ENG

MOTION CONTROL

AXV300 SERVODRIVES
SBM BRUSHLESS MOTORS

GEFRAN

COD. 82141B

Gefran, With forty years of experience, Gefran is the world's leading designer and producer of solutions for **measuring, controlling, and driving industrial production processes**.
We have branches in 14 countries and a network of over 80 worldwide distributors.

QUALITY AND TECHNOLOGY

Gefran components are a **concentration of technology**, the result of constant research and of **cooperation with major research centers**.
This makes Gefran synonymous with quality and expertise in the design and production of:

- **sensors** for measuring main variables such as **temperature, pressure, position and force**
- **state-of-the-art components and solutions for indication and control**, satisfying demands for optimization of processes and intelligent management of energy consumption
- **automation platforms** of various complexities
- **electronic drives and electric motors** in AC and DC for all industrial automation, HVAC, water treatment and lift needs.

Gefran's know-how and experience guarantee continuity and tangible solutions.

SERVICES

A team of Gefran experts works with each customer to select the ideal product for its application and to help install and configure devices (technohelp@gefran.com).

Gefran offers a wide range of courses at different levels for the technical-commercial study of its product as well as specific courses *on demand*.

PLASTIC

METAL

TEXTILE

INDUSTRIAL HOISTING

TEST BENCHES

MATERIAL HANDLING

CONVEYORS

MATERIAL RECYCLING MACHINERY

MIXER / HIGH DYNAMICS CENTRIFUGEE

In addition to foreseeing the market's application needs, Gefran forms partnerships with its customers to find **the best way to optimise and boost the performance of various applications**.
Gefran products communicate with one another to provide integrated solutions, and can dialogue with devices by other companies thanks to compatibility with numerous fieldbuses.

CANopen EtherCAT GDNET DeviceNet EtherNet/IP Modbus PROFIBUS PROFINET

DESCRIPTION

The Gefran servodrive line in the "Motion Control" sector represents the result of the experience gained in over 30 years of working in close partnership with the leading industrial automation manufacturers.
Gefran servodrives offer a high technological content in the field of drives for motion control applications and, thanks to a powerful DSP and high-bandwidth and a power stage able to offer a wide range of powers, they are able to provide excellent control for brushless servo and asynchronous motors.
The line implements next generation functions as a standard, to perfectly meet the most advanced architectures of the most modern industrial servo systems.
The integration of dedicated application software on board the drive allows full product customisation for specific control of complex machinery in areas such as plastics, sheet metal processing, textiles, wood, marble and printing machines, as well as in the most advanced automation solutions.

The **AXV300** modular line offers maximum performance for the control of brushless and asynchronous (*) motors used in multi-motor production lines that require high dynamics, accuracy and rapid operating sequences.
Thanks to the standard use of Active Front End technology powering each "multi-axis" system by means of a "common DC bus" ensures the Gefran clean power formula, of increased dynamic performance with guaranteed energy efficiency. Regeneration into the grid also avoids unnecessary energy waste on brake resistors.
The **AXV300** implements advanced application solutions based on positioning and interpolation, structured in IEC 61131-3 programming environments.

