



# TM4 Smartmotion™ AC-S1 Low-Voltage Inverters

## Controller for AC Induction Motor

Dana TM4 inverters provide advanced control of AC induction motors for traction or pump functions of any electrical vehicle working with speed or torque control algorithms.

## Mobile Machine Management

SmartMotion is an integrated controller which can manage multi-function and fully configurable I/O pins for any I/O functions like digital & analogue inputs and outputs, capable of driving fans, relays' and hydraulic valves' coils, contactors, negative brakes and many others inductive/resistive loads.

## Vehicle Application Development

Users develop AC-S1 applications with the TM4 TAU™ Software: All features are offered as standard ("one fits all" philosophy). Virtually everything can be changed with one click in an intuitive graphical tuning environment. The clone file technology allows uploads, downloads and modifications of your configuration. With TM4 TAU system, a first run for a wired vehicle can be made in minutes (not days).



Ideal for Off-Highway Applications.



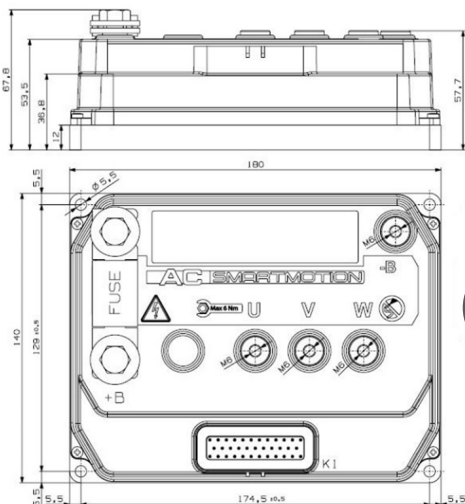
# TM4 Smartmotion™ AC-S1 Low-Voltage Inverter

## AC motor control features:

- Indirect Field Oriented Control (IFOC) with unsurpassed dynamic and performance in full speed range by decoupling and regulating flux and torque vectors of stator current components
- Advanced Space Vector Modulation (SVM) technique for high system efficiency reducing motor harmonics and losses
- Accurate Rotor Flux Model and Fully Developed Field Weakening technique for high motor efficiency and dynamic across full speed range
- Motor model fully compatible with IEEE Standard in order to get the parameters of motor's equivalent circuit from no-load and blocked rotor tests; it can work with all AC motors of all manufactures
- Quick and easy selection between Torque Control and Speed Control

## General features

- Fully configurable through supplied GUI TM4 TAU™ called SmartView, which reduces abruptly the time to market start-up of the system
- Flexible configuration of I/O in order to couple them to any provided functions
- Standard and same firmware for all inverter series (easily extendable to future models)
- Robust, safe and self-diagnostic (both for hardware and software fault conditions)
- CAN Open and serial interfaces
- Powerful logging of all sensible working variables
- Optional DC Motor Control



AC-S1	24V			36-48V		
Nom. voltage (Vdc)	24			36 - 48		
Input voltage range (Vdc)	11 - 32			22 - 64		
Cont. current (Arms)	38	75	150	38	100	150
Nom. current S2- 2 min (Arms)	75	150	300	75	200	300
Output voltage (VAC)	3 x 0 to 16 (@24 VDC)			3 x 0 to 24 (@36 VDC) 3 x 0 to 32 (@48 VDC)		
Power terminals	M6 (U/V/W/-B), M8 (+B)					

Specifications	
Switching frequency	9Khz
Efficiency	>95%
Output frequency	0-300 Hz
Ambient temperature range	-40°C to 55°C
Maximum heat-sin temp @ Full current @ linear de-rated current (down to 50%) @ 50% current	80°C 80°C- 95°C 95°C- 100°C
Signal line connectors	AMPSEAL 35 pins
IP protection	IP65
EMC	EN12895
Safety	EN 1175-1: 2010
Vibration IEC 60068-2-6 Shock IEC 60068-2-27 Bump IEC 60068-2-29	5g, 10 – 500 Hz, 3 axes +/-30g +/-10g
UL	Designed to meet UL583

