# SMVector IP31
## *frequency inverter*

**Flexible, simple, economical**

**Lenze**

# SMVector IP31 | Simple Vector Control

### Simplicity

By making Lenze products easy to install, program and commission, we can provide the ideal motor control solution for both OEM designers and electrical systems engineers. An innovative removable EPM chip feature allows instant programming of multiple drives before or after installation, and a simple intuitive front panel display also facilitates easy in-situ operation.

### Flexibility

The SMVector range of inverter drives offer fast dynamic torque response, sophisticated auto-tuning and impressive low speed operation from a compact, and simple to use package. The SMVector range is designed for motor applications where dynamic speed and torque control are required, ideal for conveyors, packaging lines and Fan and Pump systems.

### Quality

A firm commitment to design quality and continuous development of our products ensures both high performance and reliability. Manufacturing facilities have recently been expanded with manufacturing systems and quality control procedures also upgraded to provide the highest possible quality product is delivered to customers worldwide.

### Technical Support

With a worldwide network of Lenze branches and certified distributors we have hundreds of experienced engineers on hand to help customers at all levels to solve problems and find the best solutions for their applications. End users can also be assured that Lenze is always there throughout the lifecycle of its products. Technical information, literature and guides are also available from a multi-language website.

# SMVector IP31 | features and benefits

The SMVector continues our tradition for innovative products in the AC drive market. Its performance and flexibility make it an attractive solution for a broad range of applications including:
▶ Food processing machinery
▶ Packaging machinery
▶ Material handling/conveying systems
▶ Fan and Pump systems

**Superior Performance**
▶ Modes of Operation:
  – V/Hz (Constant and Variable)
  – Enhanced V/Hz (Constant and Variable)
  – Vector Speed Control
  – Vector Torque Control
▶ Dynamic Torque Response
▶ Sophisticated Auto-tuning (Motor Calibration)
▶ Impressive Low Speed Operation

**Flexible Power Ranges**
▶ International Voltages:
  – 120/240 V, 1∅ (up to 1.1 kW)
  – 200/240 V, 1/3∅ (up to 2.2 kW)
  – 200/240 V, 3∅ (up to 15 kW)
  – 400/480 V, 3∅ (up to 30 kW)
  – 480/600 V, 3∅ (up to 30 kW)

**Simplicity**
▶ Intuitive User Interface
▶ Electronic Memory Module (EPM)

**Field-bus Connectivity**
▶ DeviceNet
▶ Modbus-RTU
▶ LECOM
▶ CANopen
▶ EtherNet/IP
▶ PROFIBUS-DP

# SMVector IP31 | Electronic Programming Module (EPM)

**Electronic Programming Module (EPM)**
Program the SMVector quickly and easily using the electronic programming module (EPM). The EPM stores the drive's parameter configuration and simplifies initial setup:

▶ Three ways to program the EPM:
   1. Use the intuitive integrated keypad
   2. Program in a Microsoft WindowsTM environment with Techlink.
   3. Use the portable EPM programmer.
▶ The EPM saves time and money:
   1. Create your parameter profile and archive to the EPM programmer, a master EPM or your PC.
   2. Insert the EPM into the EPM programmer and copy parameters in a matter of seconds!
   3. Plug the EPM into the drive and it is fully programmed and ready to go.

▶ Improve efficiency:
   Program the drive anytime and anywhere where it makes sense during your manufacturing or commissioning process. You can even plug in a fully programmed EPM before connecting the drive to power. Now the drive is ready and waiting for power to be connected.
▶ Safeguard your configuration:
   When you program the EPM your parameter settings are automatically archived. This truly unique feature allows the SMVector to be reset to factory default settings or to customer settings.

The EPM. Another example of the innovative thinking that separates Lenze from other manufacturers.



