

9.13 Modbus RTU

Vacon 10 has a built-in Modbus RTU bus interface. The signal level of the interface is in accordance with the RS-485 standard.

The built-in Modbus connection of Vacon 10 supports the following function codes:

Function code	Function name	Address	Broadcast messages
03	Read Holding Registers	All ID numbers	No
04	Read Input Registers	All ID numbers	No
06	Write Single Registers	All ID numbers	Yes
16	Write multiple registers	All ID numbers	Yes

Table 9.3: Modbus RTU

9.13.1 Termination resistor

The RS-485 bus is terminated with termination resistors of 120 ohms in both ends. Vacon 10 has a built-in termination resistor which is switched off as a default (presented below). The termination resistor can be switched on and off with the right hand dip switch located above IO-terminals in the front of the drive (see below).

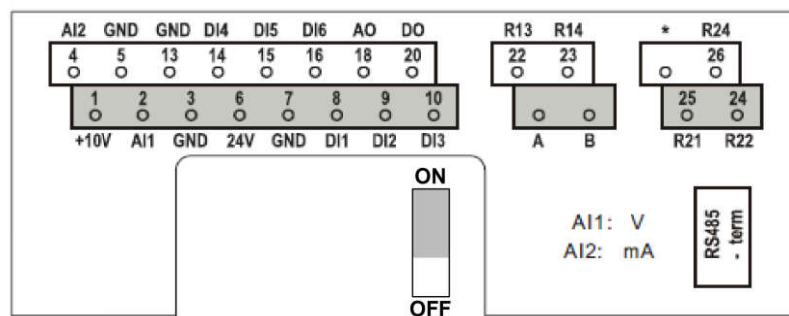


Figure 9.20: Vacon 10 I/O

9.13.2 Modbus address area

The Modbus interface of Vacon 10 uses the ID numbers of the application parameters as addresses. The ID numbers can be found in the parameter tables in chapter 8. When several parameters / monitoring values are read at a time, they must be consecutive. 11 addresses can be read and the addresses can be parameters or monitoring values.

Note! With some PLC manufacturers, the interface driver for Modbus RTU communication may contain an offset of 1 (the ID number to be used would then subtract 1).

9.13.3 Modbus process data

Process data is an address area for fieldbus control. Fieldbus control is active when the value of parameter 2.1 (Control place) is 3 (= fieldbus). The content of the process data has been determined in the application. The following tables present the process data contents in the General Purpose Application.

ID	Modbus register	Name	Scale	Type
2101	32101, 42101	FB Status Word	-	Binary coded
2102	32102, 42102	FB General Status Word	-	Binary coded
2103	32103, 42103	Reserved	0,01	%
2104	32104, 42104	Output frequency	0.01	+/- Hz
2105	32105, 42105	Motor speed	1	+/- Rpm
2106	32106, 42106	Motor current	0.01	A
2107	32107, 42107	Motor torque	0,1	+/- % (of nominal)
2108	32108, 42108	Motor power	0,1	+/- % (of nominal)
2109	32109, 42109	Motor voltage	0,1	V
2110	32110, 42110	DC link voltage	1	V
2111	32111, 42111	Active fault code	1	-

Table 9.4: Output process data

ID	Modbus register	Name	Scale	Type
2001	32001, 42001	FB Control Word	-	Binary coded
2002	32002, 42002	FB General Control Word	-	Binary coded
2003	32003, 42003	Reserved	0,01	%
2004	32004, 42004	Programmable by P15.1		
2005	32005, 42005	Programmable by P15.4		
2006	32006, 42006	-	-	-
2007	32007, 42007	-	-	-
2008	32008, 42008	-	-	-
2009	32009, 42009	-	-	-
2010	32010, 42010	-	-	-
2011	32011, 42011	-	-	-

Table 9.5: Input process data

Note! 2004 can set as PI Control Reference by setting P15.1(Setpoint selection) or 2005 can be set as PI Actual value by setting P15.4 (Feedback value selection)!

Status word (output process data)

Information about the status of the device and messages is indicated in the Status word. The Status word is composed of 16 bits the meanings of which are described in the table below:

Bit	Description	
	Value = 0	Value = 1
B0, RDY	Drive not ready	Drive ready
B1, RUN	Stop	Run
B2, DIR	Clockwise	Counter-clockwise
B3, FLT	No fault	Fault active
B4, W	No alarm	Alarm active
B5, AREF	Ramping	Speed reference reached
B6, Z	-	Drive is running at zero speed
B7 - B15	-	-

Table 9.6: Status word (output process data)

Actual speed (output process data)

This is actual speed of the frequency converter. The scaling is -10000...10000. The value is scaled in percentage of the frequency area between set minimum and maximum frequency.

Control word (input process data)

The three first bits of the control word are used to control the frequency converter. By using control word it is possible to control the operation of the drive. The meanings of the bits of control word are explained in the table below:

Bit	Description	
	Value = 0	Value = 1
B0, RUN	Stop	Run
B1, DIR	Clockwise	Counter-clockwise
B2, RST	Rising edge of this bit will reset active fault	

Table 9.7: Control word (input process data)

Speed reference (input process data)

This is the Reference 1 to the frequency converter. Used normally as Speed reference. The allowed scaling is 0...10000. The value is scaled in percentage of the frequency area between the set minimum and maximum frequencies.

10. TECHNICAL DATA

10.1 Vacon 10 technical data

Mains connection	Input voltage U_{in}	115 V, -15%...+10% 1~ 208...240 V, -15%...+10% 1~ 208...240 V, -15%...+10% 3~ 380 - 480 V, -15%...+10% 3~ 600 V, -15%...+10% 3~
	Input frequency	45...66 Hz
	Connection to mains	Once per minute or less (normal case)
Supply network	Networks	Vacon 10 (400 V) cannot be used with corner grounded networks
	Short circuit current	Maximum short circuit current has to be < 50 kA.
Motor connection	Output voltage	0 - U_{in}
	Output current	Continuous rated current I_N at ambient temperature max. +50 °C (depends on the unit size), overload 1.5 x I_N max. 1 min / 10 min
	Starting current / torque	Current 2 x I_N for 2 sec in every 20 sec period. Torque depends on motor
	Output frequency	0...320 Hz
	Frequency resolution	0,01 Hz
Control connection	Digital input	Positive; Logic 1: 8...+30V; Logic 0: 0...1.5V, $R_i = 20K\Omega$
	Analogue input voltage	0...+10V, $R_i = 300 K\Omega$ (min)
	Analogue input current	0(4)...20mA, $R_i = 200\Omega$
	Analogue output	0(4)...20mA, $R_L = 500\Omega$
	Digital output	Open collector, max. load 35V/50mA
	Relay output	Switching load: 250Vac/3A, 24V DC 3A
	Auxiliary voltage	$\pm 20\%$, max. load 50mA
Control characteristics	Control method	Frequency Control U / f Open Loop Sensorless Vector Control
	Switching frequency	1...16 kHz; Factory default 4 kHz
	Frequency reference	Resolution 0.01 Hz
	Field weakening point	30...320 Hz
	Acceleration time	0.1...3000 sec
	Deceleration time	0.1...3000 sec
	Braking torque	100%* T_N with brake option (only in 3~ drives sizes MI2-5) 30%* T_N without brake option

Table 10.1: Vacon 10 technical data