Interface	Number
Digital input	12
Analog input unipolar 0...10V	4
Analog input bipolar ± 10V	0
Digital output	2
PWM output	3
Motor temp sensor	1
Incremental encoder	1
5V sensor power supply	1
12V sensor power supply	1
CAN interface	1
Serial Interface RS232	1
LIN Bus	1

Product part number	
AC-S1 24V 75A SWS	ACS1P07000000
AC-S1 24V 150A SWS	ACS1P15000000
AC-S1 24V 300A SWS	ACS1P30000000
AC-S1 36/48V 75A SWS	ACS1Q07000A00
AC-S1 36/48V 200A SWS	ACS1Q20000000
AC-S1 36/48V 300 A SWS	ACS1Q30000000

Plate-Type Heat Sink. For other heat sink type please contact us

Related product part number	
AMPSEAL 35 pin Mating Connector Bag	900KC0000013
Thermal Pad for AC-S1	768VR457A00

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### Application Policy

Capacity ratings, features, and specifications vary depending upon the model and type of service. Application approvals must be obtained from Dana TM4; contact your representative for application approval. We reserve the right to change or modify our product specifications, configurations, or dimensions at any time without notice.





# TM4 Smartmotion™ AC-M1 Low-Voltage Inverters

## Controller for AC Induction Motor

Dana TM4 inverters provide advanced control of AC induction motors for traction or pump functions of any electrical vehicle working with speed or torque control algorithms.

## Mobile Machine Management

AC-M1 is an integrated controller which can manage multi-function and fully configurable I/O pins for any I/O functions like digital & analogue inputs and outputs, capable of driving fans, relays' and hydraulic valves' coils, contactors, negative brakes and many others inductive/resistive loads.

## Vehicle Application Development

Users develop AC-M1 applications with the TM4 TAU™ System: All features are offered as standard ("one fits all" philosophy). Virtually everything can be changed with one click in an intuitive graphical tuning environment. The clone file technology allows uploads, downloads and modifications of your configuration. With TM4 TAU system, a first run for a wired vehicle can be made in minutes (not days).



Ideal for Off-Highway Applications.



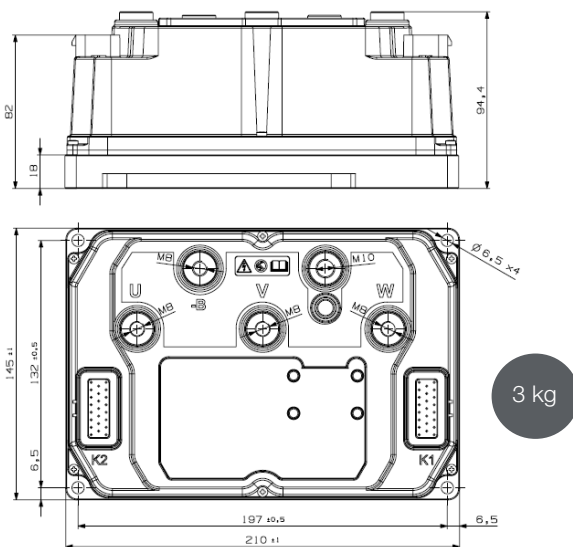
# TM4 Smartmotion™ AC-M1 Low-Voltage Inverter

## AC motor control features:

- Indirect Field Oriented Control (IFOC) with unsurpassed dynamic and performance in full speed range by decoupling and regulating flux and torque vectors of stator current components
- Advanced Space Vector Modulation (SVM) technique for high system efficiency reducing motor harmonics and losses
- Accurate Rotor Flux Model and Fully Developed Field Weakening technique for high motor efficiency and dynamic across full speed range
- Motor model fully compatible with IEEE Standard in order to get the parameters of motor's equivalent circuit from no-load and blocked rotor tests; it can work with all AC motors of all manufactures
- Quick and easy selection between Torque Control and Speed Control

## General features

- Fully configurable through supplied GUI TM4 TAU™ called SmartView™, which reduces abruptly the time to market start-up of the system
- Flexible configuration of I/O in order to couple them to any provided functions
- Standard and same firmware for all inverter series (easily extendable to future models)
- Robust, safe and self-diagnostic (both for hardware and software fault conditions)
- CAN Open and serial interfaces
- Powerful logging of all sensible working variables



