

# ISA-B2P

**Miniature Soft Starter**  
**8-170A, 220-600V**

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## **Instruction Manual**

Ver. 06.06.2012

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## Safety



- Read this manual carefully before operating the equipment and follow its instructions.
- Installation, operation and maintenance should be in strict accordance with this manual, national codes and good practice. Installation or operation not performed in strict accordance with these instructions will void manufacturer's warranty.
- Disconnect all power inputs before servicing the soft-starter and/or the motor.
- Prior to the installation, check and verify that no parts (bolts, washers, etc) will fall into the starter.

## Attention

1. This product was designed and tested for compliance with IEC 947-4-2 for class A equipment.
2. Use of the product in domestic environments may cause radio interference, in which case the user may be required to employ additional mitigation methods.
3. Utilization category is AC-53a or AC53b. Form1.
4. For further information see Technical Specification.

## Warnings



- Internal components and P.C.B's are at Mains potential when the ISA-B2P is connected to mains. This voltage is extremely dangerous and may cause death or severe injury if contacted.
- When the ISA-B2P is connected to Mains, even if start signal has not been issued, full voltage may appear on motor's terminals. Therefore, for isolation purposes it is required to connect an isolating device (C/B, switch, line contactor, etc) upstream to the ISA-B2P.
- Starter must be properly grounded (except 8-22A) to ensure correct operation and safety.
- Check that Power Factor capacitors are not connected to the output side of the soft starter

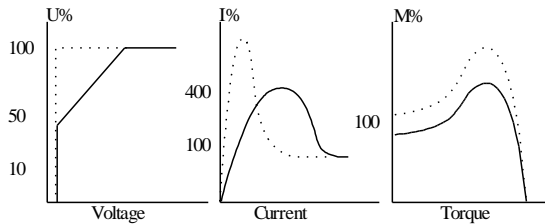
The company reserves the right to make any improvements or modifications to its products without prior notice.

# Starter Selection

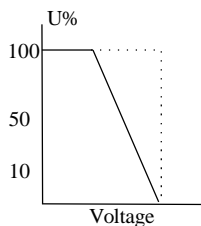
The ISA-B2P is a Miniature Analogue soft starter which incorporates two sets of thyristors to start a three phase squirrel cage induction motor. By supplying a slowly increasing voltage, it provides soft start and smooth stepless acceleration, while drawing the minimum current necessary to start the motor.

A Soft Stop feature can be enabled when the Ramp-Down potentiometer is adjusted. When used, upon stop signal (open contact terminals 1 and 2), starter's output voltage is slowly reduced to zero.

## Soft-Start Characteristics



## Soft-Stop Characteristics



Used for controlled deceleration of pumps and high friction loads.

The starter should be selected in accordance with the following criteria:

### 1. Motor Current & Starting Conditions

Select the starter according to motor's Full Load Ampere (FLA) - as indicated on its nameplate (even if the motor will not be fully loaded).

The ISA-B2P is designed for operation of:

3.5 x In, for 5 Sec. at 40°C.

Max. Starts per Hour: 4 starts per hour at maximum ratings. Up to 10 starts per hour at light load applications (consult factory).

**Note:** For very frequent starts (inching applications) the inching current should be considered as the Full Load Current (FLC) – consult factory.

### 2. Mains Voltage

Each starter is factory set for one of the following levels according to the Ordering Information.

Voltage	Tolerance
220 - 240 V	+10 -15 %
380 - 415 V	+10 -15 %
440 V	+10 -15 %
460 - 500 V	+10 -15 %
575 - 600 V	+10 -15 %

Frequency: 50 / 60 Hz.

