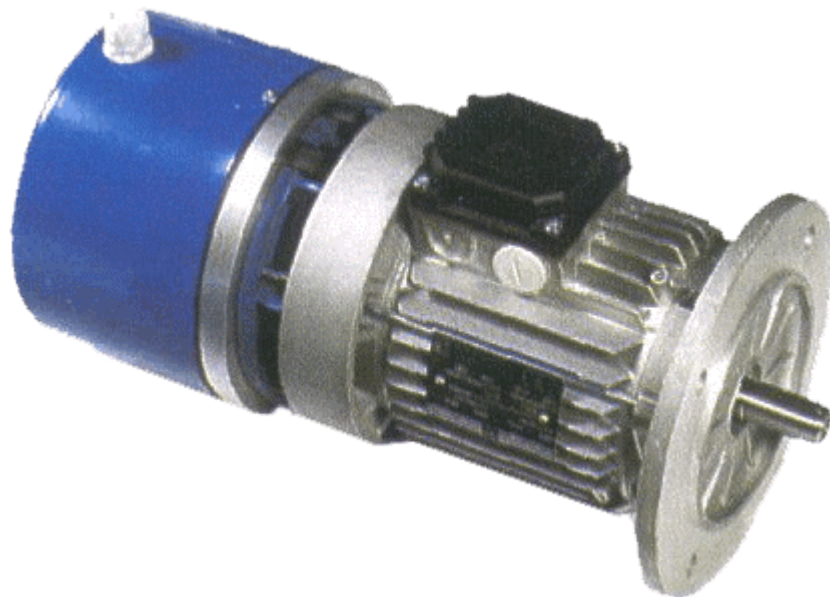




**SMI SERIES  
MOTORS WITH INTEGRATED  
INVERTER**



# SMI Series

**SMI** series is made up of three-phase asynchronous electric motors with integrated frequency inverter. Power range is between 0,37 kW and 4 kW, while motor axis height is between 71 mm and 112 mm. Unit is made up of a high-efficiency three-phase asynchronous electric motor and a compact frequency inverter placed at the motor end opposite to the control end. The basic construction is closed, externally ventilated with IP 55 protection class. **SMI** motor offers a wide range of overload capacity and a high thermal reserve; the insulating materials are class F . The casing consists of aluminium alloy. Shields and flanges consist of aluminium up to axis height 90 and of cast iron up to axis height 100 and 1D12. Inverter housing is isolated from the motor in order to avoid heat transmission (patented system); inverter dissipator is self-ventilated. The frequency converters provided here are among the most developed in the field as far design concept and components regards; control can be of V/F type (**frequency voltage control**) or SLV type (**vectorial control without sensor**). **SMI** motor can be easily programmed using only three tastes. Thanks to some functions which automatically set parameters as acceleration/deceleration times, V/f layout, etc., programming is simplified. On request, motor can be arranged for main Bus fields (Profibus, Interbus-S, Device, etc.): **SMI** motors come out and are programmed in built-in frequency inverter and not just as simple assembly of a standard motor with an inverter. The high reliability and the capacity to stand a high working load with an integrated converter **M.G.M.**, are assured thanks to position of the inverter which is separated from the motor, so to avoid heat transmission, to high performances, to sturdiness of the structure and to ease of the wiring system.

---

**SMI** series represents an innovation in the automation field and it offers to manufacturers and expert users of machinery and equipment new opportunities and great economical advantages. The ease of installation, the simple structure and the cost-effectiveness of the system are pointed out as follows:

- Overall dimensions are extremely reduced; the couplings are the same as those of a normal motor (special flanges and shafts can be delivered out on request);
- Protection class is IP 55 standard (IP 56 is available on request);
- Electrical connections are extremely simplified; power and control parts are totally separated and placed in different terminal boards;
- On request, motor can be equipped with built-in EMI filter of class A or B, so that the application of another filter on board is no longer necessary; connection to motor can be carried out through normal power supply cables, as shielded cables are no longer necessary in order to comply with EMC regulations;
- **SMI** series motor can replace a mechanical transformer, offering many advantages;
- The system performance is very high in any application condition;
- Unit switchboard on which **SMI** motor is installed can be removed or reduced as the inverter has no longer to be housed.