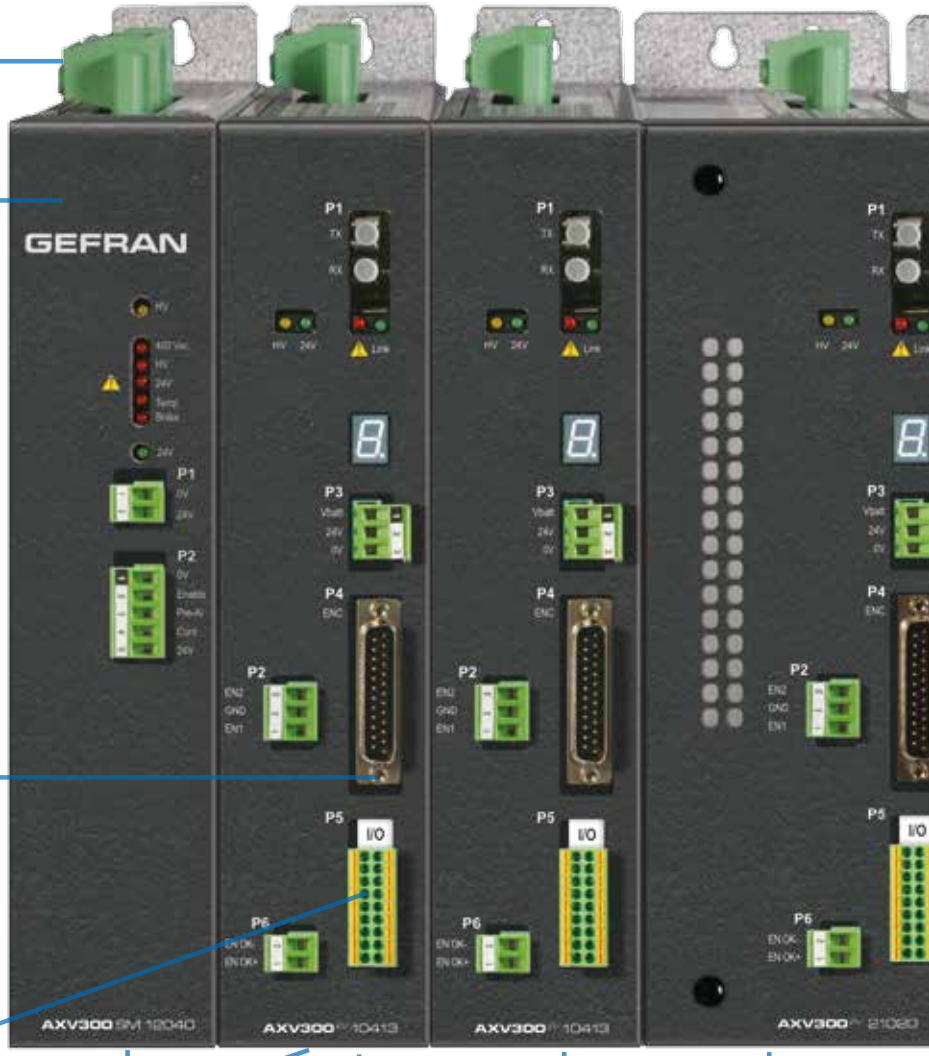
(*) Asynchronous motors currently being developed, please contact Gefran Sales Office.

GENERAL CHARACTERISTICS

Space optimisation	The modular structure and wide choice of power ratings, from 3kW to 120kW (5-200Arms), ensure maximum flexibility for the configuration of special machines
Speed of use	The AXV300 features multi-axis control which makes installation simple, fast and economical with fewer system connections
Energy efficiency	Use of a common axis power supply with Active Front End regeneration to deliver clean power with low THD and unitary power factor operation
High-level performance	For controlling brushless synchronous and asynchronous motors used in application systems characterised by high dynamics, when precision and axis coordination are required
Integrated IEC 61131-3 environment	Can be programmed using the main standard languages with the powerful MDPLc tool, to develop custom solutions or Gefran proprietary application libraries
Communication with the main fieldbus systems	System management via the most commonly-used PLC communication environments such as EtherCat, CANopen, GDNet, ProfiNet, etc.
Performance	
Current loop closing	16KHz (62.5µsec)
Speed loop closing	4KHz (250µsec)
GStar optical fibre communication with axes	max 8 axes (2 lines x 4 axes) 250µSec cycle with relative LED indicators
Overload I^2t	slow : 150% In x 60 sec; fast: 200% In x 0.5 sec
Overload IxT	200% In x 10 sec
Operating temperature	0 ... +40°C; +40°C...+50°C with derating
Protection degree	IP21
Installation position	Pollution degree 2 or lower
Altitude	Max 2000 metres above sea level; up to 1000 m with no reduction in current
Atmospheric pressure	[kPa] 86 to 106 (class 3K3 according to EN50178)
Climate	IEC 68-2 Part 2 and 3
Isolation distance	EN 50178, UL508C
Vibration	IEC68-2 Part 6
Interference immunity	IEC801 Part 2, 3 and 4
EMC compatibility	EN61800-3
Safety	STO EN61800-5-2
Certification	CE Complies with the EC directive concerning low voltage equipment (Directives LVD 2014/35/EC, EMC 2014/30/EC)

