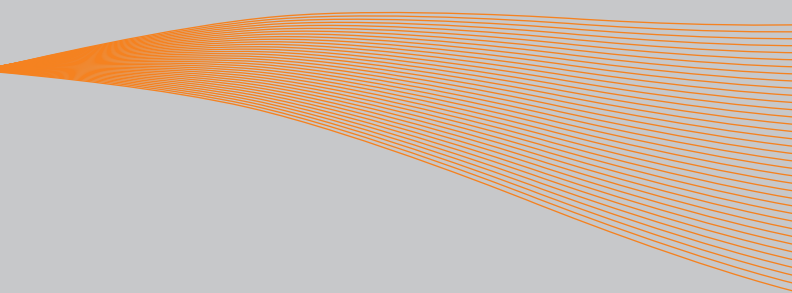# VACON 10
AC DRIVES

QUICK GUIDE

VACON
DRIVEN BY DRIVES

**This quick guide includes the essential steps for easy
installation and setup of your Vacon 10 frequency converter.
Before commissioning your drive, download and read the complete
Vacon 10 User Manual available at:
www.vacon.com -> Support & Downloads**

1. SAFETY

**ONLY A COMPETENT ELECTRICIAN IS ALLOWED TO CARRY
OUT THE ELECTRICAL INSTALLATION!**

This quick guide contains clearly marked warnings which are intended for your personal safety and to avoid any unintentional damage to the product or connected appliances.

Please read these warnings carefully:

The components of the power unit of the frequency converter are live when Vacon 10 is connected to mains potential. Coming into contact with this voltage is extremely dangerous and may cause death or severe injury.

The motor terminals U, V, W (T1, T2, T3) and the possible brake resistor terminals -/+ are live when Vacon 10 is connected to mains, even if the motor is not running.

The control I/O-terminals are isolated from the mains potential. However, the relay output terminals may have a dangerous control voltage present even when Vacon 10 is disconnected from mains.

The earth leakage current of Vacon 10 frequency converters exceeds 3.5mA AC. According to standard EN61800-5-1, a reinforced protective ground connection must be ensured.
See Chapter 7!

If the frequency converter is used as a part of a machine, the machine manufacturer is responsible for providing the machine with a main switch (EN 60204-1).

If Vacon 10 is disconnected from mains while running the motor, it remains live if the motor is energized by the process. In this case the motor functions as a generator feeding energy to the frequency converter.

After disconnecting the frequency converter from the mains, wait until the fan stops and the indicators on the display go out. Wait 5 more minutes before doing any work on Vacon 10 connections.

The motor can start automatically after a fault situation, if autorestart function has been activated.

2. INSTALLATION

2.1   Mechanical installation

There are two possible ways to mount Vacon 10 in the wall; either screw or DIN-rail mounting.
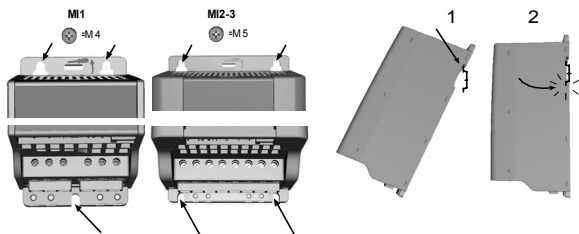

Figure 1: Screw mounting (left) and DIN-rail mounting (right)

NOTE! See the mounting dimensions on the back of the drive.
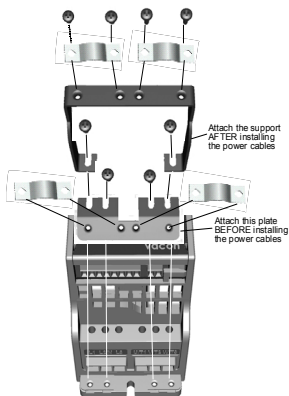Leave **free space** for cooling above **(100 mm)** and below **(50 mm)** Vacon 10!