**SMI** motor represents the solution to the current needs linked to automation systems where actuating and surveying devices can find more places on unit board so to reduce overall dimensions and wiring costs.

# MOTORS SELECTION INSTRUCTIONS

In the following paragraph some consideration for an easier selection of **SMI** series motor are reported:

- a. if **SMI** integrated motor replaces an operation carried out by a motor and an inverter separated, after checking motor rating, polarity and available supply voltage, it is possible to select using the table below. To complete the selection, type of inverter (V/F or vectorial), protection degree (IP 55 or IP 56) and construction of motor required have to be chosen. Verify if servofan is necessary.

(\* N.B. Power values shown refer to 4-pole motors; different polarities can be carried out on request).

- b. If **SMI** integrated motor replaces in a plant an assembly of a motor and a mechanical speed variator, motor rating, type of coupling between variator and unit, interval of rotation speed if necessary and available supply voltage have to be identified. Once identified type of **SMI** series motor, verify through the table below if the torque required for the unit operation is inferior to the motor delivery torque. Then verify whether servoventilation is necessary or not, using the operating diagram. Servofan may be also not installed, if the time (it is advisable not to exceed 1 minute each 10 minutes approximately) during which motor has to produce a torque whose value is between the motor delivery torque without servofan (continuous line) and that one of the motor equipped with servofan (dotted line) over the diagram, is short. **SMI** series motor can withstand short overloading periods (1 minute each 10 minutes approximately); in case of frequent overloadings or longer operating periods near to the limits provided by the operating diagram, or anyhow below 20 Hz, it is recommended to buy integrated motor complete with thermal protection devices.
- c. If the integrated motor of **SMI** series is intended for a new plant, motor rating required for unit operation and supply voltage have to be determined. Once identified type of **SMI** series motor, verify through the table below if the torque required for the unit operation is inferior to the motor delivery torque. Then verify whether torque is necessary or not, using the operating diagram. Servofan may be also not installed if the time (it is advisable not to exceed 1 minute every 10 minutes approximately), during which motor has to produce a torque whose value is between the motor delivery torque without servofan (continuous line) and that one of the motor equipped with servofan (dotted line) over the diagram, is short. **SMI** series motor can withstand short overloading periods (1 minute every 10 minutes approximately); in case of frequent overloadings or longer operating periods near the limits provided by the operating diagram, or anyhow below 20 Hz, it is recommended to buy integrated motor complete with thermal protection devices.

In the table below types of available motors are given. Letter "M" or "T" behind the motor plate indicates type of power supply (single phase or three-phase). Letter X means "V/F type inverter", letter "V" means "vectorial type inverter". To require servofan, insert into the selected motor plate the letters "SV" (for example SMISV 90 LA4 TV).

Type	Power supply	Motor In (A)	Rated Power (kW)	Rated torque (Nm)	Iverter In (A)
SMI71 B4 MX	1X230V 50/60 Hz	1.9	0.37	2.35	2.6
SMI71 B4 MV	1X230V 50/60 Hz	1.9	0.37	2.35	2.6
SMI80 B4 MX	1X230V 50/60 Hz	3.8	0.75	4.78	4.0
SMI80 B4 MV	1X230V 50/60 Hz	3.8	0.75	4.78	4.0
SMI80 B4 TX	3X400V 50/60 Hz	2.2	0.75	4.78	2.5
SMI80 B4 TV	3X400V 50/60 Hz	2.2	0.75	4.78	2.5
SMI90 SA4 TX	3X400V 50/60 Hz	2.7	1.1	7	3.8
SMI90 SA4 TV	3X400V 50/60 Hz	2.7	1.1	7	3.8
SMI 100LA4 TX	3X400V 50/60 Hz	5.0	2.2	14	5.5
SMI 100LA4 TV	3X400V 50/60 Hz	5.0	2.2	14	5.5
SMI 100LB4 TX	3X400V 50/60 Hz	6.4	3	19.1	7.8
SMI 100LB4 TV	3X400V 50/60 Hz	6.4	3	19.1	7.8
SMI 100LB4 TV	3X400V 50/60 Hz	6.4	3	19.1	7.8
SMI 112MB4 TX	3X400V 50/60 Hz	8.1	4	25.5	8.6
SMI 112MB4 TX	3X400V 50/60 Hz	8.1	4	25.5	8.6

