TM4 Tautronic™ AC-S1-S/C
Low-Voltage Inverters

Controller for AC Induction Motor

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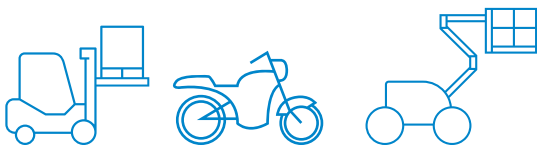
Mobile Machine Management

Tautronic 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™ 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 Tautronic™ AC-S1-S/C **Low-Voltage Inverter**

AC, PM, SR & SRIPM 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

- Fulfils automotive EMC standard ECE R10-05, Annex 7-8-9-10

- Low noise SIN/COS Encoder input for PM/SR/SRPM motors (up to 500Hz)

- One current controlled PWM out for Proportional Valves

1.5 kg
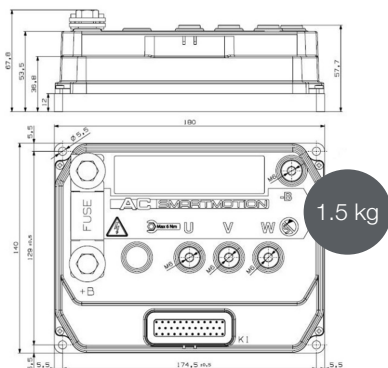
AC-S1-S/C

Nom. voltage (Vdc)	72 - 80
Input voltage range (Vdc)	42 - 108
Cont. current (Arms)	125
Nom. current S2- 2 min (Arms)	250
Output voltage (VAC)	3 x 0…47 (@72 VDC) 3 x 0…53 (@80 VDC)
Power terminals	M6(U/V/W/-B), M8(+B)

Specifications

Switching frequency	9 kHz
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 / ECE R10-05, Annex 7-8-9-10
Safety	EN 1175-1
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
Digital output	2
PWM output	2
Current controlled PWM output 0…2A	1[1]
Motor temperature sensor	1
Incremental encoder (Hi-Speed Quad. Encoder)	1[2]
Hi Speed Sin/Cos Position sensor	1[2]
5V sensor power supply	1
12V sensor power supply	1
CAN interface	1
Serial Interface RS232	1
LIN Bus	1

1) Also configurable as normal PWM out.
2) Alternative configuration, use same interface pins

Product part number

AC-S1 72/80V 250A SC SWS	ACS1R25000000

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

Related product part number

AMPSEAL 35 pin Mating Connector Bag	900KC00000013
Fuse 250A	744EFCNL250
Thermal Pad for AC-S1	768VR457A00

DANA **TM4**

TM4 Tautronic™ AC-M1-S/C
Low-Voltage Inverters

Controller for AC Motor

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

Mobile Machine Management

Tautronic 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.
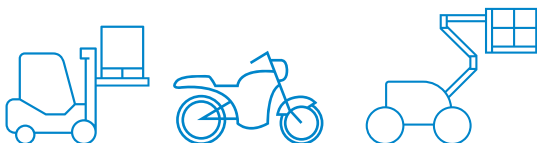
TM4 Tautronic™ AC-M1-S/C **Low-Voltage Inverter**

Including the latest technology in power electronics, control & interface technology and algorithms, Tautronic series of inverters provide advanced control of AC motors.

PM, SR & SRIPM 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

- Low noise SIN/COS Encoder input for PM/IPM/SR/SRIPM motor control (up to 500Hz)
- Fully configurable through supplied GUI TM4 TAU™, reducing 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
- Fulfils automotive EMC standard ECE R10-05, Annex 7-8-9-10

3 kg

AC-M1-S/C	36-48V		72-80V	
Nom. voltage (Vdc)	36-48		72-80	
Input voltage range (Vdc)	22-64.8		42-108	
Cont. current (Arms)	188	250	175	225
Nom. current S2- 2 min (Arms)	375	500	350	450
Output voltage (VAC)	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 / ECE R10-05, Annex 7-8-9-10
Safety	EN 1175-1
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	19
Analog input unipolar 0…10V	6
Digital output	2
PWM output	3
Motor temp sensor	1
Incremental encoder	1
Hi Speed Sin/Cos Position sensor	1
5V sensor power supply	1
12V sensor power supply	1
CAN interface (isolated)	1

