SMVector IP31

*frequency inverter*

Flexible, simple, economical
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.
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, 1Ø (up to 1.1 kW)
  - 200/240 V, 1/3Ø (up to 2.2 kW)
  - 200/240 V, 3Ø (up to 15 kW)
  - 400/480 V, 3Ø (up to 30 kW)
  - 480/600 V, 3Ø (up to 30 kW)

**Simplicity**

- Intuitive User Interface
- Electronic Memory Module (EPM)

**Field-bus Connectivity**

- DeviceNet
- Modbus-RTU
- LECOM
- CANopen
- EtherNet/IP
- PROFIBUS-DP

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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 – 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.
**SMVector IP31**

**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 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*
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

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

Additional LED Indicators
Define the units being displayed
- Hz
- RPM
- %
- Amps
- Units

Keypad (up to 7.5 kW)

Keypad (11-30 kW)
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.
## SMVector IP31 Specifications

### Control Terminals (Up to 7.5 kW)

<table>
<thead>
<tr>
<th>Control Terminals</th>
<th>Digital Inputs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dedicated Start/Stop</td>
</tr>
<tr>
<td></td>
<td>(3) Programmable</td>
</tr>
<tr>
<td>Digital Inputs</td>
<td>Form “A” Relay</td>
</tr>
<tr>
<td></td>
<td>Open Collector</td>
</tr>
<tr>
<td>Analogue Inputs</td>
<td>0 - 10 VDC</td>
</tr>
<tr>
<td></td>
<td>4 – 20 mA</td>
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</tbody>
</table>

### Control Terminals (11-30 kW)

<table>
<thead>
<tr>
<th>Control Terminals</th>
<th>Digital Inputs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dedicated Start/Stop</td>
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<tr>
<td></td>
<td>(4) Programmable</td>
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<tr>
<td>Digital Inputs</td>
<td>Form “A” Relay</td>
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<td></td>
<td>Open Collector</td>
</tr>
<tr>
<td>Analogue Inputs</td>
<td>0 - 10 VDC</td>
</tr>
<tr>
<td></td>
<td>4 – 20 mA</td>
</tr>
</tbody>
</table>

### Power Supplies

- 10 VDC
- Potentiometer Ref
- 12 VDC
- 20 mA Digital Input Ref or 0VDC Common
- 12 VDC
- 50 mA Supply Common

### Communication

- 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

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)

<table>
<thead>
<tr>
<th>Drive Model</th>
<th>Standard Filter 1 Phase</th>
<th>Low Earth Leakage Filter 1 Phase</th>
<th>Standard Filter 3 Phase</th>
<th>Low Earth Leakage Filter 3 Phase</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESV251N01SXB</td>
<td>FS23938-10-07</td>
<td>FS23938-10-07-LL</td>
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<td></td>
<td>F1</td>
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<tr>
<td>ESV371N01SXB</td>
<td>FS23938-10-07</td>
<td>FS23938-10-07-LL</td>
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<td>F1</td>
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<td>FS23938-17-07</td>
<td>FS23938-17-07-LL</td>
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<td>FS23939-7-07</td>
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<td>F1</td>
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<td>FS23938-17-07-LL</td>
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<td>FS23939-7-07-LL</td>
<td>F1</td>
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<tr>
<td>ESV112N02YXB</td>
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<td>FS23938-17-07-LL</td>
<td>FS23939-11-07</td>
<td>FS23939-11-07-LL</td>
<td>F1</td>
</tr>
<tr>
<td>ESV222N02YXB</td>
<td>FS23938-17-07</td>
<td>FS23938-17-07-LL</td>
<td>FS23939-11-07</td>
<td>FS23939-11-07-LL</td>
<td>F1</td>
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<tr>
<td>ESV112N02TXB</td>
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<td>FS23939-11-07-LL</td>
<td>FS23939-11-07</td>
<td>FS23939-11-07-LL</td>
<td>F1</td>
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<tr>
<td>ESV152N02TXB</td>
<td>FS23939-11-07</td>
<td>FS23939-11-07-LL</td>
<td>FS23939-19-07</td>
<td>FS23939-19-07-LL</td>
<td>F1</td>
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<tr>
<td>ESV153N02TXB</td>
<td>FS23939-59-07</td>
<td>FS23939-59-07-LL</td>
<td>FS23939-7-07</td>
<td>FS23939-7-07-LL</td>
<td>F1</td>
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<td>ESV371N04TXB</td>
<td>FS23939-7-07</td>
<td>FS23939-7-07-LL</td>
<td>FS23939-7-07</td>
<td>FS23939-7-07-LL</td>
<td>F1</td>
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<tr>
<td>ESV751N04TXB</td>
<td>FS23939-7-07</td>
<td>FS23939-7-07-LL</td>
<td>FS23939-7-07</td>
<td>FS23939-7-07-LL</td>
<td>F1</td>
</tr>
<tr>
<td>ESV112N04TXB</td>
<td>FS23939-7-07</td>
<td>FS23939-7-07-LL</td>
<td>FS23939-7-07</td>
<td>FS23939-7-07-LL</td>
<td>F1</td>
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<tr>
<td>ESV152N04TXB</td>
<td>FS23939-7-07</td>
<td>FS23939-7-07-LL</td>
<td>FS23939-7-07</td>
<td>FS23939-7-07-LL</td>
<td>F1</td>
</tr>
<tr>
<td>ESV222N04TXB</td>
<td>FS23939-7-07</td>
<td>FS23939-7-07-LL</td>
<td>FS23939-7-07</td>
<td>FS23939-7-07-LL</td>
<td>F1</td>
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<tr>
<td>ESV303N04TXB</td>
<td>TBA</td>
<td>TBA</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