## ISA-B2P Ratings and Frame Sizes

Max. Motor FLA (Amp)	Starter Type FLC(Amp.)	Frame Size
8	ISA-B2P 8	S1
17	ISA- B2P 17	S2
22	ISA- B2P 22	
31	ISA- B2P 31	S3
44	ISA- B2P 44	
58	ISA- B2P 58	
72	ISA- B2P 72	S4
85	ISA- B2P 85	
105	ISA- B2P 105	
145	ISA- B2P 145	S5
170	ISA- B2P 170	

## Dimensions (mm) & Weights (Kg)

Size	Width	Height	Depth	Weights (Kg)
S1	45	75	110	0.42
S2	90	75	105	0.55
S3	65	190	114	1.3
S4	120	265	121	I
S5	129	275	182	I

I → consult factory

# Installation Notes

## Prior to Installation

Check that Motor's Full Load Ampere (FLA) is lower than or equal to starters Full Load Current (FLC) and that Mains voltage is equal to the rated voltage of the starter.

## Mounting

- The starter must be mounted vertically. Allow sufficient space above and below the starter for suitable airflow.
- It is recommended to mount the starter directly on the rear metal plate of the switchgear for better heat dissipation.
- Do not mount the starter near heat sources.
- Protect the starter from dust and corrosive atmospheres.

## Temperature Range and Heat Dissipation

The starter is rated to operate over a temperature range of  $-10^{\circ}\text{C}$  ( $14^{\circ}\text{F}$ ) to  $+40^{\circ}\text{C}$  ( $104^{\circ}\text{F}$ ).

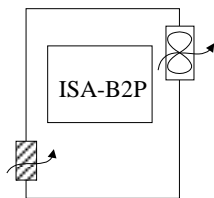
Relative non-condensed humidity inside the enclosure should not exceed 93%.

The heat dissipation during continuous operation is Approx.  $0.3 \times I_n$  (in watts).

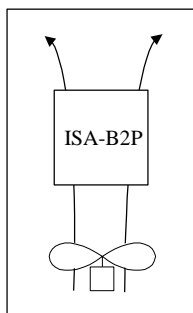
**Example:** When motor's current is 17 Amp, heat dissipation will be approx. 5.1 watts.

Internal enclosure heating can be reduced through the use of additional ventilation.

## Additional Ventilation



General purpose enclosure with filter on the air inlet and Fan on air outlet.



Fan, creating air circulation

## Voltage Spike Protection

Voltage spikes can cause malfunction of the starter and damage the SCRs. When expected, use suitable protection such as Metal Oxide Varistors (consult factory for further details).

## Short Circuit Protection

The ISA-B2P should be protected against a short circuit by Thyristor Protection fuses.

The recommended  $I^2t$  values are:

ISA-Start Type	$I^2t$
ISA- B2P 8	400
ISA- B2P 17	2000
ISA- B2P 22	2500
ISA- B2P 31	3000
ISA- B2P 44	6000
ISA- B2P 58	12000
ISA- B2P 72	I
ISA- B2P 85	I
ISA- B2P 105	I
ISA- B2P 145	I
ISA- B2P 170	I

I → consult factory

### Caution

Power factor correction capacitors **must not** be installed on starter's Load side. When required, Install capacitors on the Line side.

### Warning

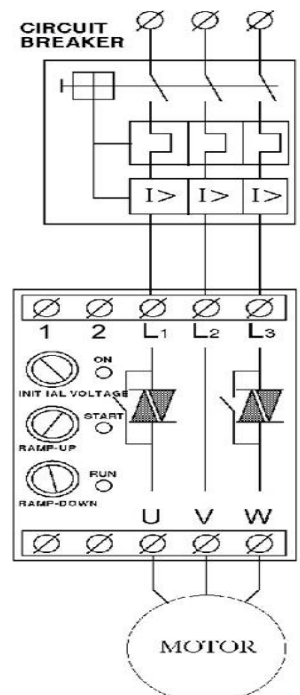
When Mains voltage is connected to the starter, even if start signal has not been initiated, full voltage will appear on the starter's load terminals. Therefore, for isolation purposes it is required to connect an isolating device (C/B, switch, line contactor, etc) upstream to the ISA-B2P (on the Line Side).