AC-M1	24V		36-48V		72-80V	
Nom. voltage (Vdc)	24		36 - 48		72 - 80	
Input voltage range (Vdc)	11 - 32		22 - 64		42 - 108	
Cont. current (Arms)	175	225	188	250	175	225
Nom. current S2- 2 min (Arms)	350	450	375	500	350	450
Output voltage (VAC)	3 x 0...16 V (@24 VDC)		3 x 0 to 24 (@36 VDC) 3 x 0 to 32 (@ 48 VDC)		3 x 0 to 47 (@72 VDC) 3 x 0 to 53 (@80 VDC)	
Power terminals	M8 (U/V/W/-B), M10 (+B)					

Specifications	
Switching frequency	9Khz
Efficiency	95%
Output frequency	0-300 Hz
Ambient temperature range	-40°C to 55°C
Maximum heat-sin temp @ Full current @ linear de-rated current (down to 50%) @ 50% current	80°C 80°C– 95°C 95°C– 100°C
Signal line connectors	2x AMPSEAL 23 pins
IP protection	IP65
EMC	EN12895
Safety	EN 1175-1: 2010
Vibration IEC 60068-2-6 Shock IEC 60068-2-27 Bump IEC 60068-2-29	5g, 10 – 500 Hz, 3 axes +/-30g +/-10g
UL	Designed to meet UL583

Interface	Number	Product part number	
Digital input	19	AC-M1 24V 350A SWS	ACM1P35000000
Analog input unipolar 0...10V	8	AC-M1 24V 450A SWS	ACM1P45000000
Analog input bipolar ± 10V	0	AC-M1 36/48V 375A SWS	ACM1Q37000000
Digital output	2	AC-M1 36/48V 500A SWS	ACM1Q50000000
PWM output	3	AC-M1 72/80V 350A SWS	ACM1R35000000
Motor temp sensor	1	AC-M1 72/80V 450A SWS	ACM1R45000000
Incremental encoder	1	Plate-Type Heat Sink. For other heat sink type please contact us	
5V sensor power supply	1	Related product part number	
12V sensor power supply	1	AMPSEAL 23 pin Mating Connector Bag	900KC00000019
CAN interface	1	Fuse 300A	744EFCNL300
Serial Interface RS232	1	Fuse 400A	744EFCNL400
LIN Bus	1	Fuse 500A	744EFCNL500
		Kit Fuse Support for AC-M1	900KC00000022
		Thermal Pad for AC-M1	768VR455A00

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### Application Policy

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# TM4 Smartmotion™ AC-M2 Low-Voltage Inverters

## Dual Controller for AC Induction Motor

Dana TM4 inverters provide advanced control of AC induction motors for traction or pump functions of any electrical vehicle working with speed or torque control algorithms.

## Mobile Machine Management

AC-M2 is an integrated controller which can manage multi-function and fully configurable I/O pins for any I/O functions like digital & analogue inputs and outputs, capable of driving fans, relays' and hydraulic valves' coils, contactors, negative brakes and many others inductive/resistive loads.

## Vehicle Application Development

Users develop AC-M2 applications with the TM4 TAU™ System: All features are offered as standard ("one fits all" philosophy). Virtually everything can be changed with one click in an intuitive graphical tuning environment. The clone file technology allows uploads, downloads and modifications of your configuration. With TM4 TAU™ system, a first run for a wired vehicle can be made in minutes (not days).



Ideal for Off-Highway Applications.