1) The model ESV251N02SXB is 1Ø input only.
For 3Ø input use the ESV371N02YXB

### Dimensions

<table>
<thead>
<tr>
<th>Size</th>
<th>H</th>
<th>W</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>248.4</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>F2</td>
<td>307.4</td>
<td>129.5</td>
<td>50</td>
</tr>
<tr>
<td>F3</td>
<td>381.4</td>
<td>177.1</td>
<td>50</td>
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</tbody>
</table>

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### Dimensions

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

Bottom Entry with IP31
Steel Conduit Plate

Bottom Entry with IP21
Finger Guard
## SMVector IP31 | Ratings and Dimensions

### 120/240V - 1Ø Input (3Ø Output)

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Output Current</th>
<th>Power</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESV251N015XB</td>
<td>1.7</td>
<td>0.25</td>
<td>G1</td>
</tr>
<tr>
<td>ESV371N015XB</td>
<td>2.4</td>
<td>0.37</td>
<td>G1</td>
</tr>
<tr>
<td>ESV751N015XB</td>
<td>4.2</td>
<td>0.75</td>
<td>G1</td>
</tr>
<tr>
<td>ESV112N015XB</td>
<td>6.0</td>
<td>1.1</td>
<td>G2</td>
</tr>
</tbody>
</table>

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)

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Output Current</th>
<th>Power</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESV251N025XB</td>
<td>1.7</td>
<td>0.25</td>
<td>G1</td>
</tr>
<tr>
<td>ESV371N02YXB</td>
<td>2.4</td>
<td>0.37</td>
<td>G1</td>
</tr>
<tr>
<td>ESV751N02YXB</td>
<td>4.2</td>
<td>0.75</td>
<td>G1</td>
</tr>
<tr>
<td>ESV112N02YXB</td>
<td>6.0</td>
<td>1.1</td>
<td>G2</td>
</tr>
<tr>
<td>ESV152N02YXB</td>
<td>7.0</td>
<td>1.5</td>
<td>G2</td>
</tr>
<tr>
<td>ESV222N02YXB</td>
<td>9.6</td>
<td>2.2</td>
<td>G2</td>
</tr>
</tbody>
</table>