*EPM Programmer*

4
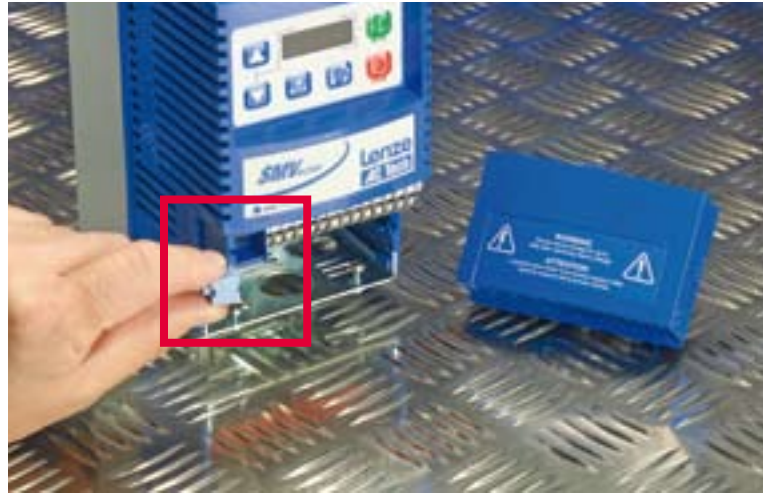
**EPM – OEM Magic!**
The robust plug-in EPM chip is a fantastic feature for companies using the SMVector drive in a production line product.
The EPM chip contents can also be duplicated instantly using the electronic programming module, allowing OEM builders to set-up drives on duplicate machines at the push of a button.

**Maintenance & Replacements**
Contained in a small but robust 10 mm square housing the EPM can easily be posted out to customers in the field. This allows the machine manufacturer to avoid the cost of sending out an engineer to re-commission a drive.

In the unlikely event that a drive fails, a replacement can be despatched to the site and a maintenance operative or electrician can replace the drive and then simply transfer the EPM chip from the old unit to the new drive and it will be ready to run.



*Ideal for identical repeat applications.*
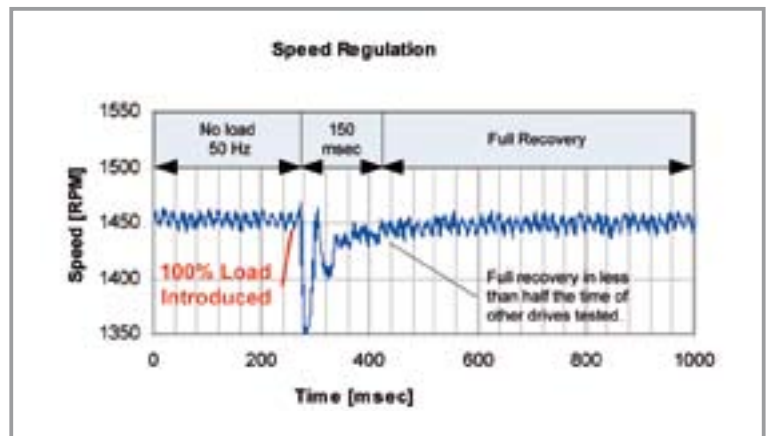
# SMVector IP31 | performance

**Exceptional Starting Torque**
Overpower demanding applications.
The SMVector is peerless in controlling
the motor's ability to convert current into
torque. In this example, the SMVector is
started into a stiff 195% torque load. Not
only does the motor start the load, but
it also delivers a full 195% torque while
accelerating to 50 Hz in 8 seconds.
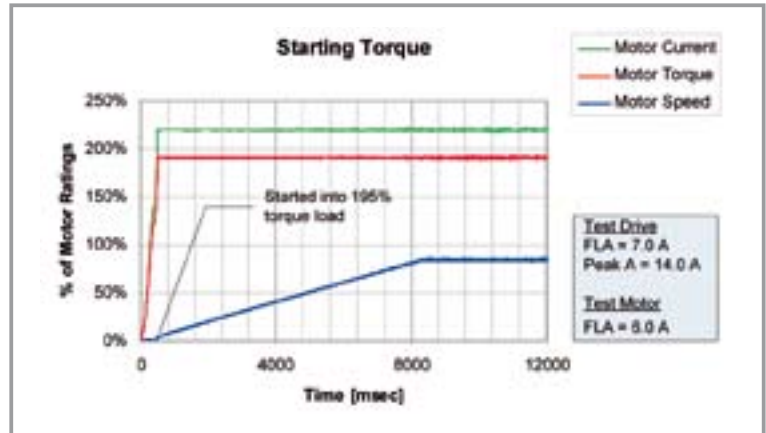
**Dynamic Speed Regulation**
Shock loads are no match for the
SMVector. Here an instantaneous
100% load is dealt with in a mere 0.15
seconds. Remarkably, this level of speed
regulation is achieved open loop without
the additional cost of a feedback device
associated with closed loop systems.