Figure 2: Attaching the PE-plate and API cable support

2.2 Cabling and connections

2.2.1 Power cabling

Note! Tightening torque for power cables is 0.5 - 0.6 Nm
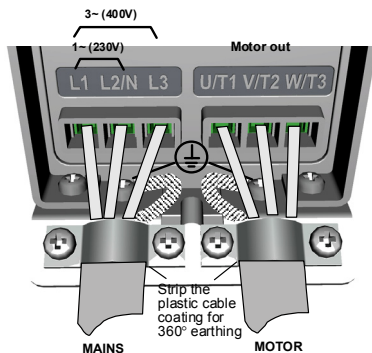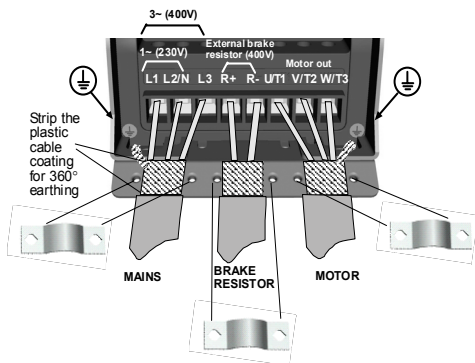

Figure 3: Vacon 10 power connections, MI1

Figure 4: Vacon 10 power connections, MI2 - MI3
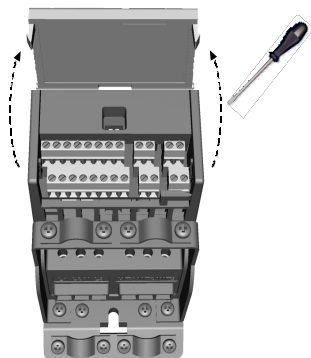
2.2.2 Control cabling
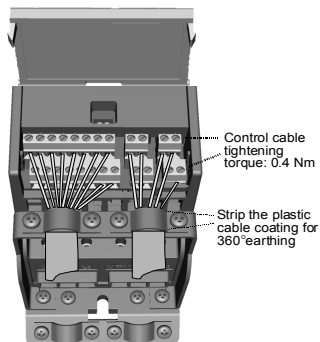

Figure 5: Open the cover

Control cable tightening torque: 0.4 Nm
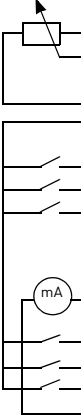
Strip the plastic cable coating for 360°earthing

Figure 6: Install the control cables. See next page!

3. CONTROL I/O AND TERMINALS

	Terminal		Signal	Factory preset	Description
1	+10Vref		Ref. voltage out		Maximum load 10 mA
2	AI1		Analog signal in 1	Freq. reference [P]	0 - +10 V Ri = 200 kΩ (min)
3	GND ●		I/O signal ground		
6	24Vout		24V output for DI's		±20 %, max. load 50 mA
7	GND ●		I/O signal ground		
8	DI1		Digital input 1	Start forward [P]	
9	DI2		Digital input 2	Start reverse [P]	0 - +30 V Ri = 12 kΩmin
10	DI3		Digital input 3	Preset speed B0 [P]	
A	A		RS485 signal A	FB Communication	
B	B		RS485 signal B	FB Communication	
4	AI2		Analog signal in 2	PI actual value [P]	0(4) - 20 mA, Ri = 200Ω
5	GND ●		I/O signal ground		
13	GND ●		I/O signal ground		
14	DI4		Digital input 4	Preset speed B1 [P]	
15	DI5		Digital input 5	Fault reset [P]	0 - +30 V Ri = 12 kΩ min
16	DI6		Digital input 6	Disable PI control [P]	
18	AO		Analog signal out	Output frequency [P]	0(4) - 20 mA, RL = 500Ω
20	DO		Digital signal out	Active = READY [P]	Open collector, max. load 48V/50mA
22	RO 11	Relay out 1		Active = RUN [P]	Max. switching load: 250Vac/2A or 250Vdc/0,4A
23	RO 12				
24	RO 21	Relay out 2		Active = FAULT [P]	Max. switching load: 250Vac/2A or 250Vdc/0,4A
25	RO 22				
26	RO 23				

Table 1: Vacon 10 General purpose application default I/O configuration and connections
P) = Programmable function, see User manual, Parameters

Vacon 10 I/O terminals:

AI2	GND	GND	DI4	DI5	DI6	AO	DO
4	5	13	14	15	16	18	20

RO1	RO1
22	23

-	RO2
	26

1	2	3	6	7	8	9	10
+10V	AI1	GND	24V	GND	DI1	DI2	DI3

A	B

25	24
RO2	RO2

█ + ░ = API LIMITED   █ = API RS485
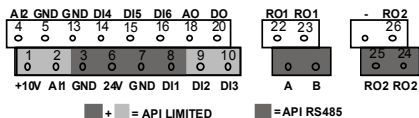
4. NAVIGATION & STARTUP

4.1 The main menus of Vacon 10

REFERENCE MENU
Displays the keypad reference value regardless of the selected control place.

