SMVector i550 protec migration guideline

NEMA 4X | IP66

Contents

1 Use of document

This document is a guideline for the replacement of SMV NEMA 4X/IP65 drive with i550 protec NEMA 4X/IP66 drive and can be used by Application Engineers, Sales and Project Management.

It shows the following

- Suitability of i550 protec IP66 instead of SMV NEMA 4X/IP65 drive
- Replacement engineering help

NOTICE! For detailed engineering, the technical documents have to be considered!

NOTICE! Comparison is based on i500 state as of HMI 2018.

2 Why should I change?

Advantages of i500 protec series

- New state of the art drive (start of the i-series lifetime)
- Zero clearance mounting
- More functionalities for advanced applications
- More motor control possibilities: VFC-Eco, SLVC, PMAC, Closed-loop ASM (closed loop for i550 protec)
- Integrated Safety possibilities (STO for i550 protec)
- Integrate EMC filter possibility (i550 protec 480V only)
- Integrated brake chopper for all sizes (i550 protec)
- DC Bus sharing (i550 protec, 480 V 3-ph)
- New communication possibilities (EtherCat, Profinet, Modbus TCP/IP, PowerLink for i550 protec)
- +24 VDC “Keep-Alive” capability (i550 protec)
- Fulfills IE2 of new drive efficiency class
- Intuitive PC Tool interface
- More programming interface options: Programming without mains power via USB
- Easy parameter set duplicating and archiving with memory module, Smart Keypad and PC Tools
- CiA402 Velocity profile native support
- Integrated into Lenze PLC Designer
- User/OEM configurable “Favorites” Menu
- Improved usability for easy commissioning: descriptive keypad text, parameter grouping
- Extended power range
- Advanced sequencer capability
- Same firmware architecture as i500 cabinet drives

3 Replacement unit

The following list shows an overview of the available product range:

SMV													
		1x120V		1x230V		1/3x230V		3x230V		3x480V		3x600V	
HP	kW	SMV	i550 pro-tec	SMV	i550 pro-tec	SMV	i550 pro-tec	SMV	i550 pro-tec	SMV	i550 pro-tec	SMV	i550 pro-tec
0.33	0.25												
0.50	0.37	ESV371N01SX②	Y	ESV371N02SF②	Y	ESV371N02YX②	Y			ESV371N04T①②	Y*		
1.0	0.75	ESV751N01SX②	Y	ESV751N02SF②	Y	ESV751N02YX②	Y			ESV751N04T①②	Y	ESV751N06TX②	Y
1.5	1.1	ESV112N01SX②	Y	ESV112N02SF②	Y	ESV112N02YX②	Y			ESV112N04T①②	Y		
2.0	1.5			ESV152N02SF②	Y	ESV152N02YX②	Y			ESV152N04T①②	Y	ESV152N06TX②	Y
3.0	2.2			ESV222N02SF②	Y	ESV222N02YX②	Y			ESV222N04T①②	Y	ESV222N06TX②	Y
5.0	4.0							ESV402N02TX②	Y	ESV402N04T①②	Y	ESV402N06TX②	Y
7.5	5.5							ESV552N02TX③	Y	ESV552N04T①②	Y	ESV552N06TX②	Y
10.0	7.5							ESV752N02TX③	Y	ESV752N04T①③	Y	ESV752N06TX③	Y
15.0	11.0							ESV113N02TX③	Y	ESV113N04T①③	Y	ESV113N06TX③	Y
20.0	15.0							ESV153N02TX③	Y	ESV153N04T①③	Y	ESV153N06TX③	Y
25.0	18.5									ESV183N04T①③	Y	ESV183N06TX③	Y
30.0	22.0									ESV223N04T①③	Y	ESV223N06TX③	Y

Notes:
* substitution uses higher power rating
① - can be “X” for non-filtered drive or “F” for drive with integrated EMC filter
② - can be “C” for Indoor only rated drive or “E” for indoor/outdoor rated drive
③ - can be “D” for Indoor only rated drive or “F” for indoor/outdoor rated drive

4 Mechanical installation

4.1 General fit

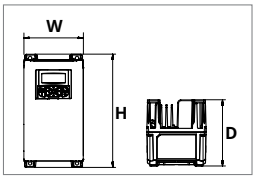
Mechanical	SMV	i550 protec
Enclosure Protection Class	NEMA 1 or IP65	NEMA 1 or IP66 (*30kW and larger are IP54)
Built-in Heatsink	Yes	Yes
Cold plate	No	C-type Possible
Push trough	No	C-type Possible
Zero-clearance side-by-side Mounting	No	Yes

Notes:

1. I550 protec is available as IP66 rated up to 22kW and IP54 rated for 30kW and larger power ratings.
2. Size: The i550 protec is similar in size to the SMV. See dimensional comparison.