AXV300 • GENERAL CHARACTERISTICS

TERMINALS M1 • M3



AXV300–SM

AXV300–SM and AXV300-SR power supply modules are available with the Basic AC/DC configuration or with regenerative Active Front End technology, which feeds energy back into the grid.

AXV300–SM modules have 6 terminal strips:

- M1 DC high voltage (VDC BUS)
- M2 Main grid terminals
- M3 Auxiliary grid terminals (used as three-phase input for pre-load phase)
- M4 Braking resistor terminals (internal braking unit)
- P1 24V DC auxiliary power supply
- P2 Control input

ENCODER INPUT

for speed loop feedback and management of auxiliary encoders including:

- 5-tracks SinCos
- TTL incremental
- High-performance resolvers (models AXV300-...-R)
- EnDat 2.1
- EnDat 2.2
- SSI
- Smart Abs
- Hiperface

IO CONNECTOR + RESOLVER REPETITION

- Digital input for encoder Freeze function
- Digital output for Brake Control
- Digital output for motor cooling
- 2 programmable digital outputs
- 1 programmable digital input
- Resolver Repetition (models AXV300-...-R).

TERMINALS M2 • M4

AXV300 EV: AXIS MODULES

AXV300 EV axis modules come in a wide range of current ratings, making them the ideal choice for building multi-axis systems.

AXV300 EV modules interface via an optical fibre system with AXV300-CU control loops.

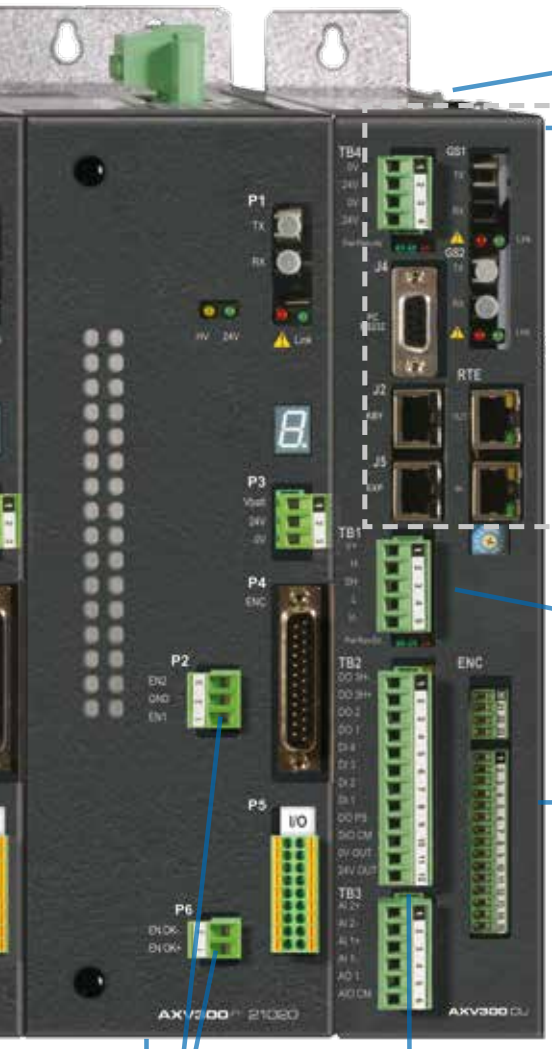
Synchronous communication via **GStar II*** optical fibre system.