**Quick Acceleration**
Motors controlled by the SMVector benefit
from a sophisticated motor control
algorithm that drives motor performance
to maximum levels. In this application the
the motor is able to drive a 165% torque
load while accelerating from 0 to 100%
speed in an impressive 0.33 seconds.
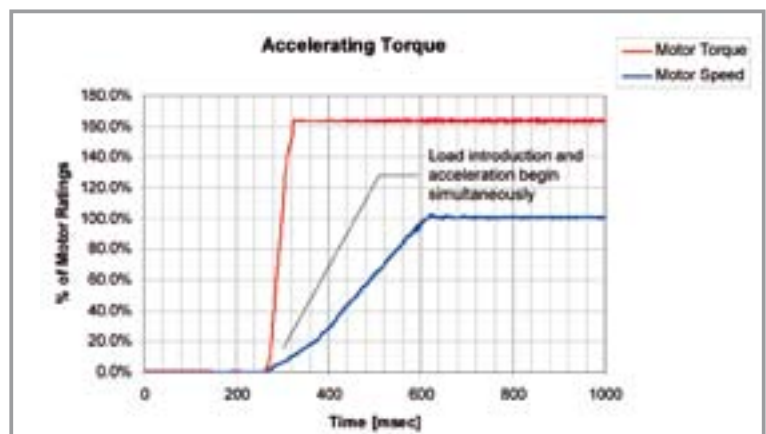
*All Performance figures are application dependant*

# SMVector IP31 | specifications

## World Class Control

### Modes of Operation
► Open Loop Flux Vector
   Speed or Torque Control
► V/Hz (Constant or Variable)
► Enhanced V/Hz with Auto-tuning

### Performance
► 150% overload for 60 sec's
   - 200% overload for 15 sec's
     (up to 7.5kW)
   - 180% overload for 15 sec's
     (11kW to 30kW)

### Acceleration/Deceleration Profiles
► Two Independent Accel Ramps
► Two Independent Decel Ramps
► Linear
► S-Type
► Auxiliary Ramp-to-Stop

### Output Frequency
► 500 Hz Standard
► 1,000 Hz Optional

### Switching Frequency
► 4, 6, 8, 10 (kHz) (Optional 16 kHz)

### Universal Logic Assertion (Selectable)
► Positive Logic Input
► Negative Logic Input

### Braking Functions
► DC Injection Braking
► Optional dynamic Braking
► Motor Flux braking

### Speed/Torque Control
► Keypad
► Jog
► Floating Point Control
► Voltage: Scalable 0 –10 VDC
► Current: Scalable 4 – 20 mA
► Potentiometer
► Fieldbus
► 8 Preset Speeds
► Flying start

### Process Control
► PID Modes: Direct and Reverse Acting
► PID Sleep Mode
► User defined units
► Sequencer
► Pump-Rinse Mode

## Vigilant System Protection

### Voltage Monitoring
► Low DC Bus V Protection
► High DC Bus V Protection
► Low Line V Compensation
► Phase Loss Protection

### Current Monitoring
► Motor Overload Protection
► Current Limiting Safeguard
► Ground Fault
► Short Circuit Protection

### Loss of Follower Management
► Protective Fault
► Go to Preset Speed or Preset Setpoint
► Initiate System Notification

### Over Temperature Protection

## Comprehensive Diagnostic Tools

### Real Time Monitoring
► 8 Register Fault History
► Software Version
► DC Bus Voltage (V)
► Motor Voltage (V)
► Output Current (%)
► Motor Current (A)
► Motor Torque (%)
► Output Frequency/ RPM
► Power (kW)
► Energy Consumption (kWh)
► Heatsink Temperature (°C)
► 0 – 10 VDC Input (User Defined)
► 4 – 20 mA Input (User Defined)
► PID Feedback (User Defined)
► Analog Output (Speed, Load, Torque, kW)
► Terminal Status
► Keypad Status
► Elapsed Run Time (Hours)
► Elapsed Power on Time (Hours)