## Built-in Bypass

The ISA-B2P incorporates two internal bypass relays allowing current flow through the thyristors only during starting process. At the end of the starting process the built-in relays bypass the thyristors and carry the current to the Motor.

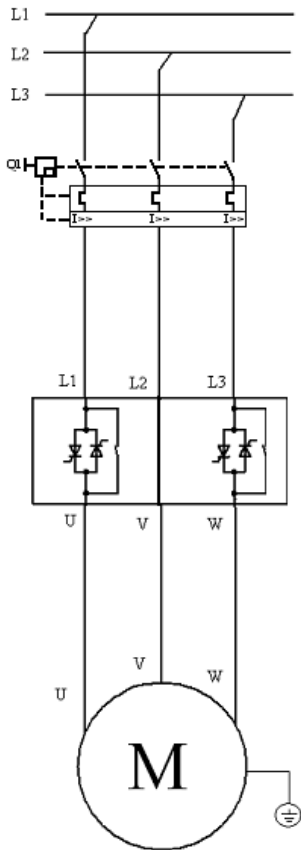
Upon stop signal, or in case of fault, the bypass relays will open and stop the motor.

When Ramp-Down potentiometer is set to allow soft-Stop process, upon stop command, the bypass relays will open immediately and the current will flow through the thyristors. The voltage will then be reduced slowly and smoothly to zero.



# Wiring

## Block and Connection Diagram



**Stop / Start..... Terminals 1 - 2**  
 By voltage free contact (Dry contact)  
 Close: Start command.  
 Open : Stop command.

**Warning**

Do not apply voltage to terminals 1 - 2.

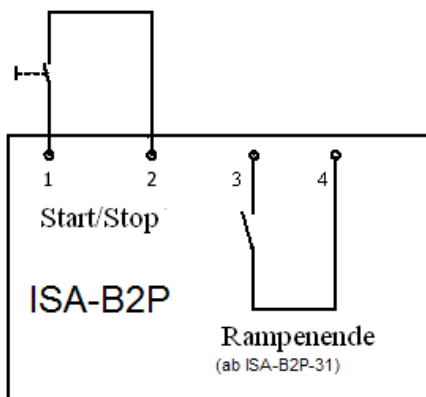
**End of Acceleration (E.O.A) ..... Terminals 3 - 4**  
 EOA relay exists only in starters 31-58A.  
 Voltage free, N.O., 5A / 250VAC, 2000VA max.,  
 The contact closes after the time adjusted on the "Ramp-Up" potentiometer. The contact returns to its original position on stop signal, on fault condition, upon voltage outage and at the beginning of Soft Stop.

**Warning**

Start/Stop with a maintained contact !

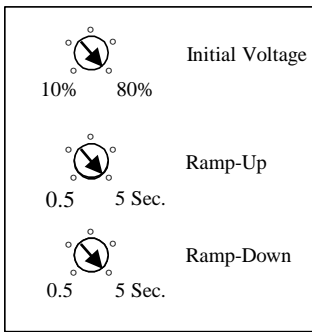
When the line contactor is operated by a maintained contact, in case of Mains failure, the motor will be automatically restarted upon voltage restoration.

## Connection Diagram



# Setting & Startup Procedure

## Front Panel Layout



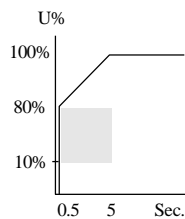
### Initial Voltage

Determines the initial voltage to the motor (The torque is directly proportional to the square of the voltage).  
Range : 10-80% of nominal voltage.

This adjustment also determines the inrush current and mechanical shock.

Too high of a setting may cause high initial mechanical shock and high inrush current.

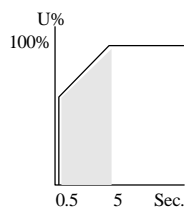
Too low of a setting may result in prolonged time until motor starts revolving. The motor should start revolving immediately after Start signal.