7-segment display, shows operative state of axis module

Each module implements the following software macro-functions:

- motor control loop (brushless synchronous or asynchronous motors)
- 16KHz current loop closing (62.5μsec)
- 4KHz speed loop closing (250μsec)
- management of local encoder for closing current/speed loops alarm management
- management of GStar II communication from/to the AXV300-CU control module
- motor cooling function
- dynamic overloads (improved delivery of current in start and stop)
- 24V power supply separate from main power with possibility of backup
- settable encoder supply voltage.

* *GStar II, compatible with GStar, allows CU module and axis modules to exchange many more words on new systems.*



SD-card for storing configurations and downloading system data

AXV300-CU: CONTROL UNIT MODULE

The AXV300 CU module, based on an embedded platform with 32 bit floating point processor, coordinates the entire multi-axis system.

The AXV300 CU processes data in order to generate paths and coordinate simultaneous movements of up to 8 axes, calculating positions or interpolation values.

- System initialisation
- System alarm management
- Software updates
- Master control unit communication via fieldbus
- Fast data exchange with all axes
- Set-point calculation/transmission
- Reading of significant values
- Execution of application (e.g. Injection press)
- Fieldbus communication
- Encoder management

CANopen Master/Slave or **DeviceNet** Slave port

EXP-AXV300-ENC

Auxiliary encoder card:

- 5-tracks SinCos
- TTL incremental
- Resolver
- EnDat 2.1
- EnDat 2.2
- SSI

ENABLE STO

Enable STO function (Safe Torque Off) (AXV300-...-SI)

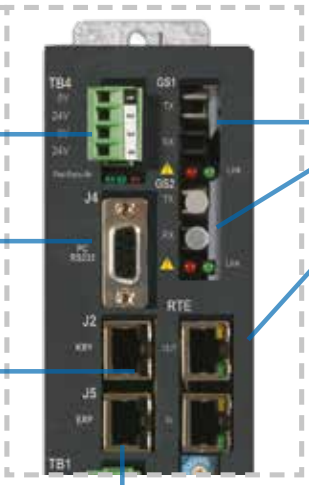
SYSTEM IO

- 2 analog inputs
- 1 analog output
- 4 digital inputs
- 3 digital outputs

POWER SUPPLY

24V external

RS232 **Modbus RTU** connection standard



2-way synchronous communication with axes via **optical fibre**

EXP-AXV300-RTE

Real-time Ethernet card:

- Real time GDNet
- Ethercat
- Modbus TCP-IP

Serial port for connection to **auxiliary programming keypad**

EXTERNAL CANOPEN MODULE

I.e. : Gefran - GILOGIK II, with max:

- 64 Digital Input
- 64 Digital Output
- 8 Analog Input 16 Bit
- 8 Analog Output 16 Bit
- Baudrate 125, 250, 500, 1000 KBit/s (default 500 KBit/s).

GDNET™ Gefran Deterministic Network

EtherCAT

Modbus

AXV300 • CHOOSING THE MODULES – INPUT AND OUTPUT DATA

AXIS MODULES AXV300 EV-...