### Status Outputs
► Programmable Form "A" Relay Output
► Programmable Open Collector Output
► Scalable 0-10 VDC / 2-10 VDC Analog Output

## Environmental Capabilities

### Ambient Temperature
► -10 to 55°C
► Derate 2.5% per °C Above 40°C

### EMC Conformance
► CE EMC Directive (EN61800-3) with optional external EMC filter (First and second environment, category C1 and C2).

## Global Standards
► UL, cUL
► CE Low Voltage Directive (EN61800-5-1) (Europe)
► GOST (Russia/Ukraine)
► C-Tick (Australia/New Zealand)
► RoHs
► ECA listed (UK- Enhanced Capital Allowance Scheme)

# SMVector IP31 | user interface

**Simple Six Button Programming**
▶ Start
▶ Stop
▶ Forward/Reverse
▶ Scroll Up
▶ Scroll Down
▶ Enter/Mode



*Keypad (up to 7.5 kW)*

**Informative LED Display**
▶ Vivid Illumination
▶ Easily Read from a Distance

**Five Status LEDs**
▶ Run
▶ Automatic Speed mode
▶ Manual Speed Mode
▶ Forward Rotation
▶ Reverse Rotation

**Status Display**
▶ Motor Status
▶ Fault Management
▶ Operational Information

**Additional CTRL Button**
Switch between control modes
▶ Local-Manual
▶ Local-Auto
▶ Remote-Manual
▶ Remote-Auto



*Keypad (11-30 kW)*

**Additional LED Indicators**
Define the units being displayed
▶ Hz
▶ RPM
▶ %
▶ Amps
▶ Units
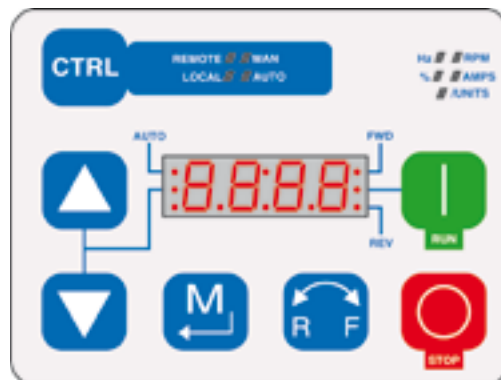
# SMVector IP31 | connectivity

With optional plug-in communication modules, the SMVector is easily integrated into any one of today's most commonly used industrial networks. Whether the application is to automate a single machine or an entire facility.

Setting up a drive in a network has never been so simple. If the SMVector is already installed it can be easily upgraded in the field.

LECOM
Lenze Proprietary Protocol

Modbus-RTU

CANopen

PROFI

EtherNet/IP

DeviceNet

# SMVector IP31 | specifications

## Control Terminals (Up to 7.5 kW)

**Selector switch for negative or positive logic.**

**Control Terminals**

**EPM**
*(Electronic Programming Module)*

**Communication Gateway**

**Dynamic Brake connection**

*Digital Inputs*
► *Dedicated Start/Stop*
► *(3) Programmable*

*Digital Outputs*
► *Form "A" Relay*
► *Open Collector*

*Analogue Inputs*
► *0 - 10 VDC*
► *4 - 20 mA*

*Analogue Outputs*
► *0 - 10 VDC / 2 - 10 VDC*

*Power Supplies*
► *10 VDC*
  *Potentiometer Ref*
► *12 VDC*
  *20 mA Digital Input*
  *Ref or 0VDC Common*
► *12 VDC*
  *50 mA Supply Common*

## Control Terminals (11-30 kW)

**Selector switch for negative or positive logic.**

**Control Terminals**

**EPM**
*(Electronic Programming Module)*

**Communication Gateway**

**Dynamic Brake connection**

*Digital Inputs*
► *Dedicated Start/Stop*
► *(4) Programmable*

*Digital Outputs*
► *Form "A" Relay*
► *Open Collector*

*Analogue Inputs*
► *0 - 10 VDC*
► *4 - 20 mA*

*Analogue Outputs*
► *0 - 10 VDC/2-10VDC*

*Power Supplies*
► *10 VDC*
  *Potentiometer Ref*
► *12 VDC*
  *20 mA Digital Input*
  *Ref or 0VDC Common*
► *12 VDC*
  *50 mA Supply Common*

*RS-485 Communications*
► *TXA*
► *TXB*

# SMVector IP31 | options

**Optional Remote Keypad**

▶ Allows operation of the drive from a remote location up to 30 Mtrs from the drive.