### Ramp-up Time

Determines motor's voltage ramp-up time from initial to full voltage.  
Range: 0.5-5 sec.

It is recommended to set Ramp-Up Time to the minimum acceptable value.

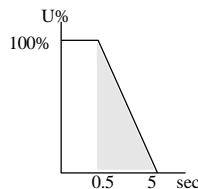


### Ramp-Down time (Soft-stop)

Used to control deceleration of high friction loads. When Ramp-Down potentiometer is set, upon stop signal the starter output voltage is gradually ramped down.

Range: 0.5-5 sec.

When "Ramp-down Time" is set to minimum (0.5Sec), the motor will stop immediately.



## Startup Process

1. Set Initial Voltage potentiometer to mid scale (approx. 40%)
2. Set Ramp-Up potentiometer to approx. 3 sec.
3. Connect Mains voltage to starter Line terminals.
4. Start the motor. If it begins revolving shortly after start signal proceed to Para. 5. If not, increase Initial Voltage setting until motor starts to turn shortly after start signal.
5. When initial inrush current and mechanical shock are too high, decrease Initial Voltage setting and proceed to paragraph 6.
6. Disconnect the start command (open Terminals 1 and 2) and wait until the motor stops.
7. Slightly increase Initial Voltage adjustments to allow for load variations.
8. Start the motor again and verify that acceleration process to full speed is as required.
9. If acceleration time is too short, increase Ramp-Up time setting.

When Soft stop is required, set Ramp-Down Potentiometer to the required time (minimum deceleration time is recommended).

Check that soft stopping process is as required.

### Note:

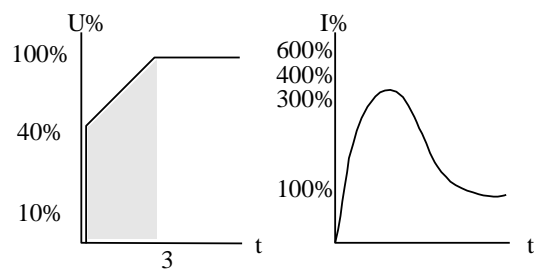
If Ramp Down potentiometer is not in the minimum setting. Emergency stop may be performed by disconnecting the mains voltage.

### Example of Starting Curves

Light Loads - Pumps, Etc.

Initial Voltage - set 40%

Ramp-up time - set 3 sec.

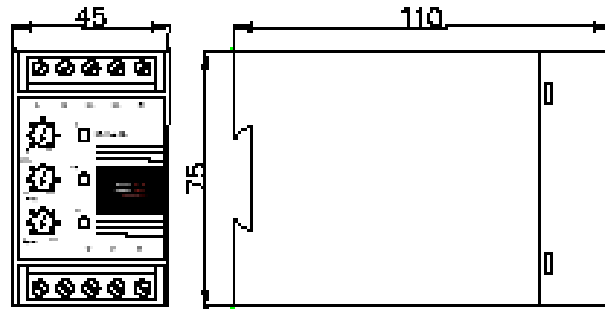


Upon start, the voltage quickly increases to the Initial Voltage value (40%  $U_n$ ) and then gradually ramps-up to nominal.

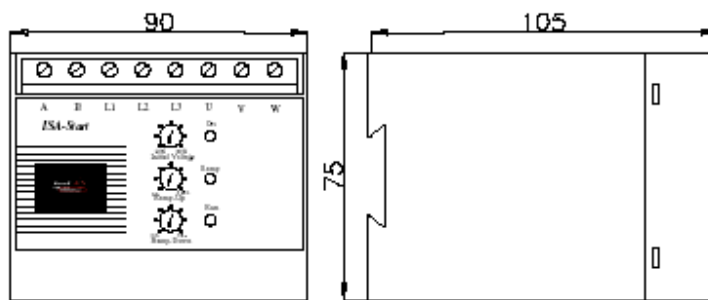
The current will simultaneously increase to peak current value, before smoothly decreasing to the operating current. Motor will quickly and smoothly accelerate to full speed.