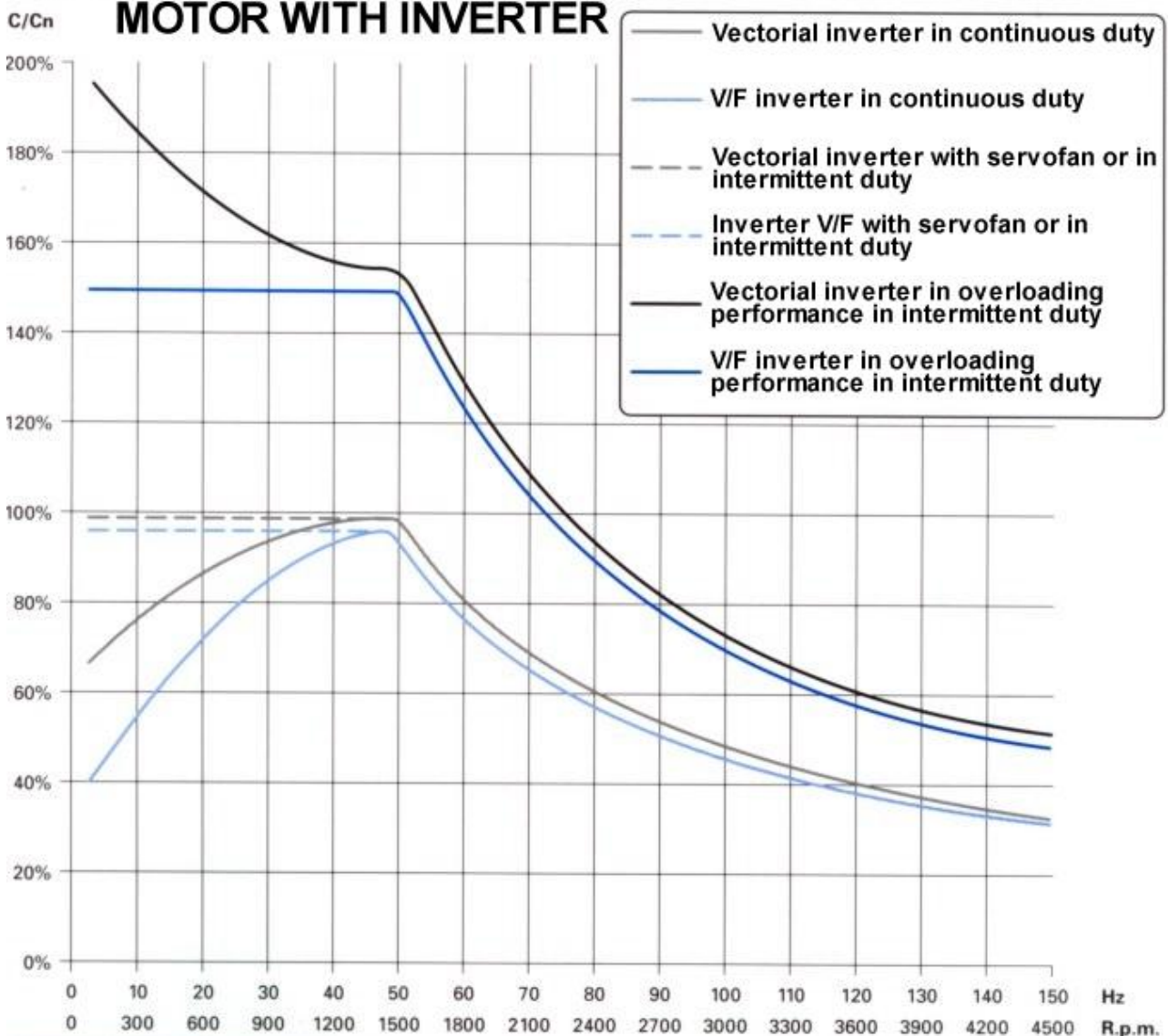
\* N.B. Power values shown refer to 4-pole motors; different polarities can be carried out on request.