▶ Cubicle door mountable

▶ IP65 rating



*ESVZXK1*
*Remote keypad -*
*For drives up to 7.5 kW*

*ESVZXH0*
*Remote keypad -*
*For drives 11 - 30 kW*

**Extended I/O modules**

▶ **ESVZAL0**
Extends the standard drive with 1 extra programmable form C relay output.

▶ **ESVZAL1**
Extends the standard drive with 1 extra programmable form C relay output and 2 extra programmable digital inputs.



**External Dynamic Braking Unit**



**External EMC filter**

▶ Enables the drive to meet (EN61800-3) (First and second environment, category C1 and C2).

# SMVector IP31 | filters

## External EMC filters (Schaffner)

| Drive Model | Standard Filter 1 Phase | Low Earth Leakage Filter 1 Phase | Standard Filter 3 Phase | Low Earth Leakage Filter 3 Phase | Size |
|---|---|---|---|---|---|
| ESV251N01SXB | FS23938-10-07 | FS23938-10-07-LL | | | F1 |
| ESV371N01SXB | FS23938-10-07 | FS23938-10-07-LL | | | F1 |
| ESV751N01SXB | FS23938-17-07 | FS23938-17-07-LL | | | F1 |
| ESV251N02SXB [1] | FS23938-10-07 | FS23938-10-07-LL | | | F1 |
| ESV371N02YXB | FS23938-10-07 | FS23938-10-07-LL | FS23939-7-07 | FS23939-7-07-LL | F1 |
| ESV751N02YXB | FS23938-10-07 | FS23938-10-07-LL | FS23939-7-07 | FS23939-7-07-LL | F1 |
| ESV112N02YXB | FS23938-17-07 | FS23938-17-07-LL | FS23939-7-07 | FS23939-7-07-LL | F1 |
| ESV152N02YXB | FS23938-17-07 | FS23938-17-07-LL | FS23939-11-07 | FS23939-11-07-LL | F1 |
| ESV222N02YXB | FS23938-17-07 | FS23938-17-07-LL | FS23939-11-07 | FS23939-11-07-LL | F1 |
| ESV112N02TXB | | | FS23939-7-07 | FS23939-7-07-LL | F1 |
| ESV152N02TXB | | | FS23939-11-07 | FS23939-11-07-LL | F1 |
| ESV222N02TXB | | | FS23939-11-07 | FS23939-11-07-LL | F1 |
| ESV402N02TXB | | | FS23939-19-07 | FS23939-19-07-LL | F1 |
| ESV552N02TXB | | | FS23939-33-07 | FS23939-33-07-LL | F2 |
| ESV752N02TXB | | | FS23939-33-07 | FS23939-33-07-LL | F2 |
| ESV113N02TXB | | | FS23939-59-07 | FS23939-59-07-LL | F3 |
| ESV153N02TXB | | | FS23939-59-07 | FS23939-59-07-LL | F3 |
| ESV371N04TXB | | | FS23939-7-07 | FS23939-7-07-LL | F1 |
| ESV751N04TXB | | | FS23939-7-07 | FS23939-7-07-LL | F1 |
| ESV112N04TXB | | | FS23939-7-07 | FS23939-7-07-LL | F1 |
| ESV152N04TXB | | | FS23939-7-07 | FS23939-7-07-LL | F1 |
| ESV222N04TXB | | | FS23939-7-07 | FS23939-7-07-LL | F1 |
| ESV402N04TXB | | | FS23939-11-07 | FS23939-11-07-LL | F1 |
| ESV552N04TXB | | | FS23939-18-07 | FS23939-18-07-LL | F2 |
| ESV752N04TXB | | | FS23939-18-07 | FS23939-18-07-LL | F2 |
| ESV113N04TXB | | | FS23939-35-07 | FS23939-35-07-LL | F3 |
| ESV153N04TXB | | | FS23939-35-07 | FS23939-35-07-LL | F3 |
| ESV183N04TXB | | | FS23939-52-07 | FS23939-52-07-LL | F3 |
| ESV223N04TXB | | | FS23939-52-07 | FS23939-52-07-LL | F3 |
| ESV303N04TXB | | | TBA | TBA | |