Product part number

AC-M1 36/48V 375A S/C SWS	ACMIQ37000E00
AC-M1 36/48V 500A S/C SWS	ACMIQ50000E00
AC-M1 72/80V 350A S/C SWS	ACM1R35000E00
AC-M1 72/80V 450A S/C SWS	ACM1R45000EY0

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

Related product part number

AMPSEAL 23 pin Mating Connector Bag	900KC00000019
Fuse 300A	744EFCNL300
Fuse 400A	744EFCNL400
Fuse 500A	744EFCNL500
Kit Fuse Support for AC-M1	900KC00000022
Thermal Pad for AC-M1	768VR455A00
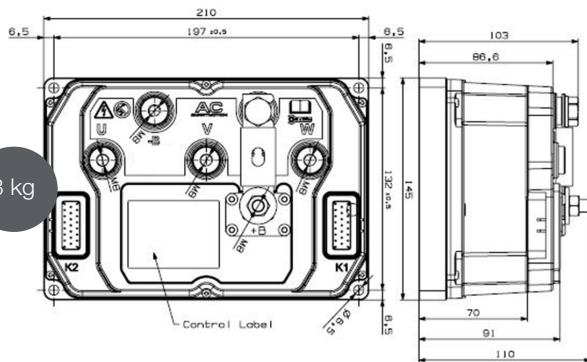
DANA TM4

TM4 Tautronic AC-X1
High Performance Low-Voltage Inverters

Controller for AC Motors

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

Mobile Machine Management

Tautronic AC-X1 is an integrated controller which can manage multi-function and fully configurable I/O pin 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-X1 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).
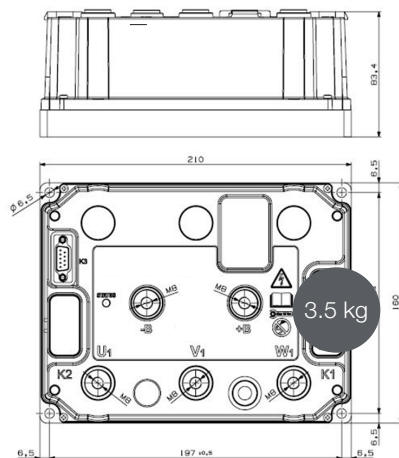
Ideal for Off-Highway Applications.
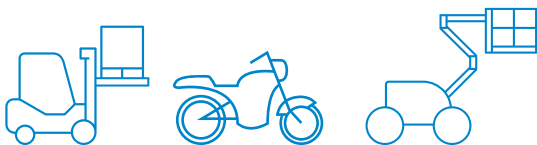
| TM4 Tautronic AC-X1 **Low-Voltage Inverter**

AC, PM, SR & SRIPM 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

- Fulfils automotive EMC standard ECE R10-05, Annex 7-8-9-10

3.5 kg

AC-X1

AC-X1					
Nom. voltage (Vdc)	80 - 100				
Input voltage range (Vdc)	52 - 130				
Cont. current (Arms)	125	188	250	313	375
Nom. current S2- 2 min (Arms)	250	375	500	625	750
Output voltage (VAC)	3 x 0…47 (@80 VDC) 3 x 0…53 (@100 VDC)				
Power terminals	M8				

Specifications

Specifications	
Switching frequency	9 kHz
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, Sub-D 9 pins
IP protection	IP65
EMC	EN12895 / ECE R10-05, Annex 7-8-9-10
Safety	EN 1175-1
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	9
Analog input unipolar 0…12V	5
Digital output	2
Analog output unipolar 0…10V	1
PWM output	4
Motor temperature sensor	1
Incremental encoder (Hi-Speed Quad. Encoder)	1[*]
Hi Speed Sin/Cos Position sensor	1[*]
Resolver interface	1
5V sensor power supply	1
12V sensor power supply	1
CAN interface (isolated)	1
Serial Interface RS232	1
LIN Bus	1

