2	2	4
PWM control output	-	2	-
On/off output	-	2	-
CAN**	2	1	2
Motor temp	1	1	2

* Multifunction I/O can be used as motor feedback, analog in, or digital in. Motor feedback supported is encoder, UVW (6-step), analog sin/cos

** CAN interface consists of CAN_HIGH, CAN_LOW and CAN_GND. The 23P and 35P-D versions have two of each pin to facilitate daisy-chaining in a network. Additionally all inverters have a CAN_120 pin that serves to terminate the CAN bus if a jumper is placed in the wiring harness

OPTIONS

ACS model	Terminal posts	Multi axle
S	Threads	-
M	Studs or threads	Dual controller
L	Studs or threads	-

CURRENT AND OUTPUT RATINGS

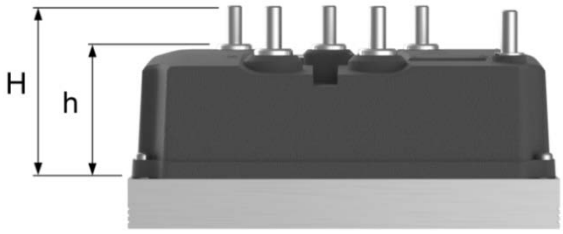
ACS model	Nominal DC supply voltage Udc	Rated current (S2, 2min) ARMS**	Rated current (S2, 1h) ARMS***	Rated power (S2, 2min) kVA**	Rated power (S2, 1h) kVA***
ACS S					
ACS24S35*	24	350	150	10	4
ACS48S28*	48	280	120	17	7
ACS M (also available as dual inverter, MD*)					
ACS24M55	24	550	275	16	8
ACS48M35	48	350	175	21	10
ACS48M45		450	225	27	13
ACS48M55		550	275	32	16
ACS80M23	80	230	115	23	11
ACS80M35		350	175	34	17
ACS80M40		400	200	39	20
ACS96M23	96	230	115	27	14
ACS96M35		350	175	41	21
ACS96M40		400	180	47	21
ACS L					
ACS48L70	48	700	350	41	21
ACS48L90		900	450	53	27
ACS80L50	80	500	250	49	25
ACS80L60		600	300	59	29
ACS80L70		700	350	69	34
ACS96L50	96	500	250	59	29
ACS96L60		600	300	71	35
ACS96L70		700	350	82	41

* Available with 35-pins I/O connector

** 2 minute rating at 8 kHz switching frequency and 25 °C ambient temperature

*** 1h rating at 8 kHz switching frequency. 40 °C ambient temperature. and 6 m/s air flow through finned heat sink

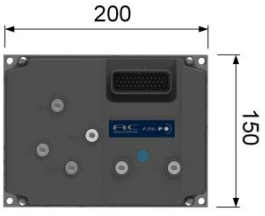
ACS GEN7 HEIGHT WITHOUT HEAT SINK



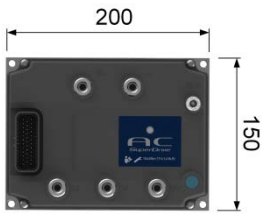
ACS model	H* [mm]	h** [mm]
S	-	50.4
M	72.3	52.3
MD	72.3	52.3
L	79.7	59.7

* With optional studs
** Without optional studs

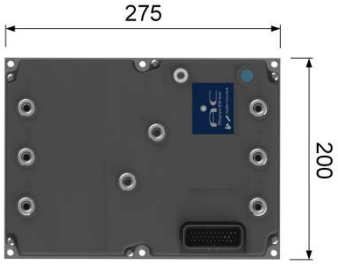
ACS FOOTPRINTS [mm]



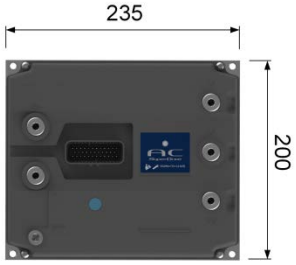
ACS S



ACS M

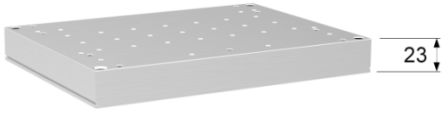
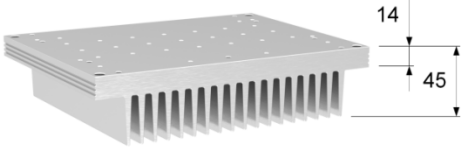
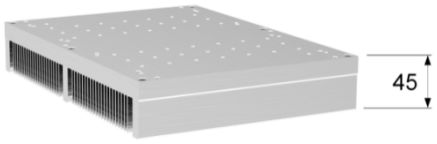
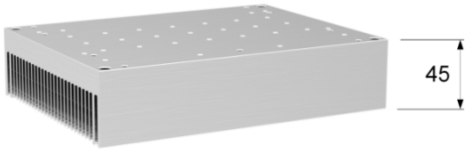
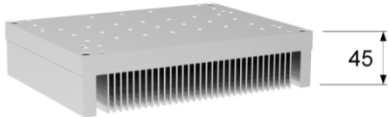


ACS MD



ACS L

HEAT SINKS

Heat sink type	Height [mm]	ACS compatibility
C		S M MD L
F		M L
Q		MD
T		S M
Y		S M MD L