[1] The model ESV251N02SXB is 1Ø input only.
For 3Ø INPUT use the ESV371N02YXB

## Dimensions

| Size | H | W | D |
|---|---|---|---|
| | mm | mm | mm |
| F1 | 248.4 | 100 | 50 |
| F2 | 307.4 | 129.5 | 50 |
| F3 | 381.4 | 177.1 | 50 |

# SMVector IP31 | ratings and dimensions
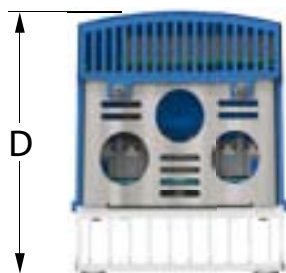
*Bottom Entry with IP31*
*Steel Conduit Plate*



*Bottom Entry with IP21*
*Finger Guard*

## Dimensions

|  | H | | W | | D | |
|---|---|---|---|---|---|---|
|  | in. | mm | in. | mm | in. | mm |
| G1 (0.25-0.75 kW) | 7.48 | 190 | 3.90 | 99 | 4.35 | 110 |
| G2 (1.1-2.2 kW) | 7.52 | 191 | 3.90 | 99 | 5.45 | 138 |
| G3 (4.0kW) | 7.52 | 191 | 3.90 | 99 | 5.80 | 147 |
| H1 (5.5-7.5 kW) | 9.83 | 250 | 5.12 | 130 | 6.30 | 160 |
| J1 (11.0-22.0 kW) | 12.50 | 318 | 6.92 | 176 | 8.09 | 206 |
| J2 (30 kW) | 14.2 | 360 | 8.8 | 222 | 10.1 | 256 |

# SMVector IP31 | ratings and dimensions

### 120/240V - 1Ø Input (3Ø Output)

| Model Number | Output Current | Power | Size |
|---|---|---|---|
| | $I_N$ [A] | kW | |
| ESV251N01SXB | 1.7 | 0.25 | G1 |
| ESV371N01SXB | 2.4 | 0.37 | G1 |
| ESV751N01SXB | 4.2 | 0.75 | G1 |
| ESV112N01SXB | 6.0 | 1.1 | G2 |

Notes:

Output voltage will be twice line voltage when connected to a 120V source.
Output voltage will not exceed line voltage when connected to a 240V source.

### 200/240V - 1 or 3Ø Input (3Ø Output)

| Model Number | Output Current | Power | Size |
|---|---|---|---|
| | $I_N$ [A] | kW | |
| ESV251N02SXB [1] | 1.7 | 0.25 | G1 |
| ESV371N02YXB | 2.4 | 0.37 | G1 |
| ESV751N02YXB | 4.2 | 0.75 | G1 |
| ESV112N02YXB | 6.0 | 1.1 | G2 |
| ESV152N02YXB | 7.0 | 1.5 | G2 |
| ESV222N02YXB | 9.6 | 2.2 | G2 |

### 200/240V - 3Ø Input (3Ø Output)

| Model Number | Output Current | Power | Size |
|---|---|---|---|
| | $I_N$ [A] | kW | |
| ESV112N02TXB | 6.0 | 1.1 | G2 |
| ESV152N02TXB | 7.0 | 1.5 | G2 |
| ESV222N02TXB | 9.6 | 2.2 | G2 |
| ESV402N02TXB | 16.5 | 4.0 | G3 |
| ESV552N02TXB | 23 | 5.5 | H1 |
| ESV752N02TXB | 29 | 7.5 | H1 |
| ESV113N02TXB | 42 | 11.0 | J1 |
| ESV153N02TXB | 54 | 15.0 | J1 |