4 Mechanical installation

4.1.1 Dimensions



	yellow = 0....15% larger than SMV
	red = more than 15% larger than SMV
	green = smaller than SMV
	blue = SMV bolt in replacement (overall height may be larger)

			i550 protec				SMV			
V	kW	Internal EMC Filter	H (with tabs)	W	D	vol [dm³]	Size	H	W	D
120 V 1-p	0.37	no	170	190.2	100	111.2	190	99	111	
120 V 1-p	0.75	no	170	190.2	100	111.2	190	99	111	
120 V 1-p	1.1	no	222.5	249.9	130	114	191	99	138	
230 V 1-p	0.37	yes	191	100.01	147	250	191	100.01	147	250
230 V 1-p	0.55	yes	191	100.01	147	250	191	100.01	147	250
230 V 1-p	0.75	yes	191	100.01	147	250	191	100.01	147	250
230 V 1-p	1.1	yes	191	100.01	147	250	191	100.01	147	250
230 V 1-p	1.5	yes	191	100.01	147	250	191	100.01	147	250
230 V 1-p	2.2	yes	191	100.01	147	250	191	100.01	147	250
230V 1/3-p	0.37	no	170	190	100	111.2	190	100.01	111	
230V 1/3-p	0.55	no	191	100.01	147	250	n/a	n/a	n/a	
230V 1/3-p	0.75	no	170	190	100	111.2	190	100.01	111	
230V 1/3-p	1.1	no	170	190	100	111.2	191	100.01	138	
230V 1/3-p	1.5	no	200	209.6	100	111.2	191	100.01	138	
230V 1/3-p	2.2	no	200	209.6	100	111.2	191	100.01	138	
230V 3-p	3	no	230	246	100	104	191	100.01	147	
230V 3-p	4	no	230	246	100	104	191	100.01	147	
230V 3-p	5.5	no	222.5	249.9	130	114	250	130	160	
230V 3-p	7.5	no	191	100.01	147	250	250	130	160	
230V 3-p	11	no	191	100.01	147	250	318	176	205	
230V 3-p	15	no	191	100.01	147	250	318	176	205	
230V 3-p	18.5	no	191	100.01	147	250	318	176	205	
400/480 V 3-p	0.75	yes (i550 no)	170	190	100	111.2	190	100.01	111	
400/480 V 3-p	1.1	yes (i550 no)	170	190	100	111.2	191	100.01	138	
400/480 V 3-p	1.5	yes (i550 no)	170	190	100	111.2	191	100.01	138	
400/480 V 3-p	2.2	yes (i550 no)	170	190	100	111.2	191	100.01	138	
400/480 V 3-p	3	yes (i550 no)	200	209.6	100	111.2	191	100.01	147	
400/480 V 3-p	4	yes (i550 no)	200	209.6	100	111.2	191	100.01	147	
400/480 V 3-p	5.5	yes (i550 no)	222.5	249.9	130	114	250	130	160	
400/480 V 3-p	7.5	yes (i550 no)	222.5	249.9	130	114	250	130	160	
400/480 V 3-p	11	yes								
400/480 V 3-p	15									
400/480 V 3-p	18.5									
400/480 V 3-p	22									
400/480 V 3-p	30									
400/480 V 3-p	37.5									
400/480 V 3-p	45									
400/480 V 3-p	55									
400/480 V 3-p	75									
480/600V 3-p	0.75	no	200	209.6	100	111.2	190	100.01	111	
480/600V 3-p	1.5	no	200	209.6	100	111.2	191	100.01	138	
480/600V 3-p	2.2	no	200	209.6	100	111.2	191	100.01	138	
480/600V 3-p	4	no	200	209.6	100	111.2	191	100.01	147	
480/600V 3-p	5.5	no	222.5	249.9	130	114	250	130	160	
480/600V 3-p	7.5	no	222.5	249.9	130	114	250	130	160	
480/600V 3-p	11	no	Not				318	176	205	
480/600V 3-p	15	no					318	176	205	
480/600V 3-p	18.5	no					318	176	205	
480/600V 3-p	22	no					318	176	205	
480/600V 3-p	30	no					360	221	256	
480/600V 3-p	45	no					513	221	256	

4 Mechanical installation

4.2 Engineering

1. Mounting: SMV has different mounting hole locations than i550 protec. New mounting holes will need to be drilled.

2. Zero clearance: i550 protec can be mounted side by side with zero clearance without derating. This was not possible with SMV.