MONITORING MENU
In this menu you can browse the monitoring values.

PARAMETER MENU
In this menu you can browse and edit the parameters.

FAULT MENU
Here you will be able to browse through the faults occurred.
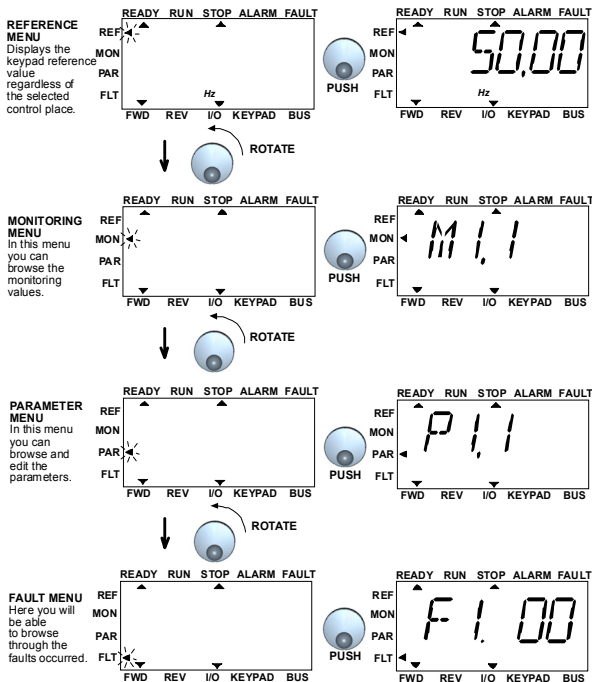
Figure 1: The main menu of Vacon 10

4.2 Commissioning and startup wizard

4.2.1 Commissioning steps:

1. Read safety instructions on page 1	6. Run the Startup wizard and set all necessary parameters
2. Secure the grounding and check that cables comply with requirements	7. Perform test run without motor, see the User Manual at www.vacon.com
3. Check quality and quantity of cooling air	8. Run no-load tests without motor being connected to the process
4. Check that all start/stop switches are in STOP position	9. Connect the motor to the process and perform test run once again
5. Connect the drive to mains	10. Vacon 10 is now ready for use

Table 1: Commissioning steps

4.2.2 Startup wizard

Vacon 10 runs the startup wizard in first power-up. After that the wizard can be run by pressing STOP for 5 seconds in main menu. The following figures show the procedure.

NOTE! Running the startup wizard will always return all parameter settings to their factory defaults!
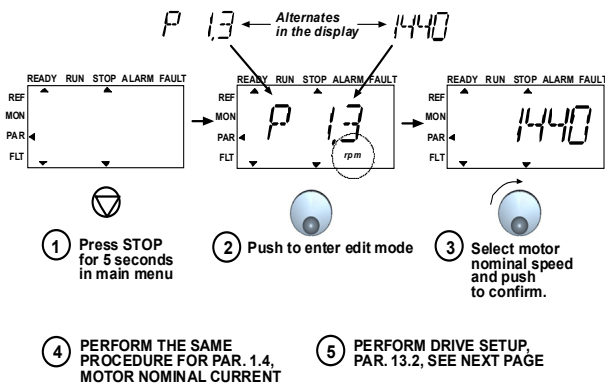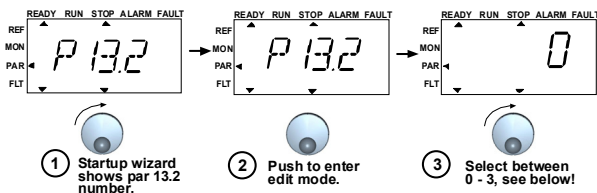

Figure 2: Vacon 10 startup wizard (General purpose application)

			READY RUN STOP ALARM FAULT	
	1	Startup wizard shows par 13.2 number.	2 Push to enter edit mode.	3 Select between 0 - 3, see below!