# Technical Specifications

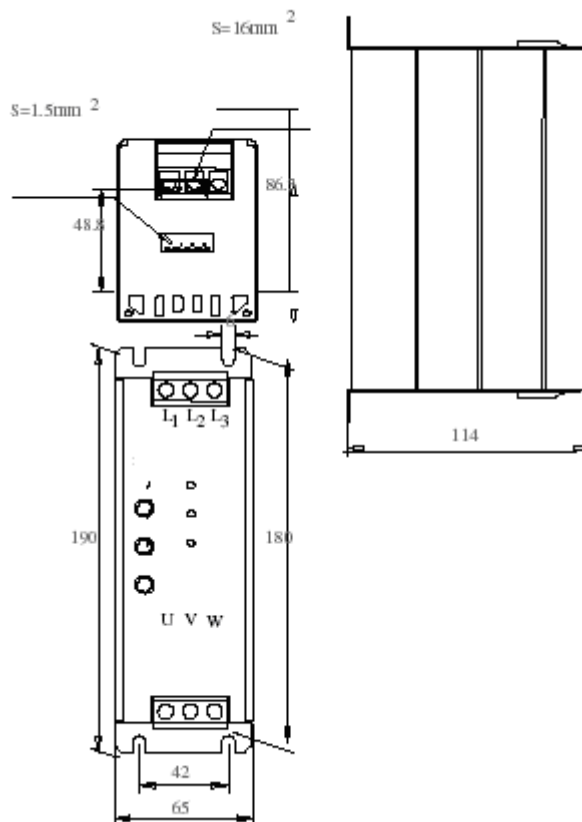
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**Size S1**