3. i550 protec is available as both IP31 and IP66 rated up to 22kW. i550 protec is IP54 rated for 30kW and larger power ratings.

5 Main electrical installation

5.1 General fit

Electrical	SMV	i550 protec
Supported network	TT, TN	TT, TN (IT only as C-type)
Integrated Dynamic Brake Transistor	-	Yes
DC Interconnection 230V/1ph	-	-
DC Interconnection 400/480V-3ph:	-	Yes
Mains Choke Requirement	-	-

NOTE: The SMVector drives' SCCR ratings were qualified using the rules governed by UL508C. The i510 protec and i550 protec drives' SCCR ratings are empirically tested per the rules of UL61800-5-1. As such the products have different SCCR ratings. Please see the Project Planning Guide at lenze.com/smvmigration for your drive's SCCR rating using your type of branch circuit protection device (fuses or breakers).

5.2 Engineering

Connector position: Both the SMV and i550 protec have all connections at the bottom of the drive; however Mains and Motor connections are reversed.

- **SMV** Mains are on the Right.
- **i550 protec** Mains are on the left.

This is to be more intuitive for customers where we have seen a tendency for customers to miss-wire.

5 Main electrical installation

5.3 General fit

Device I/O	SMV	i550 protec
		Standard I/O
Digital inputs	3 + 1 Start / Stop	5
Digital outputs	1 (NPN, sinking)	1
Relay output	1 (NO)	1 (NO/NC)
Analog inputs	2 - 1 (V), 1 (I)	2 (Bipolar V/I)
Analog outputs	1 (V) Not configurable	1 (V/I)
Frequency Output	-	Yes
Logic	PNP/NPN	PNP or NPN
Encoder Feedback	-	DI3 / DI4
Frequency Input (Pulse Train Input)	-	up to 100kHz
Internal 24V Supply; 100 mA	12V, 50 mA	DI3 / DI4
Input for external 24V (Keep alive)	-	Yes
Available with fieldbus	Modbus-RTU standard at => 11.0 kW (15.0 Hp)	Yes
Safe Torque Off STO	-	Optional
Integrated brake transistor	-	Yes (all sizes)
Brake with external chopper	yes	(Not needed)
Dedicated PTC input	-	Yes

Control connectors	SMV	i550 protec
AIO, DIO terminals	Fixed, Screw	Fixed, Spring
Relay terminals	Fixed, Screw	Fixed, Spring
STO terminals	-	Pluggable, Spring
PTC input	-	Fixed, Spring