Module code		10413	21020	22040	33570	350100	480160	5100200	5140210	6200320
V_L	[V_{AC}]	400Vac ±10%, 50/60Hz								
$V_{DC\ BUS}$	[V_{DC}]	600 ±10%								
I_N (output)	[Arms]	4.5	10	20	35	50	80	100	140	200
I_{PEAK} (output)	[Arms]	13.5	20	40	70	100	160	200	210	320
P_N	[kW]	2.7	6	12	21	30	48	60	84	120
P_{PEAK}	[kW]	8.1	12	24	42	60	96	120	126	192
f_{OUT}	[Hz]	400Hz (PWM 4kHz) / 450Hz (PWM 8kHz)								
$V_{EXT\ AUX}$	[V_{DC}]	24								
P DISSIP. @ P_N	[W]	30	75	140	240	360	550	780	1120	1850
Standard IOs		2 digital inputs (encoder Freeze function and programmable input) 4 digital outputs (Brake control, motor cooling, and 2 programmable outputs)								
Dimensions: H x D. x Width	[mm]	310x261x **59.7**	310x261x **89.7**	313x261x **89.5**	328x261x **149.5**	328x261x **149.5**	349x261x **209.5**	356x261x **268**	362x261x **268**	362x260x **378**
Weight	[kg]	3	5	5	9	9	13	16	20	25

POWER SUPPLY MODULE AXV300-SM-...

Module code		12040	24080	380140	4140210	4180270	4230345
V_L	[V_{AC}]	400Vac ±10%, 50/60Hz					
$V_{DC\ BUS}$	[V_{DC}]	565					
I_N (output)	[A]	20	40	80	140	180	230
I_{PEAK} (output)	[A]	40	80	140	210	270	345
P_N	[kW]	11	22	44	74	95.5	122
P_{PEAK}	[kW]	22	44	80	111	143	183
$V_{EXT\ AUX}$	[V_{DC}]	24					
P DISSIP. @ P_N	[W]	53	89	192			
Dimensions: H x D. x Width	[mm]	310x257x **59.5**	315x257x **89.5**	349x257x **119.2**	355.4x259x **268**	355.4x259x **268**	355.4x259x **268**
Weight	[kg]	2	4	9	19	19	19

Regenerative Power Supply Module AXV300-SR-...

Module code		10413	21020	22040	33570	350100	480160	5100200	5140210	6200320
V_L	[VAC]	400Vac ±10%, 50/60Hz								
$V_{DC\ BUS}$	[VDC]	625								
I_N (output)	[A]	4.5	10	20	35	50	80	100	140	200
I_{PEAK} (output)	[A]	13.5	20	40	70	100	160	200	210	320
P_N	[kW]	2.7	6	12	21	30	48	60	84	120
$V_{EXT\ AUX}$	[VDC]	24								
$P_{DISSIP.}$ @ P_N	[W]	30	75	140	240	360	550	780	1120	1850
Dimensions: H x D. x **Width**	[mm]	310x261x **120**	310x261x **150**	310x261x **150**	330x261x **210**	330x261x **210**	350x261x **270**	360x261x **330**	370x261x **330**	362x260x **210**
Weight	[kg]	5	7	7	11	11	15	18	22	27

CONTROL UNIT MODULE AXV300-CU

V POWER SUPPLY	24 Vdc
Standard IO	• 2 non-opto-isolated analog inputs -10V...+10V • 1 non-opto-isolated analog output -10V...+10V@5mA • 4 opto-isolated digital inputs HTL 0...30V • 2 opto-isolated digital outputs 30V@40mA • 1 opto-isolated digital output 30V@500mA
Real Time Ethernet (EXP-AXV300-RTE card)	• Real time GDNet • Ethercat • Modbus TCP-IP • ...
IO expansion (external), max	• 64 Digital Input • 64 Digital Output • 8 Analog Input 16 Bit • 8 Analog Output 16 Bit
Encoder expansion (EXP-AXV300-ENC card)	• HTL-TTL encoder input (+5V...+24V) and HTL-TTL encoder repetition (+5V...+24V) • Number of SW-selectable input and output impulses • Integrated encoder power supply unit (+24Vdc...+5Vdc)
Dimensions: Height x Depth x **Width**	310 x 263.5 x **59.7 mm**
Weight	2 kg

SOFTWARE

"GF_eXpress" PC CONFIGURATION TOOL

All drives and automation devices manufactured by the GEFRAN group (PLC, HMI, instrumentation, etc.) can be programmed via PC using the **GF_eXpress** configurator, a programming environment that enables complete setup and control of the product, based on a powerful, user-friendly and intuitive software platform:

- Programming with parameter list or block diagrams
- Integrated oscilloscope
- Programming tool configuration.
- Multi-drop network management with up to 32 devices/modules

Connected to the **AXV300-CU** module, it enables programming and monitoring of machine functions and those of individual axes.