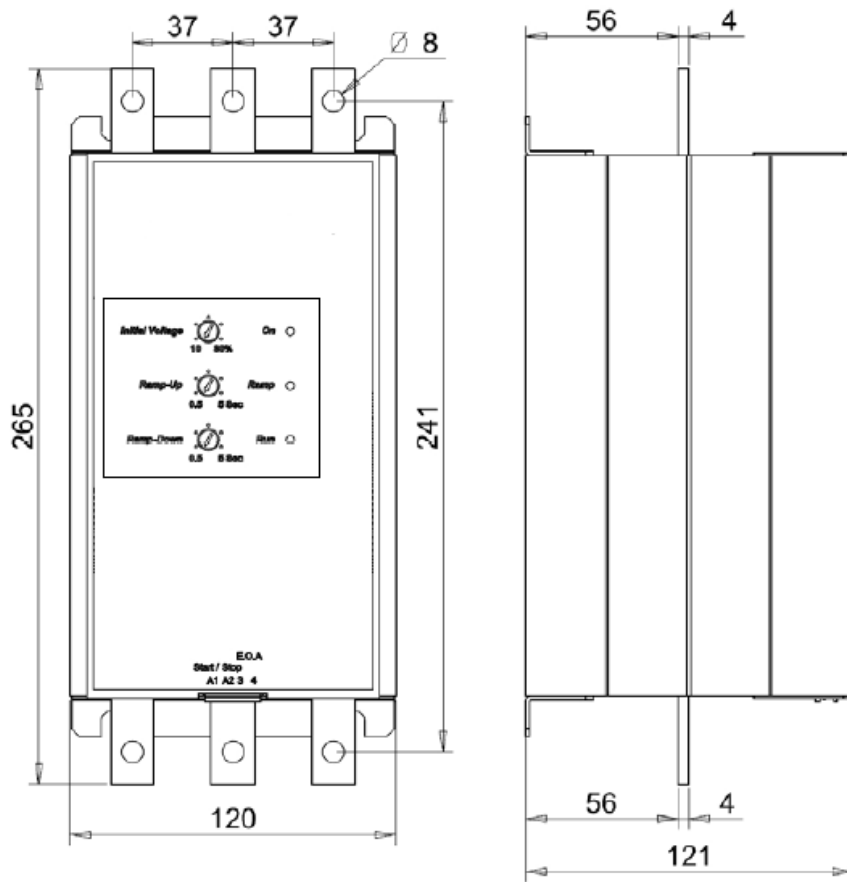


**Size S2**

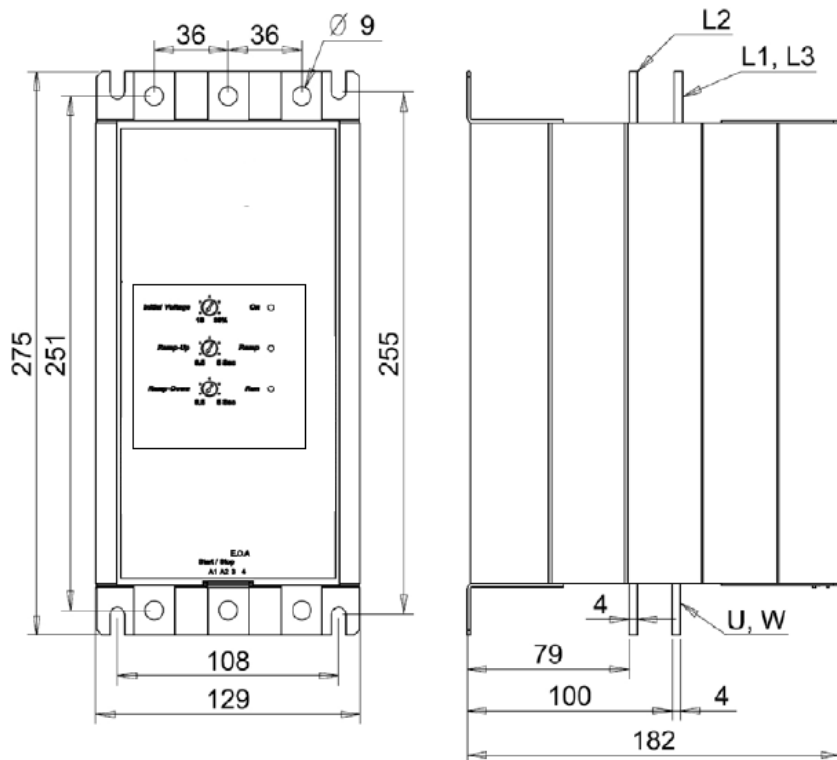


**Size S3**

# Technical Specifications



**Size S4**



**Size S5**



## Technical Specifications

<b>Environment</b>		
Supply voltage	220 - 240 Vac +10% -15% 230 380 - 415 Vac +10% -15% 400 440 Vac +10% -15% 440 460 - 500 Vac +10% -15% 480 575 - 600 Vac +10% -15% 600	
Frequency	50 / 60 Hz	
Load	Three-Phase, Three-Wire, Squirrel Cage Induction Motor	
Degree of protection	ISA-B2P 8-44A: IP 20 ISA-B2P 58-170A: IP 00	
Altitude	1000 m above sea level	Consult factory for derating
<b>Adjustments</b>		
Starting Torque (Initial Voltage)	10-80 % of full voltage	
Ramp Up Time (soft start)	0.5 - 5 sec.	
Ramp Down Time (Soft Stop)	0.5 - 5 sec.	
<b>Indications</b>		
Indication lights (LEDs)	ON - Green	Lights when mains is connected to the ISA-B2P.
	Ramp Up / Ramp Down – Yellow	Lights during Ramp-Up and Ramp-Down
	RUN – Green	Lights upon end of starting. When the internal bypass relays close.
<b>Temperatures</b>		
Operating	-10° to 40°C	
Storage	-20° to 70°C	
Relative humidity	93 % - non condensed	
<b>EMC</b>		
Immunity to radio electric interference	EN 1000-4-3 level 3	Conforming to EN 60947-4-2
Electrostatic discharge	EN 1000-4-2 level 3	Conforming to EN 60947-4-2
Immunity to electrical transients	EN 1000-4-4 level 4	Conforming to EN 60947-4-2
Shock waves of voltage / current	EN 1000-4-5 level 3	Conforming to EN 60947-4-2
Radiated and conducted emissions	EN 1000-4-6 level 3	
Radio frequency emissions	According to EN 55011 class A	Conforming to EN 60947-4-2
<b>Mechanical</b>		
Shock resistance	8 gn	Conforming to EN 60947-4-2
Vibration resistance	2 gn	Conforming to EN 60947-4-2
<b>Output relay (Solstart 31-170A only)</b>		
End of Acceleration Contact	N.O.	
Rated operating current	5 A, 250 VAC – ISA-B2P 31-58A 8 A, 250 VAC – ISA-B2P 72-170A	