Selections:

		P1.1	P1.2	P1.7	P1.15	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.2	P4.3
0 = Basic		400 V*	50 Hz	1,1 * I$_{NMOT}$	0= Not used	I/O	0= Ramp	0= Coast.	0 Hz	50 Hz	0= Ai1 0-10V	3 s	3 s
1 = Pump drive		400 V*	50 Hz	1,1 * I$_{NMOT}$	0= Not used	I/O	0= Ramp	1= Ramp	20 Hz	50 Hz	0= Ai1 0-10V	5 s	5 s
2 = Fan drive		400 V*	50 Hz	1,1 * I$_{NMOT}$	0= Not used	I/O	0= Ramp	0= Coast.	20 Hz	50 Hz	0= Ai1 0-10V	20 s	20 s
3 = Conveyor drive		400 V*	50 Hz	1,5 * I$_{NMOT}$	1= Used	I/O	0= Ramp	0= Coast.	0 Hz	50 Hz	0= Ai1 0-10V	1 s	1 s

*In drives of 208V...230V this value is 230V

Parameters affected:		
	P1.1 Motor Un (V)	P2.3 Stop function
	P1.2 Motor fn (Hz)	P3.1 Min frequency
	P1.7 Current limit (A)	P3.2 Max frequency
	P1.15 Torque boost	P3.3 I/O reference
	P2.1 Control place	P4.2 Acc. time (s)
	P2.2 Start function	P4.3 Dec time (s)

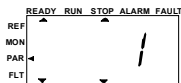|	
4	Push to confirm drive setup

Figure 3: Drive setup

5. MONITORING & PARAMETERS

Note! Complete parameter listing and descriptions are given in Vacon 10 User Manual, available at: www.vacon.com -> Support & Downloads

5.1 Monitoring values

Code	Monitoring signal	Unit	ID	Description
M1.1	Output frequency	Hz	1	Frequency to the motor
M1.2	Frequency reference	Hz	25	
M1.3	Motor shaft speed	rpm	2	Calculated motor speed
M1.4	Motor current	A	3	Measured motor current
M1.5	Motor torque	%	4	Calculated actual/nominal torque of the motor
M1.6	Motor power	%	5	Calculated actual/nominal power of the motor
M1.7	Motor voltage	V	6	Motor voltage
M1.8	DC-link voltage	V	7	Measured DC-link voltage
M1.9	Unit temperature	C°	8	Heat sink temperature
M1.10	Motor temperature	C°		Calculated motor temperature
M1.11	Analogue input 1	%	13	AI1 value
M1.12	Analogue input 2	%	14	AI2 value
M1.13	Analogue output	%	26	AO1
M1.14	DI1, DI2, DI3		15	Digital input statuses
M1.15	DI4, DI5, DI6		16	Digital input statuses
M1.16	RO1, RO2, DO		17	Relay/digital output statuses
M1.17	PI setpoint	%	20	In percent of the maximum process reference
M1.18	PI feedback	%	21	In percent of the maximum actual value
M1.19	PI error value	%	22	In percent of the maximum error value
M1.20	PI Output	%	23	In percent of the maximum output value

Table 1: Vacon 10 monitoring values (General purpose application)