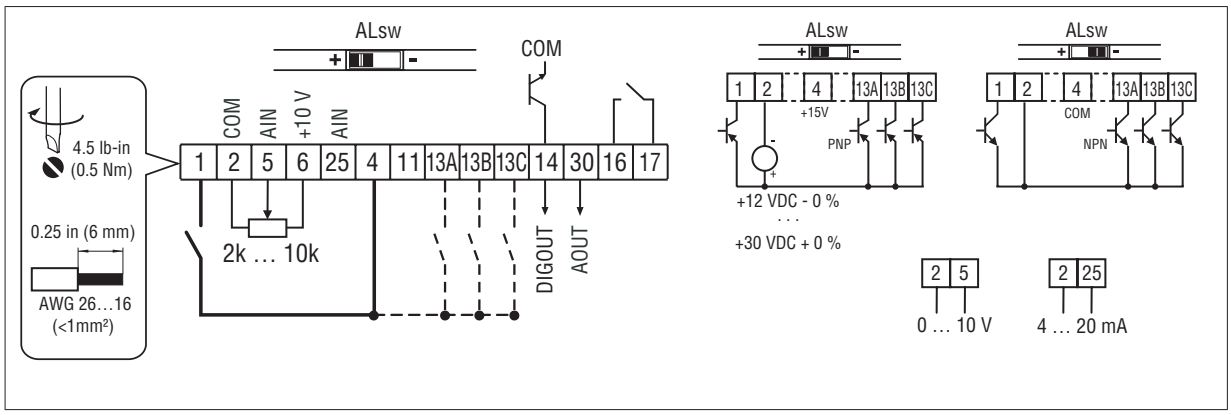
5 Main electrical installation

5.4 Engineering notes

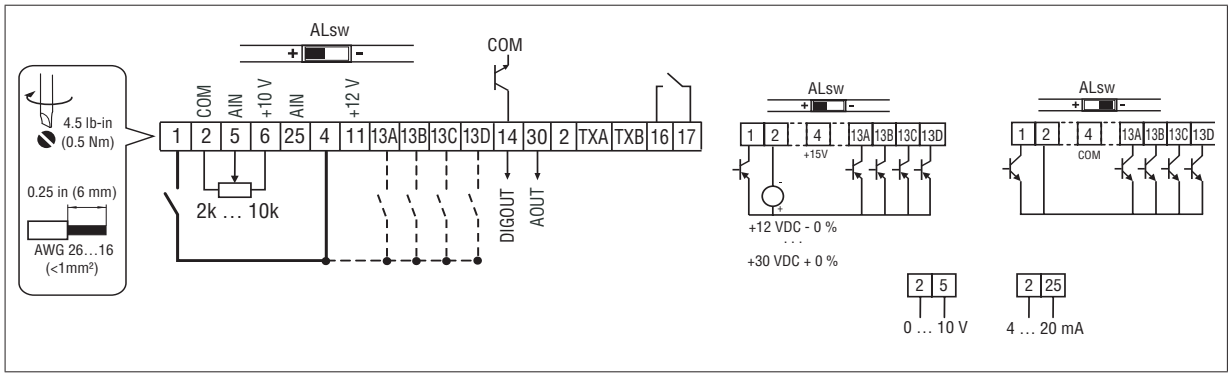
1. Stop Terminal: The Stop function (terminal # 1) is a dedicated digital input on SMV. On i550 protec every IO-function can be freely assigned in Parameter 400 (P400). The function Stop is assigned in P400:02.

2. Control terminals Standard I/O:

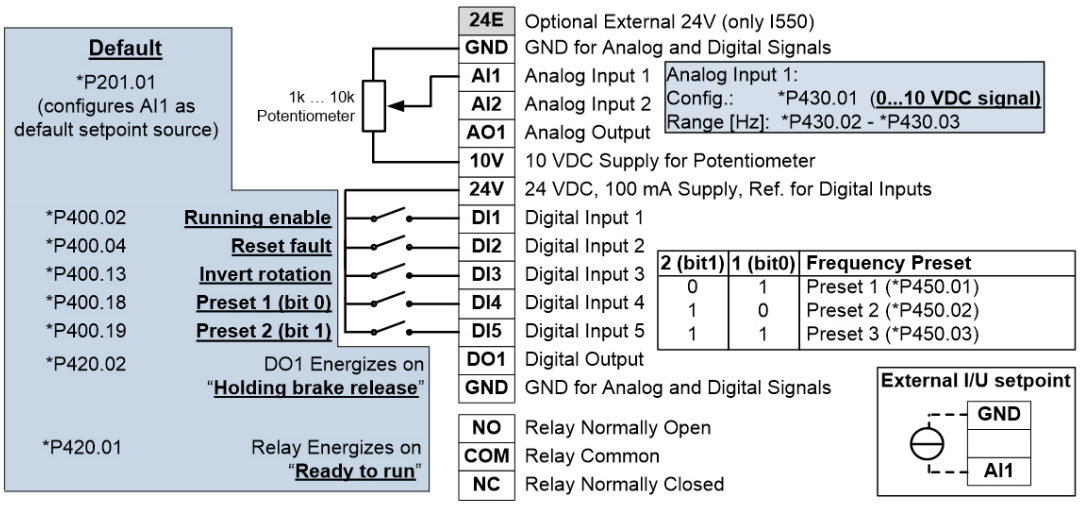
SMV Control Terminal Strip for 0.33 - 10 HP (0.25 - 7.5 kW):



SMV Control Terminal Strip for 15HP (11 kW) and Greater Drives:

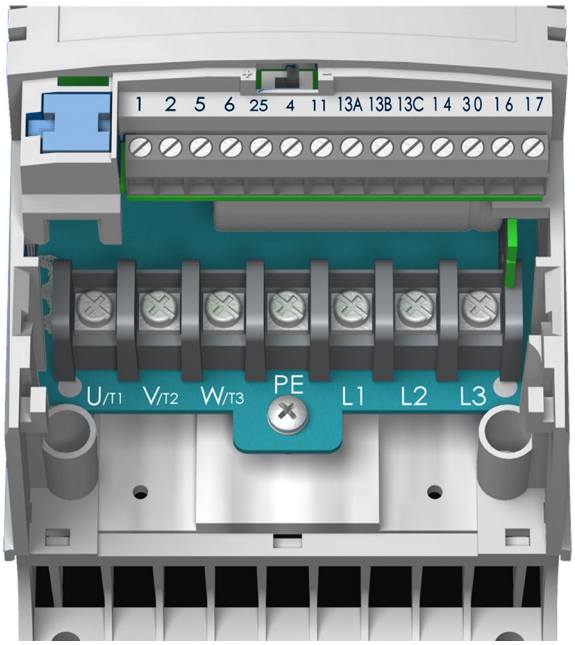


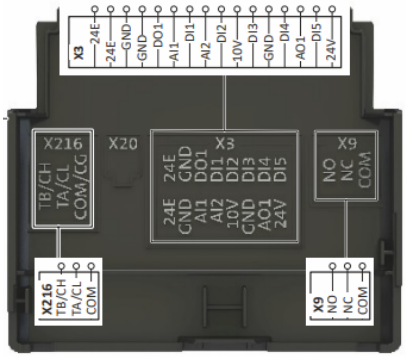
i500 protec series



5 Main electrical installation

I/O Point Comparison





SMV	Function	i500	Note:
1	DI - Dedicated Stop	**DI1**	P400.1: TRUE [1], P400.2: Digital Input 1 [11]
2	Analog Common	**GND**	Analog and Digital Common
5	Analog input (Setpoint) 0...10 VDC	**AI1**	P430:1 (0...10 VDC; 4...20 mA Configurable)
6	+10 V for potentiometer	**10V**	+10 V for potentiometer
25	Analog input (Setpoint) 4...20 mA	**AI2**	P431:1 (0...10 VDC; 4...20 mA Configurable)
4	Digital Reference Common (+15 VDC/0 VDC, depending on assertion level)	**-**	I550 protec uses 24V as reference when active high or GND as reference when active low. i550 protec is active high only, reference 24V.
11	+12V Supply (SCM, SCL Ref. for DI)	**24V**	+24 VDC, 100 mA
13A	DI – P121 (default not Configured)	**DI2**	P400:004 (default config. – Reset Fault)
13B	DI – P122 (default not Configured)	**DI3**	P400:013 (default config. – Invert rotation)
13C	DI – P123 (default not Configured)	**DI4**	P400:018 (default config. – Preset Setpoint bit 0)
13D	DI – P124 (default not Configured)	**DI5**	P400:019 (default config. – Preset Setpoint bit 1)
14	DO (Sinking) P13 (default not Configured)	**DO1**	PNP +24 VDC, , P420.2 (default – Release Brake)
30	Analog output (Output freq. or Load)	**AO1**	Analog output Configurable P440:1, P440:2
TXA	Modbus TXB	**CH/TB**	Modbus Variant Required
TXB	Modbus TXA	**CL/TA**	Modbus Variant Required
16	Relay Output, NO	**NO**	Form C relay (NO, NO, COM) P420.1: Fault [56]
-		**NC**	
17	Relay COM	**COM**	

Notes:

The Digital Output on SMV (terminal 14) is Open Collector/Sinking type output.

The i550 protec Digital Outputs are PNP/Sourcing +24 VDC.

6 Communication

6.1 General fit

Communication (Optional!)	SMV	i550 protec
CANopen	Option Module	Yes
PROFIBUS	Option Module	Yes
ETHERNET Powerlink	-	Yes
DeviceNet	Option Module	-
Modbus	Option Module at 7.5 kW (10.0 Hp and below) Integrated at 11.0 kW (15.0 Hp and above)	Yes
Modbus TCP/IP	-	Yes
EtherCat	-	Yes
ProfiNet	Option Module	Yes
EthernetIP	Option Module	Yes
Connector Type	Pluggable Screw (Modbus/ CANopen) 1xRJ-45 all EtherNET busses)	Fixed ,Spring (Modbus/CANopen, Profibus) Dual RJ-45 (all EtherNET busses)
Combination Fieldbus & Keypad	Yes	Yes
Fieldbus combination with I/O	Yes	Standard I/O

6.2 Engineering

1. Control words and register addresses: The fieldbus control words and the register addresses have changed. Refer to the communication manual for detailed information.

2. Modbus:

   – i550 protec: CANopen and Modbus combined in one type code (Selection by DIP switch).

   – i550 protec: Modbus and CANopen are dedicated type codes.