### 200/240V - 3Ø Input (3Ø Output)

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Output Current</th>
<th>Power</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESV112N02TXB</td>
<td>6.0</td>
<td>1.1</td>
<td>G2</td>
</tr>
<tr>
<td>ESV152N02TXB</td>
<td>7.0</td>
<td>1.5</td>
<td>G2</td>
</tr>
<tr>
<td>ESV222N02TXB</td>
<td>9.6</td>
<td>2.2</td>
<td>G2</td>
</tr>
<tr>
<td>ESV402N02TXB</td>
<td>16.5</td>
<td>4.0</td>
<td>G3</td>
</tr>
<tr>
<td>ESV552N02TXB</td>
<td>23</td>
<td>5.5</td>
<td>H1</td>
</tr>
<tr>
<td>ESV752N02TXB</td>
<td>29</td>
<td>7.5</td>
<td>H1</td>
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<tr>
<td>ESV113N02TXB</td>
<td>42</td>
<td>11.0</td>
<td>J1</td>
</tr>
<tr>
<td>ESV153N02TXB</td>
<td>54</td>
<td>15.0</td>
<td>J1</td>
</tr>
</tbody>
</table>
SMVector IP31 ratings and dimensions

400/480V - 3Ø Input (3Ø Output)

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Output Current</th>
<th>Power</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESV371N04TXB</td>
<td>1.3/1.1</td>
<td>0.37</td>
<td>G1</td>
</tr>
<tr>
<td>ESV751N04TXB</td>
<td>2.4/2.1</td>
<td>0.75</td>
<td>G1</td>
</tr>
<tr>
<td>ESV112N04TXB</td>
<td>3.5/3.0</td>
<td>1.1</td>
<td>G2</td>
</tr>
<tr>
<td>ESV152N04TXB</td>
<td>4.0/3.5</td>
<td>1.5</td>
<td>G2</td>
</tr>
<tr>
<td>ESV222N04TXB</td>
<td>5.5/4.8</td>
<td>2.2</td>
<td>G2</td>
</tr>
<tr>
<td>ESV402N04TXB</td>
<td>9.4/8.2</td>
<td>4.0</td>
<td>G3</td>
</tr>
<tr>
<td>ESV552N04TXB</td>
<td>12.6/11</td>
<td>5.5</td>
<td>H1</td>
</tr>
<tr>
<td>ESV752N04TXB</td>
<td>16.1/14</td>
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<td>H1</td>
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<tr>
<td>ESV113N04TXB</td>
<td>24/21</td>
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<td>J1</td>
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<tr>
<td>ESV153N04TXB</td>
<td>31/27</td>
<td>15.0</td>
<td>J1</td>
</tr>
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<td>ESV183N04TXB</td>
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<td>18.5</td>
<td>J1</td>
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<td>ESV223N04TXB</td>
<td>46/40</td>
<td>22</td>
<td>J1</td>
</tr>
<tr>
<td>ESV303N04TXB</td>
<td>60/52</td>
<td>30</td>
<td>J2</td>
</tr>
</tbody>
</table>

480/600V - 3Ø Input (3Ø Output)

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Output Current</th>
<th>Power</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESV751N06TXB</td>
<td>1.7</td>
<td>0.75</td>
<td>G1</td>
</tr>
<tr>
<td>ESV152N06TXB</td>
<td>2.7</td>
<td>1.5</td>
<td>G2</td>
</tr>
<tr>
<td>ESV222N06TXB</td>
<td>3.9</td>
<td>2.2</td>
<td>G2</td>
</tr>
<tr>
<td>ESV402N06TXB</td>
<td>6.1</td>
<td>4.0</td>
<td>G3</td>
</tr>
<tr>
<td>ESV552N06TXB</td>
<td>9</td>
<td>5.5</td>
<td>H1</td>
</tr>
<tr>
<td>ESV752N06TXB</td>
<td>11</td>
<td>7.5</td>
<td>H1</td>
</tr>
<tr>
<td>ESV113N06TXB</td>
<td>17</td>
<td>11.0</td>
<td>J1</td>
</tr>
<tr>
<td>ESV183N06TXB</td>
<td>22</td>
<td>15.0</td>
<td>J1</td>
</tr>
<tr>
<td>ESV223N06TXB</td>
<td>27</td>
<td>18.5</td>
<td>J1</td>
</tr>
<tr>
<td>ESV303N06TXB</td>
<td>32</td>
<td>22</td>
<td>J1</td>
</tr>
</tbody>
</table>

1) The model ESV251N025XB is 1Ø input only.
   For 3Ø 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