*Alternatively, use same interface pins

Product part number

Product part number	
AC-X1 80/100V 250A SWS	ACX1S25000000
AC-X1 80/100V 375A SWS	ACX1S37000000
AC-X1 80/100V 500A SWS	ACX1S50000000
AC-X1 80/100V 625A SWS	ACX1S62000000
AC-X1 80/100V 750A SWS	ACX1S75000000

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

Related product part number

Related product part number	
AMPSEAL 35 pin Mating Connector bag	900KC00000013
Fuse 300A	744EFCNL300
Fuse 400A	744EFCNL400
Fuse 500A	744EFCNL500
Fuse 700A	744EFCNN700
Thermal Pad for AC-X1	768VR454A00

Dana.com/TM4

DANA ◇ TM4

TM4 Tautronic^{TM} AC-X1-I with Isolated Logic
High Performance Low-Voltage Inverters

Controller for AC Motors

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

Mobile Machine Management

Tautronic AC-X1-I is an integrated controller which can manage multi-function and fully configurable I/O pin 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-X1-I 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 called. 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).
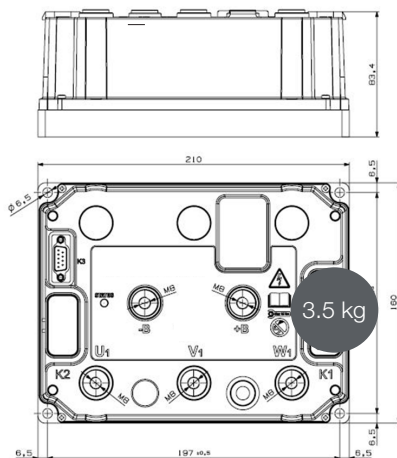
Ideal for Off-Highway Applications.
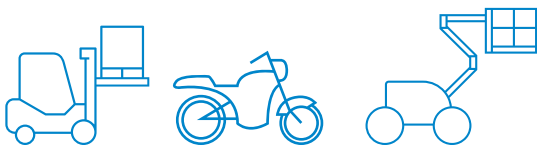
| TM4 Tautronic™ AC-X1-I **Low-Voltage Inverter**

AC, PM, SR & SRIPM 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

- Fulfils automotive EMC standard ECE R10-05, Annex 7-8-9-10

3.5 kg

AC-X1-I

Nom. voltage (Vdc)		80 - 100				120 - 144
Input voltage range (Vdc)		45 - 133				73…184
Cont. current (Arms)	125	187	250	375		250
Nom. current S2- 2 min (Arms)	250	375	500	750		500
Boost current 10 sec. (Arms)	350	450	600	850		600
Output voltage (VAC)		3 x 0…47 (@80 VDC) 3 x 0…53 (@100 VDC)				3 x 0…80 (@120 VDC) 3 x 0…93 (@140 VDC)
Logic supply voltage [Vdc]		12 – 24 Nom./ 8 … 32 Range				
Power terminals		M8				

Specifications

Switching frequency	9 kHz
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, Sub-D 9 pins
IP protection	IP65
EMC	EN12895 / ECE R10-05, Annex 7-8-9-10
Safety	EN 1175-1
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	9
Analog input unipolar 0…12V	5
Digital output	2
Analog output unipolar 0…10V	1
PWM output	4
Motor temperature sensor	1
Incremental encoder (Hi-Speed Quad. Encoder)	1*
Hi Speed Sin/Cos Position sensor	1*
Resolver interface	1
5V sensor power supply	1
12V sensor power supply	1
CAN interface (isolated)	1
Serial Interface RS232	1
LIN Bus	1

Product part number	
AC-X1 80/100V 250 I SWS	ACX1S25000I00
AC-X1 80/100V 375 I SWS	ACX1S37000I00
AC-X1 80/100V 500A I SWS	ACX1S50000I00
AC-X1 80/100V 750A I SWS	ACX1S75000I00
AC-X1 120/144V 500A ISWS	ACX1T50000000

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

Related product part number	
AMPSEAL 35 pin Mating Connector Bag	900KC00000013
Fuse 500A	744EFCNL500
Fuse 700A	744EFCNN700
Thermal Pad AC-X1	768VR454A00

*Alternatively, use same interface pins

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DANA TM4