MDPLC PROGRAMMING IN IEC 61131-3

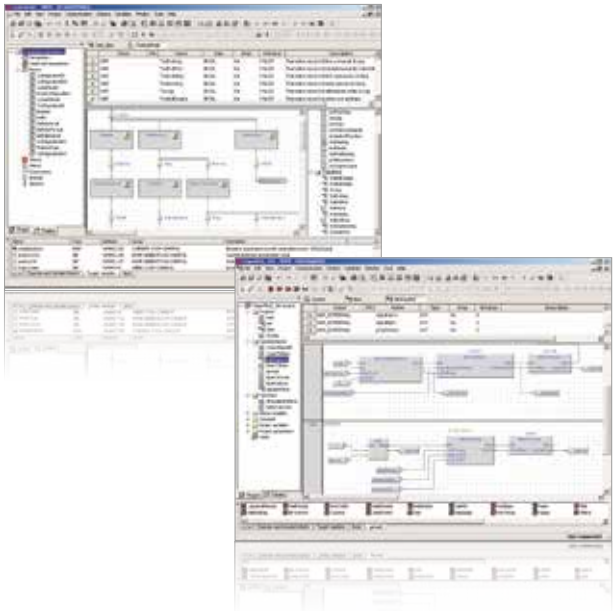
The **MDPlc** environment is a tool for developing high-level application architectures directly implemented by the **AXV300-CU** control module.

MDPlc allows complete customisation of control unit system functions, machine sequences and axis coordination and management. The powerful graphic programming interface makes it intuitive and flexible.

MDPlc generates the application code for the control module directly in machine language, compiling the SW using PLC languages that are all compliant with the IEC 61131-3 international standard.

- Instruction List (IL)
- Ladder Diagram (LD)
- Sequential Flow Chart (SFC)
- Structured Text (ST)
- Function Block Diagram (FBD)

In addition to function blocks that are compiled or predefined, the MDPlc function can also be used to generate custom libraries using dedicated templates.