# SMVector IP31 | ratings and dimensions

## 400/480V - 3∅ Input (3∅ Output)

| Model Number | Output Current | Power | Size |
|---|---|---|---|
| | $I_N$ [A] | kW | |
| ESV371N04TXB | 1.3/1.1 | 0.37 | G1 |
| ESV751N04TXB | 2.4/2.1 | 0.75 | G1 |
| ESV112N04TXB | 3.5/3.0 | 1.1 | G2 |
| ESV152N04TXB | 4.0/3.5 | 1.5 | G2 |
| ESV222N04TXB | 5.5/4.8 | 2.2 | G2 |
| ESV402N04TXB | 9.4/8.2 | 4.0 | G3 |
| ESV552N04TXB | 12.6/11 | 5.5 | H1 |
| ESV752N04TXB | 16.1/14 | 7.5 | H1 |
| ESV113N04TXB | 24/21 | 11.0 | J1 |
| ESV153N04TXB | 31/27 | 15.0 | J1 |
| ESV183N04TXB | 39/34 | 18.5 | J1 |
| ESV223N04TXB | 46/40 | 22 | J1 |
| ESV303N04TXB | 60/52 | 30 | J2 |

## 480/600V - 3∅ Input (3∅ Output)

| Model Number | Output Current | Power | Size |
|---|---|---|---|
| | $I_N$ [A] | kW | |
| ESV751N06TXB | 1.7 | 0.75 | G1 |
| ESV152N06TXB | 2.7 | 1.5 | G2 |
| ESV222N06TXB | 3.9 | 2.2 | G2 |
| ESV402N06TXB | 6.1 | 4.0 | G3 |
| ESV552N06TXB | 9 | 5.5 | H1 |
| ESV752N06TXB | 11 | 7.5 | H1 |
| ESV113N06TXB | 17 | 11.0 | J1 |
| ESV153N06TXB | 22 | 15.0 | J1 |
| ESV183N06TXB | 27 | 18.5 | J1 |
| ESV223N06TXB | 32 | 22 | J1 |

[1] The model ESV251N02SXB is 1∅ input only.

For 3∅ INPUT use the ESV371N02YXB.

# SMVector IP31 | applications

- ▶ Assembly Line
- ▶ Automated Warehousing
- ▶ Automation
- ▶ Automotive
- ▶ Conveying
- ▶ Energy Saving
- ▶ Fans
- ▶ Food
- ▶ Indoor Climate Control
- ▶ Instrumentation
- ▶ Packaging
- ▶ Panel Components
- ▶ Paper
- ▶ Printing
- ▶ Process
- ▶ Production Line
- ▶ Pumps & Compressors
- ▶ Recycling

# SMVector IP31 | industries

- ▶ Aggregates
- ▶ Automotive
- ▶ Brewing
- ▶ Food
- ▶ Horticulture
- ▶ HVAC
- ▶ Leisure
- ▶ Printing
- ▶ Woodworking
- ▶ Process
- ▶ Sortation warehouses
- ▶ Wine production
- ▶ Textiles
- ▶ Grinding and finishing
- ▶ Fairground rides

# It's good to know | why we are there for you

*"Our customers come first. Customer satisfaction is what motivates us. By thinking in terms of how we can add value for our customers we can increase productivity through reliability."*

## Lenze drive and automation solutions

*"We will provide you with exactly what you need – perfectly co-ordinated products and solutions with the right functions for your machines and installations. That is what we mean by 'quality'."*

*"Take advantage of our wealth of expertise. For 60 years now we have been gathering experience in various fields and implementing it consistently and rigorously in our products, motion functions and preprepared solutions for industry."*

*"We identify with your targets and strive towards a long-term partner-ship which benefits both sides. Our competent support and consultation process means that we can provide you with tailor-made solutions. We are there for you and can offer assistance in all of the key processes."*

**You can rely on our service. Expert advice is available 24 hours a day, 365 days a year, in more than 30 countries via our international helpline: 008000 24 Hours (008000 2446877).**

**www.Lenze.com**

13340595