5.2 Quick setup parameters

Code	Parameter	Min	Max	Unit	Default	ID	Note
P1.1	Motor nominal voltage	180	500	V	230 400	110	Check rating plate on the motor
P1.2	Motor nom. frequency	30	320	Hz	50,00	111	Check rating plate on the motor
P1.3	Motor nominal speed	300	20000	rpm	1440	112	Default applies for a 4-pole motor.
P1.4	Motor nominal current	0,2 x I_{Nunit}	1,5 x I_{Nunit}	A	I_{Nunit}	113	Check rating plate on the motor
P1.5	Motor cos φ	0,30	1,00		0,85	120	Check rating plate on the motor
P1.7	Current limit	0,2 x I_{Nunit}	2 x I_{Nunit}	A	1,5 x I_{Nunit}	107	
P1.15	Torque boost	0	1		0	109	**0** = Not used **1** = Used
P2.1	Control place	1	3		1	125	**1** = I/O terminal **2** = Keypad **3** = Fieldbus
P2.2	Start function	0	1		0	505	**0** = Ramp **1** = Flying start
P2.3	Stop function	0	1		0	506	**0** = Coasting **1** = Ramp
P3.1	Min frequency	0,00	P3.2	Hz	0,00	101	
P3.2	Max frequency	P3.1	320	Hz	50,00	102	
P3.3	I/O reference	0	4		3	117	**0** = Preset Speeds (0-7) **1** = Keypad Reference **2** = Fieldbus Reference **3** = AI1 **(API LIMITED & FULL)** **4** = AI2 **(API FULL)**
P3.4	Preset speed 0	0,00	P3.2	Hz	5,00	124	Activated by digital inputs
P3.5	Preset speed 1	0,00	P3.2	Hz	10,00	105	Activated by digital inputs
P3.6	Preset speed 2	0,00	P3.2	Hz	15,00	106	Activated by digital inputs
P3.7	Preset speed 3	0,00	P3.2	Hz	20,00	126	Activated by digital inputs
P4.2	Acceleration time	0,1	3000	s	1,0	103	
P4.3	Deceleration time	0,1	3000	s	1,0	104	
P6.1	AI1 Signal range	0	3		0	379	**0** = Voltage 0...10 V **(F + L)** **1** = Voltage 2...10 V **(F + L)** **2** = Current 0...20 mA **(L)** **3** = Current 4...20 mA **(L)**
P6.5	AI2 Signal range **(API FULL)**	2	3		3	390	**2** = Current 0...20 mA **3** = Current 4...20 mA
P10.4	Automatic restart	0	1		0	731	**0** = Not used **1** = Used
P13.1	Parameter conceal	0	1		1	115	**0** = All parameters visible **1** = Only basic parameters

Table 2: Quick setup parameters (General purpose application)

5.3 System menu parameters

Code	Parameter	Min	Max	Default	ID	Note
Software information (MENU PAR -> S1)						
S1.1	Software package				833	
S1.2	Power SW version				834	
S1.3	API SW version				835	
S1.4	API Firmware interface				836	
S1.5	Application ID				837	
S1.6	Application revision				838	
S1.7	System load				839	
RS485 information (MENU PAR -> S2)						
S2.1	Communication status				808	Format: **xx.yyy** **xx** = 0 - 64 (Number of error messages) **yyy** = 0 - 999 (Number of good messages)
S2.2	Fieldbus protocol	0	1	0	809	**0** = FB disabled **1**= Modbus
S2.3	Slave address	1	255		810	
S2.4	Baud rate	0	5	5	811	**0**=300, **1**=600, **2**=1200, **3**=2400, **4**=4800, **5**=9600,
S2.5	Number of stop bits	0	1	1	812	**0**=1, **1**=2
S2.6	Parity type	0	0	0	813	**0**= None (locked)
S2.7	Communication time-out	0	255	0	814	**0**= Not used, **1**= 1 second, **2**= 2 seconds, etc.
S2.8	Reset communication status				815	**1**= Resets par. S2.1
Total counters (MENU PAR -> S3)						
S3.1	MWh counter	0	1	0	827	
S3.2	Power on days	0	1	0	828	
S3.3	Power on hours	0	1	0	829	
User settings (MENU PAR -> S4)						
S4.1	Display contrast	0	15	7	830	Adjusts the display contrast
S4.2	Restore factory defaults	0	1	0	831	**1**= Restores factory defaults

Table 3: System menu parameters

6. FAULT TRACING

Fault code	Fault name
1	Overcurrent
2	Overvoltage
3	Earth fault
8	System fault
9	Undervoltage
13	Frequency converter undertemperature
14	Frequency converter overtemperature
15	Motor stalled
16	Motor overtemperature
22	EEPROM checksum fault
25	Microcontroller watchdog fault
34	Internal bus communication
35	Application fault
50	Analogue input I_{in} < 4mA (selected signal range 4 to 20 mA)
51	External fault
53	Fieldbus fault

Table 1: Fault codes. See User Manual for detailed fault descriptions.