## Technical Specifications

Starter	Starter FLC [A]	Power [kW] 230V	Power [kW] 400V	Power [kW] 480V	Power [kW] 600V
ISA-B2P 8	8	2,3	4	4,8	6
ISA-B2P 17	17	4,8	7,5	10	12,7
ISA-B2P 22	22	6,3	11	13	16,5
ISA-B2P 31	31	9	15	18	23
ISA-B2P 44	44	12,5	22	26	33
ISA-B2P 58	58	17	30	36	45
ISA-B2P 72	72	20	37	45	59
ISA-B2P 85	85	25	45	55	59
ISA-B2P 105	105	30	55	59	80
ISA-B2P 145	145	40	75	90	110
ISA-B2P 170	170	51	90	110	140

ISA-B2P Model	FLC [A]	Dimensions WxHxD [mm]	Weight [kg]	EOA Relay	Aluminium case	Din rail mounting
ISA-B2P 8	8	45x75x110	0.42	(-)	(-)	✓
ISA-B2P 17	17	90x75x105	0.55	(-)	(-)	✓
ISA-B2P 22	22	90x75x105	0.55	(-)	(-)	✓
ISA-B2P 31	31	65x190x114	1.3	✓	✓	O
ISA-B2P 44	44	65x190x114	1.3	✓	✓	O
ISA-B2P 58	58	65x190x114	1.3	✓	✓	O
ISA-B2P 72	72	120x265x121	C	✓	✓	(-)
ISA-B2P 85	85	120x265x121	C	✓	✓	(-)
ISA-B2P 105	105	120x265x121	C	✓	✓	(-)
ISA-B2P 145	145	129x275x182	C	✓	✓	(-)
ISA-B2P 170	170	129x275x182	C	✓	✓	(-)

**Notes:**

- ✓ – Standard
- O – Option
- C – Consult factory
- (-) – Not available

## Technical Specifications

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Specify	Description
Starter's FLC [A]	8 <sup>(1)</sup> , 17 <sup>(1)</sup> , 22 <sup>(1)</sup> , 31, 44, 58, 72, 85, 105, 145, 170

### Mains Voltage

Specify	Description
230	220 - 240 Vac +10% -15%
400	380 - 415 Vac +10% -15%
440	440 Vac +10% -15%
480	460 - 500 Vac +10% -15%
600	575 - 600 Vac +10% -15%

### Options

Specify	Description
0	No options
8	Harsh environment treatment
DRM	DIN rail mounting accessory. (models 31-58A.)
Notes:	<ul style="list-style-type: none"> <li>For more than one option indicate, for example: 8+DRM (Harsh environment and DIN rail mounting accessory)</li> <li>Options must be factory installed.</li> </ul>

### Front Panel

Specify	Description
I	Standard lexan

### Notes:

(1)

To End of Acceleration Relay in Solstart 8, 17, 22



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