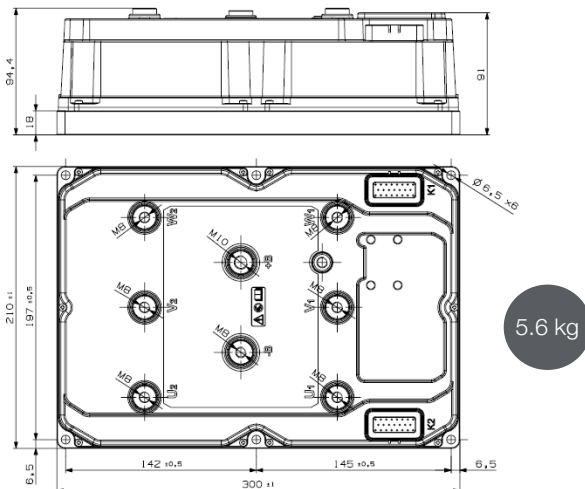
# TM4 Smartmotion™ AC-M2 Low-Voltage Inverter

## AC motor control features:

- Indirect Field Oriented Control (IFOC) with unsurpassed dynamic and performance in full speed range by decoupling and regulating flux and torque vectors of stator current components
- Advanced Space Vector Modulation (SVM) technique for high system efficiency reducing motor harmonics and losses
- Accurate Rotor Flux Model and Fully Developed Field Weakening technique for high motor efficiency and dynamic across full speed range
- Motor model fully compatible with IEEE Standard in order to get the parameters of motor's equivalent circuit from no-load and blocked rotor tests; it can work with all AC motors of all manufactures
- Quick and easy selection between Torque Control and Speed Control

## General features

- Fully configurable through supplied GUI TM4 TAU™ called SmartView, which reduces abruptly the time to market start-up of the system
- Flexible configuration of I/O in order to couple them to any provided functions
- Standard and same firmware for all inverter series (easily extendable to future models)
- Robust, safe and self-diagnostic (both for hardware and software fault conditions)
- CAN Open and serial interfaces
- Powerful logging of all sensible working variables
- Advanced control of two AC induction motors working in independent mode or in dual drive applications with differential function.



AC-M2	36-48V	72-80V		
<b>Nom. voltage (Vdc)</b>	36 - 48	72 - 80		
<b>Input voltage range (Vdc)</b>	22 - 64	42 - 108		
<b>Cont. current (Arms)</b>	188 +188	250 +250	175 +175	225 +255
<b>Nom. current S2- 2 min (Arms)</b>	375 +375	500 +500	350 +350	450 +450
<b>Output voltage (VAC)</b>	6 x 0 to 24 (@36 VDC) 6 x 0 to 32 (@48 VDC)	6 x 0 to 47 (@72 VDC) 6 x 0 to 53 (@80 VDC)		
<b>Power terminals</b>	M8 (U/V/W/-B), M10 (+B)			

Specifications	
<b>Switching frequency</b>	9Khz
<b>Efficiency</b>	>95%
<b>Output frequency</b>	0-300 Hz
<b>Ambient temperature range</b>	-40°C to 55°C
<b>Maximum heat-sin temp @ Full current @ linear de-rated current (down to 50%) @ 50% current</b>	80°C 80°C- 95°C 95°C- 100°C
<b>Signal line connectors</b>	2x AMPSEAL 23 pins
<b>IP protection</b>	IP65
<b>EMC</b>	EN12895
<b>Safety</b>	EN 1175-1: 2010
<b>Vibration IEC 60068-2-6 Shock IEC 60068-2-27 Bump IEC 60068-2-29</b>	5g, 10 - 500 Hz, 3 axes +/-30g +/-10g
<b>UL</b>	Designed to meet UL583

Interface	Number	Product part number
Digital input	17	AC-M2 36/48V 375A+375A SWS ACM2Q37A37000
Analog input unipolar 0...10V	8	AC-M2 36/48V500A+500A SWS ACM2Q50A50000
Analog input bipolar ± 10V	0	AC-M2 72/80V 350A+350A SWS ACM2R35A35000
Digital output	2	AC-M2 72/80V 450A+450A SWS ACM2R45A45000
PWM output	3	
Motor temp sensor	2	
Incremental encoder	2	
5V sensor power supply	1	
12V sensor power supply	1	
CAN interface	1	
Serial Interface RS232	1	
LIN Bus	1	

Plate-Type Heat Sink. For other heat sink type please contact us

Related product part number	
AMPSEAL 23 pin Mating Connector Bag	900KC00000019
Fuse 500A	744EFCNL500
Fuse 700A	744EFCNL700
Thermal Pad	768VR456A00

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### Application Policy

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