7. GENERAL DATA

Dimensions and weight	Frame	Height	Width	Depth (mm)	Weight (kg)
	MI1	156,5	65,5	98,5	0,55
	MI2	195	90	101,5	0,70
	MI3	262,5	100	108,5	0,99

Supply network	Networks	Vacon 10 cannot be used with corner grounded networks
	Short circuit current	Maximum short circuit current has to be < 50kA

Motor connection	Output voltage	0 - U$_{in}$
	Output current	Continuous rated current I$_N$ at ambient temperature max. +50ºC, over-load 1.5 x I$_N$ max. 1min/10min

Ambient conditions	Ambient operating temperature	-10°C (no frost)...+50°C: rated loadability I$_N$
	Storage temperature	-40°C...+70°C
	Enclosure class	IP20
	Relative humidity	0...95% RH, non-condensing, non-corrosive, no dripping water
	Altitude	100% load capacity (no derating) up to 1000m. 1% derating for each 100m above 1000m; max. 2000m

EMC	Immunity	Complies with EN50082-1, -2, EN61800-3
	Emissions	230V : Complies with EMC category C2 (Vacon level H); With an internal RFI filter 400V: Complies with EMC category C2 (Vacon level H): With an internal RFI filter Both: No EMC emission protection (Vacon level N): Without RFI filter **See detailed descriptions in Vacon 10 User Manual at:** **www.vacon.com/support**

Standards	For EMC: EN61800-3, For safety: UL508C, EN61800-5-1

Certificates and manufac-turer's decla-rations of conformity	For safety: CB, CE, UL, cUL, For EMC: CE, CB, c-tick (see unit nameplate for more detailed approvals)

Cable and fuse require-ments	Frame	Fuse (A)	Mains cable Cu (mm^2)	Terminal cable min-max (mm^2)	
				Main & earth	Control & relay
380 - 500V	MI1	6	3*1.5+1.5	1.5-4	0.5-1.5
	MI2	10	3*1.5+1.5		
	MI3	20	3*2.5+2.5	1.5-6	
208 - 240V	MI1	10	2*1.5+1.5	1.5-4	
	MI2	20	2*2.5+2.5		
	MI3	32	2*6+6	1.5-6	

- With above-mentioned fuses, the drive can be connected to power supply the short circuit current of which is max. 50kA
- Use cables with heat resistance of at least +70 C.
- The fuses function also as cable overload protection.

- These instructions apply only to cases with one motor and one cable connection from the frequency converter to the motor.
- To fulfil standard EN61800-5-1, the protective conductor should be **at least 10mm2 Cu or 16mm Al**. Another possibility is to use an additional protective conductor of at least the same size as the original one.

Vacon 10 power ratings

Mains voltage 208-240 V, 50/60 Hz, 1~ series					
Frecuency converter type	Rated loadability		Motor shaft power	Nominal input current	Mechani-cal size
	100% contin. current I_N [A]	150% overload current [A]	P [kW]	[A]	
Vacon 10-1L-0001 - 2	1,7	2,6	0,25	4,2	MI1
Vacon 10-1L-0002 - 2	2,4	3,6	0,37	5,7	MI1
Vacon 10-1L-0003 - 2	2,8	4,2	0,55	6,6	MI1
Vacon 10-1L-0004 - 2	3,7	5,6	0,75	8,3	MI1
Vacon 10-1L-0005 - 2	4,8	7,2	1,1	11,2	MI2
Vacon 10-1L-0007 - 2	7,0	10,5	1,5	14,1	MI2
Vacon 10-1L-0009 - 2 *	9,6	14,4	2,2	15,8	MI3

* The maximum ambient operating temperature of Vacon 10-1L-0009 - 2 is **+40°C!**

Mains voltage 380-480 V, 50/60 Hz, 3~ series					
Frecuency converter type	Rated loadability		Motor shaft power	Nominal input current	Mechani cal size
	100% continu-ous current I_N [A]	150% over-load current [A]	380-480V sup-ply P[kW]	[A]	
Vacon 10-3L-0001 - 4	1,3	2,0	0,37	2,2	MI1
Vacon 10-3L-0002 - 4	1,9	2,9	0,55	2,8	MI1
Vacon 10-3L-0003 - 4	2,4	3,6	0,75	3,2	MI1
Vacon 10-3L-0004 - 4	3,3	5,0	1,1	4,0	MI1
Vacon 10-3L-0005 - 4	4,3	6,5	1,5	5,6	MI2
Vacon 10-3L-0006 - 4	5,6	8,4	2,2	7,3	MI2
Vacon 10-3L-0008 - 4	7,6	11,4	3,0	9,6	MI3
Vacon 10-3L-0009 - 4	9,0	13,5	4,0	11,5	MI3
Vacon 10-3L-0012 - 4	12,0	18,0	5,5	14,9	MI3

Note: The input currents are calculated values with 100 kVA line transformer supply.