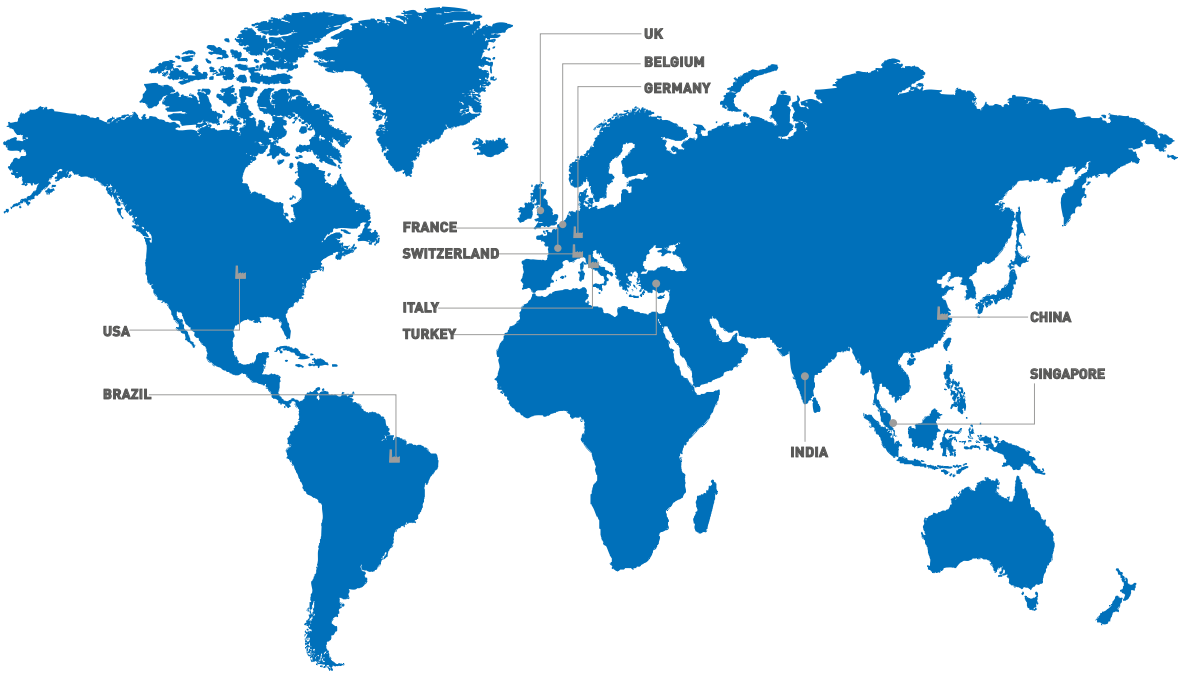


SBM SERVOMOTORS • DESCRIPTION

The permanent magnet synchronous servomotor with the corresponding servodrive is a servosystem suitable for driving a high performance shaft, in particular when high dynamics and stability are required during transient or steady state conditions.
In general, the servomotors ensure high bandwidths compared to other types of motor thanks to their compact design, providing a high torque/inertia ratio. They do not need brushes, as the name suggests, unlike a DC motor.
This solution offers high performance with compact size and excellent reliability and reduced maintenance procedures.
Brushless servomotors are used in a wide range of sectors, chosen for their ability to operate with a an almost constant torque and high overloads.
SBM series servomotors were designed to generate a sinusoidal EFM and reduced torque disturbances.
Thanks to the use of high energy magnets, these motors can withstand high overloads without risk of demagnetisation.
The best torque-size ratio makes SBM series motors suitable for applications where high dynamic performance and torque peaks are required.

STANDARD SBM SERVOMOTORS AND AVAILABLE OPTIONS

		SBM 3	SBM 5	SBM 7	SBM 8	SBM 8...F	SBM 9	SBM 9...F
Max Speed	1500 rpm			•				
	2000 rpm		•	•	•	•	•	•
	3000 rpm	•	•	•	•	•	•	
	4000 rpm	•	•					
	6000 rpm	•						
Supply voltage	230 Vac		o	o				
	400 Vac	•	•	•	•	•	•	•
	460 Vac	o	o	o	o	o	o	o
Flange	B5	•	•	•	•	•	•	•
	B3&B5	o	o	o	o	o	o	
Shaft	11 mm	•	o					
	14 mm	o	o					
	19 mm		•	o				
	24 mm			•				
	42 mm				•	•		
	48 mm						•	•
	with key	•	•	•	•	•	•	•
	without key	o	o	o	o	o	o	o
Connections	power connector	•	•	•				
	power terminal strip box	o	o	o	•	•	•	•
	signal connector	•	•	•	•	•	•	•
Protection	IP54	•	•	•	•	•	•	•
	IP65	o	o	o	o		o	
Feedback devices	Resolver 2 poles	•	•	•	•	•	•	•
	Digital (4096 c/rev) + hall sensors		o	o	o	o	o	o
	5-traces SinCos encoder (2048 c/rev)		o	o	o	o	o	o
	Absolute encoder SSI Protocol (multiturn 4096 / incremental 512 c/rev)		o	o	o	o	o	o
	Absolute encoder EN-DAT Protocol (multiturn 4096 / incremental 512 c/rev)	o	o	o	o	o	o	o
Brake		o	o	o	o	o	o	o
Fan				o		•		•
Oil seal		o	o	o	•	•	•	•
Approvals		CE						



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