# BASIC INFORMATION

Below is some basic information for a correct application of **SMI** motor:

- Rotation speed of an asynchronous motor depends on the supply voltage frequency;
- Inverter recalls from the rated voltage with fixed amplitude and frequency (e.g. 400 V 50 Hz) and convert it into voltage with variable amplitude and frequency suitable to regulate motor speed;
- inverter can not generate an output voltage higher than the input voltage; on the contrary, it can increase the frequency above the nominal rated value;
- by constant torque regulation range is intended a range where the inverter is able to secure the maintenance of a nominal ratio voltage/frequency ; in our diagram the range is up to 50 Hz.
- by constant power (or flow range) regulation range is intended a range where the inverter can increase frequency (and so the motor rotation speed), without increase voltage used to feed the motor (that is the available torque); in our diagram the range exceeds 50 Hz;
- operating diagram reports the percent values of the torque available both in continuous and overloading running;
- when the motor is running in constant torque regulation range (frequency below 50 Hz), it is necessary to take care that continuous slow running does not cause overheating; in that case servo fan (see operating diagram) is needed;
- when the motor is running in constant power regulation range (frequency above 50 Hz), it is necessary to check if the torque required from the load does not exceed the torque indicated on operating diagram; otherwise malfunction and possible intervention of inverter overload protective devices may occur.

## OPERATING DIAGRAM OF ASYNCHRONOUS 4-POLES MOTOR WITH INVERTER

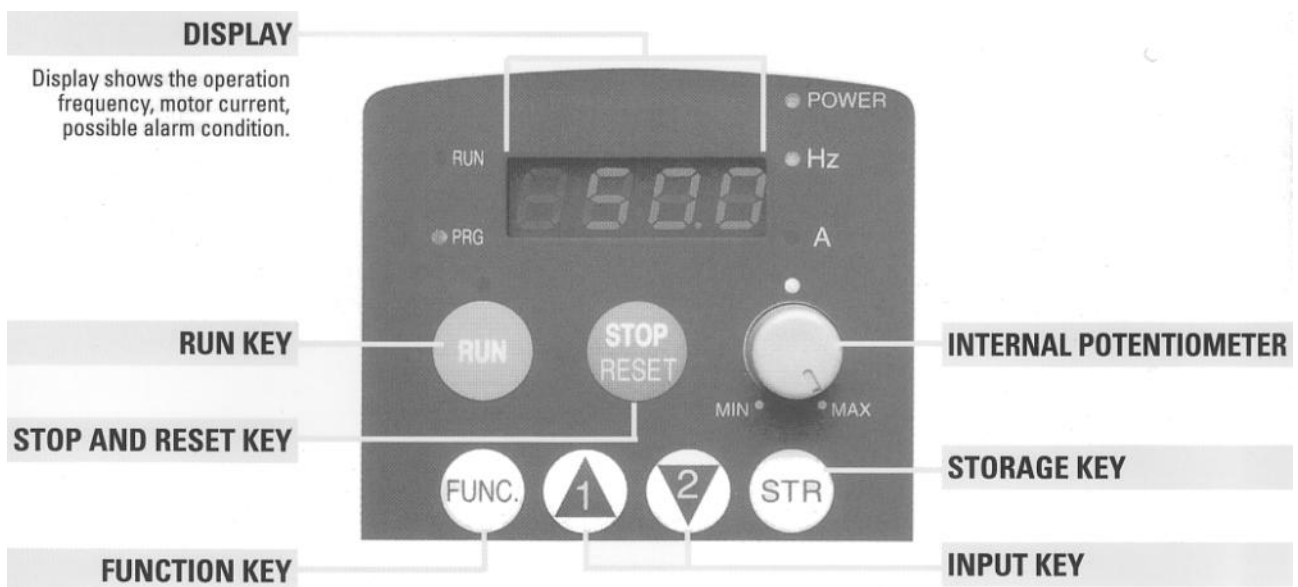


# CONTROL AND PROGRAMMING PANEL

**SMI** motor programming and its application is based on a very simple concept that meets the needs of most expert users as well as those of the operator newly introduced to electronic technology for speed variation of electric motors.

The figure below shows an inverter control and programming panel placed on the motor back site. Panel and terminal board of control signals are accessible after removing the protective cover and opening the proper front door.