7 Functionality

7.1 General fit

Motor	SMV	i550 protec
Asynchronous induction motor control	Yes	Yes
Synchronous motor control	-	Yes
Max Output frequency	500 Hz	599 Hz (>599Hz --> C-Type)

Motor control	SMV NEMA	i550 protec
VFCplus: V/f linear	Yes	Yes
VFCplus: V/f squared	Yes	Yes
VFCplus: V/f linear closed loop with encoder	-	Yes
VFCplus: V/f squared closed loop with encoder	-	Yes
VFCplus: V/f user definable V/f characteristic	Yes	Yes
VFCplus Eco (Energy saving feature)	-	Yes
Voltadd control (Additive voltage impression)	-	Yes
SLVC: Sensorless vector control ASM	Yes – Speed & Torque	Yes – Speed & Torque
SLPSM: Sensorless vector control PSM	-	Yes
SC: Servo Control for synchr. motors (SM)	-	-
SC: Servo Control for asnchr. motors (ASM)	-	Yes

Functions	SMV	i550 protec
Process controller (PID)	Yes	Yes
Motor potentiometer	Yes	Yes
Fixed setpoints for speed /accel/decel	8/2/2	15/2/2
Slip compensation	Yes	Yes
Skip frequency	2 frequency ranges	3 frequency ranges
Motor brake (holding brake) control	-	Yes
Speed control with torque limitation	-	Yes
Flying start	Yes	Yes
Parameter change over	-	4x32 parameter
Sequencer	Yes (flat sequences)	Yes (flat, but also nested sequences possible)
Automatic Start	Yes	Yes
DC brake	Yes (Hz trigger, auto only)	Yes (Hz trigger auto and manual trigger)
AC motor brake	Yes	Yes
Controlled deceleration during undervoltage	-	Yes
Frequency (Pulse-Train) setpoint	-	Yes

8 Operation/Commissioning

8.1 General fit

Operation	SMV	i550 protec
Program without mains power?	Yes (memory module)	Yes (USB, memory module, +24 VDC [1550])
Keypad	Integrated	Optional
Descriptive text on keypad	No	Yes
PC tool	TechLink	EasyStarter, Smart Keypad
Interface	4-digit LED Keypad	LCD Text Keypad, USB, WLAN-Module *i550 protec has USB integrated
Removable memory module	Yes	Yes

8.2 Engineering notes

1. New parameter numbers: The parameters for the i500 protec series have been arranged for better usability. Due to this, the parameter numbers are not equal and can't be copied 1:1.

2. Common parameters: Parameter numbers have changed. The following list shows the most common used parameters:

SMV NEMA 1/IP31		i550 protec		
Param. #	**Param. Name**	**Param. #**	**Param. Name**	**Param. Group**
P100	Start Control Source	P200:00	Control Selection	Group 2: Basic Settings
P101	Standard Reference Source	P201:01	Frequency Setpoint Source	
P102	Minimum frequency	P210:00	Minimum motor frequency	
P103	Maximum frequency	P211:00	Maximum motor frequency	
P104	Acceleration time	P220:00	Acceleration time 1	
P105	Deceleration time	P221:00	Deceleration time 1	
P107	Line Voltage	P208:01	Rated Mains Voltage	
P167	Base frequency	P303.02	V/f Base Frequency	Group 3: Motor Control
P168	Fixed boost	P316.01	Fixed voltage boost	
P121	Configuration digital input 1	P400.02	Run/Stop	Group 4: Function & I/O Settings
P122	Configuration digital input 2	P400.04	Reset Fault	
P123	Configuration digital input 3	P400.13	Invert Rotation Direction	
P131	Preset Speed 1	P450.01	Preset frequency setpoint 1	
P132	Preset Speed 2	P450.02	Preset frequency setpoint 2	
P133	Preset Speed 3	P450.03	Preset frequency setpoint 3	
P140	Relay Output	P420.01	Relay function	
P142	TB-14 Output	P420.02	DO1 function	
		Favorites		

Notes:

- Please note that the most commonly used MC parameters can be found in the preconfigured Favorites Menu (Group 0) of i500.
- In addition – the Favorites Menu contents in i550 protec can be customized by the OEM/machine builder.
- Please note in MC changes to parameters were automatically saved. In i500 the user must execute a SAVE command to have changes be written to the EPM. A SAVE command can be executed either via the SAVE icon in EasyStarter or by pressing and holding the drive's enter key on the keypad for three seconds. This is also true for keypad speed setpoint.