By means of few keys and in an extremely direct way it is possible to have access to the numberless functions suitable for various application ranges.



During the installation phase of **SMI** motor to the unit, it is possible to verify the correct dimensioning thanks to the control panel. Therefore, a display is located on the panel in order to verify frequency of inverter output signal, motor absorbed current, sense of rotation, possible alarm condition.

The control panel is also supplied as standard with a built-in potentiometer which allows the frequency to be easily changed and therefore the motor rotation speed. During the installation phase of **SMI** motor it is possible to know the real application conditions of the operation system at the various speeds, using information supplied by the control panel display.

By opening the proper front door placed on the panel it is possible to have access to the terminal board of the control signals. By means of the terminal board it is also possible to connect to a PLC, or to proper control signals or, in a simpler way, to an external potentiometer which can be incorporated and/or more switches or microswitches. To give an example, a **SMI** series built-in motor can be used to check suitably capacities or pressures of a fan or a pump, to make starts with fixed acceleration ramps, to be installed into plants where cycles up to 15 different presetting speeds are provided, or, generally, in any process or automation in which motor speed needs control according to proper signals.

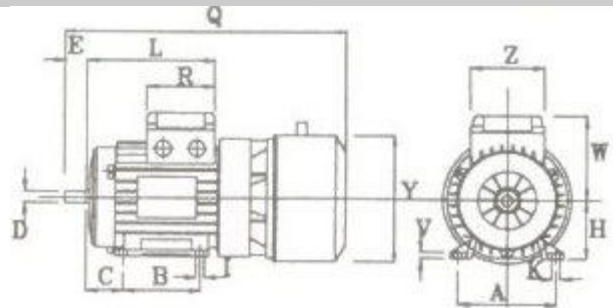
# DIMENSIONS

Tipo	SMI 71	SMI 80	SMI 90S	SMI 80L	SMI 100	SMI 112
A	112	125	140	140	160	160
B	90	100	100	125	140	140
C	45	50	56	56	63	70
ØD	14	19	24	24	28	28
d	M5	M6	M8	M8	M10	M10
E	30	40	50	50	60	60
Fa	9.5	11.5	11.5	11.5	14	14
Fb	M6	M6	M8	M8	M8	M8
f	5	6	8	8	8	8
g	11	15.5	20	20	24	24
H	71	80	90	90	100	112
h	5	6	7	7	7	7
I	7	9	10	10	12	12.5
K	10.5	14	14	14	15	16
L	148	162	171	196	217	229
L1	180	194	207	232	254	262
ØMa	130	165	165	165	215	215
ØMb	85	100	115	115	130	130
ØNa	110	130	130	130	180	180
ØNb	70	80	95	95	110	110
Oa	3.5	3.5	3.5	3.5	4	4
Ob	2.5	3	3	3	3.5	3.5
ØPa	160	200	200	200	250	250
ØPb	105	120	140	140	160	160
Q	370	421	443	467	509	528
R	81	81	98.5	98.5	98.5	98.5
R1	135	135	170	170	170	170
S	10	12	12	12	14	14
V	8.5	9.5	10.5	10.5	13	13.5
W	102	113	127	127	138	158
W1	120	131	148	148	162	176
Y	159	178	199	199	221	221
Z	75	75	98.5	98.5	98.5	98.5
Z1	86	86	112	112	112	112

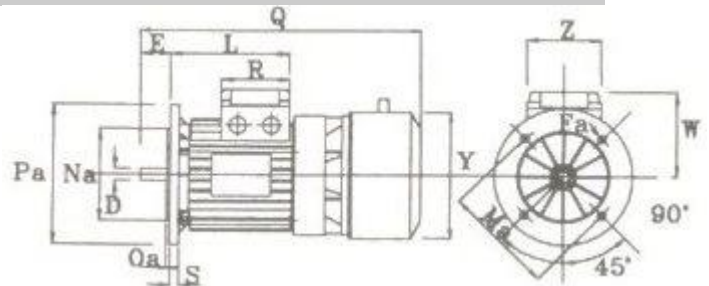
## NOTES:

- 1) Cable insertion screw on power side PG 16, on control side PG 11;
- 2) In IMB3 construction it is necessary to provide proper motor mountings owing to "Y" overall dimension;
- 3) Cable insertion screw belonging to control side can be rotated to 90°

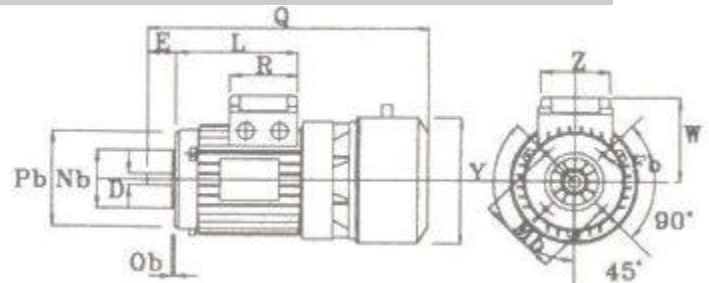
**SMI B3**



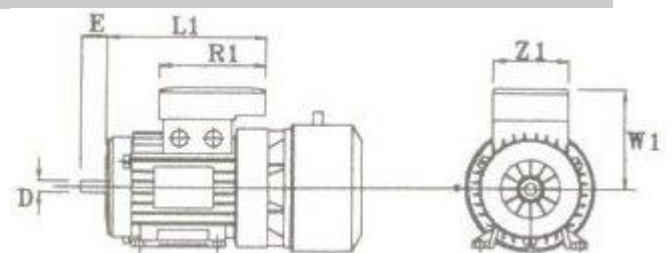
**SMI B5**



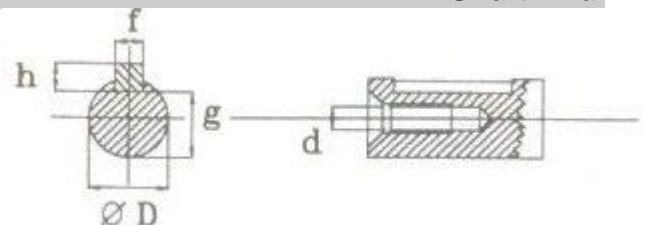
**SMI B14**



**SMI Double Terminal Board Box**



**Shaft End**



# MAIN TECHNICAL SPECIFICATIONS

## Power range

0.37 - 0.75 kW (single-phase power supply) 0.75 - 4 kW (three-phase power supply)

## Supply voltage

1x200-240 V 50/60 (single phase)

3x380-460 V 50/60 (three-phase)

## Protection class

IP 55 (IP56 on request)

## Construction

IM B3, IM B5, IM B14 (shaft/flange reduced/increased on request)

## Type of control

V/F frequency voltage control (letter x behind the motor plate)

SLV vectorial control without sensor (letter V behind the motor plate)

## Adjustment range

3-150 Hz for version X (frequency voltage control)

1-150 for version V (vectorial control without sensor)

## Analog input

0-10 V D.C. 4-20 mA

## Digital input

5 programmable with 14 functions (for versions X)

6 programmable with 19 functions (for versions V)

## Digital output

- 1 programmable relay - only alarm (exchange contact 250 V a.c. 25 A) version x

- 1 programmable relay with 6 functions version V

- 2 outputs with programmable transistors with 6 functions (open collector 27 V 50 mA)

## Serial interface

RS 422 as standard for parameters loading/unloading

RS 485 multidrop for automation by external module

## Protection functions

Overcurrent, overvoltage, low voltage, overloading, exceeding operation temperature, CPU error, phase earthed protection when starting

---

# OPTIONS

## **Servofan**

It allows a wider application of **SMI** motor. It can be required at the time of the purchase or installed afterwards - if required - buying the proper kit.

## **Thermal protection devices:**

they can be inserted into the motor and controlled by the inverter logic

## **External potentiometer**

it can be built-in (allowing the speed regulation directly on the motor)

## **Remote control panel**

**SMI** motor can be also controlled through a remote keyboard. The keyboard is equipped with parameter copy function

## **EMI incorporable filters**

Class A (industrial application)

Class B (residential application)

## **Braking dynamic resistance**

it can be incorporated in the version with vectorial control

## **Field bus**

it is arranged for the main commercial buses (Profibus, Interbus-S, Device Net, etc.)