Modbus Quick Guide
NFO Sinus [G2 ver 4.70]

NFO Sinus

Communication using Modbus

Modbus RTU or Modbus ASCII can be used for communication with the inverter. Available ports are RS485 for multidrop serial line (accessible from terminals) and RS232 for point to point communication (available in a RJ-45 connector). For connection and setup of communication parameters, please see Operating and Installation Manual.

The inverter implements a bus slave, and will never transmit data unless transmission is initiated by a bus master. Default station address is 1. The Modbus implementation follows "MODBUS over Serial Line Specification and Implementation Guide V1.02" and "MODBUS APPLCATIONPROTOCOL SPECIFICATION V1.1b", available from https://www.modbus.org

Available function codes are:

Code Description
- 03 Read Holding Registers
- 06 Write Single Register
- 16 Write Multiple Registers
- 23 Read/Write Multiple Registers

Any parameter value and/or data is by default treated as a 16-bit data type, transmitted with most significant byte first (sometimes referred to as Big Endian). For 32-bit values, the low order 16-bit word is transmitted first, followed by the high order word (i.e. communication is Big Endian on a 16-bit level but Little Endian on a 32-bit level).

The available parameters of the inverter are numbered using an Application Data Interface (ADI) number, starting on 1. Each ADI (parameter index) can contain up to 64 bits of data (2x 32-bit or 4x 16-bit), but most parameter sizes are only 16 bits. Modbus register address start offset for ADI number 1 is 210h (528 in decimal), and each ADI takes up four Modbus register addresses (i.e. next Modbus register base address will be 214h, then 218h, etc).

Default bus master access to Modbus register addresses should be by using the parameter's base register address (i.e. a register address that is a multiple of 4). The bus master may also choose to access the registers that are located on the in-between addresses (e.g. 211h, 212h and 213h), but this will only be possible if the parameter in question is 32-bit (or 2x 32-bit, 4x 16-bit, etc), and if the parameter itself requires explicit access to a register address that is not aligned with the parameter base address. If bus master makes an illegal register address access, the inverter will reply with a Modbus error code.

For bus master read access, the number of registers to read in each transmission is internally limited to the number of registers used by the ADI in question, i.e. maximum four consecutive registers (if parameter is 64 bits).

Below follows a small selection of parameters that can be accessed from the inverter. A complete list of parameters can be found in the Communication Supplement Manual which can be downloaded from www.nfodrives.se Please note that the parameters are always accessed using their Modbus register address, while the ADI number is used only for reference to the parameter in documentation or when using other communication methods than Modbus. The table continues on next page.

Parameter Name	ADI	Modbus reg. addr	Type	Scaling/ Coding	Remark
I-rms (output current)	120	03ECh – 03EDh	SINT32	mA (A × 10^3)	Read only
P-out (output power)	121	03F0h – 03F1h	SINT32	W (kW × 10^3)	Read only
PF (output power factor)	122	03F4h	SINT16	$1 × 10^3$	Read only
Stator Freq (actual)	125	0400h	SINT16	Hz $× 10^1$	Read only
Rotor Speed (actual)	22	0264h	SINT16	rpm	Read only
Operating Time	39	02A8h – 02A9h	UINT32	h × 10^1 (one tick per every 6 min)	Read only
Running Time	40	02ACh – 02ADh	UINT32	h × 10^1 (one tick per every 6 min)	Read only

Parameter Name	ADI	Modbus reg. addr	Type	Scaling/ Coding	Remark
MODE	34	0294h	UINT16	1 = Manual 2 = Auto 3 = Bus	
SMODE (Command)	35	0298h	UINT16	0 = Stop 081h = Run (from terminal) 101h = Run (from Input setpoint)	
Input Freq Setpoint	124	03FCh	SINT16	Hz $\times$ 10^1 (in Frequency mode)	
Input Speed Setpoint	20	025Ch	SINT16	rpm (in Speed mode)	
Inverter Status with Ack	38	02A4h	UINT16	Status code, see description	Read only
Inverter Status w/out Ack	38	02A5h	UINT16	Status code, see description	Read only

Control from terminals and use Modbus to read status and actual values

If the inverter is controlled from terminals (e.g. run signal, analog input etc.), you can still use the Modbus interface for continuously reading status and actual values. First part of table above contains a small selection of readable parameters that could be of interest. For status information, read the Inverter status which returns a status code.

Control inverter using MODE/SMODE/InverterStatus

To control the inverter (Start/Stop, etc) from a bus interface, the run signal (terminal 5) must be active. A common installation would be to strap the run signal to +24V and set parameter Autostart = Off. Then the inverter will not start by itself when powered on, but it allows control from bus.

First the master shall set the parameter MODE = 3 (Bus) to gain control over the inverter. Then it can use SMODE to send a start or stop command. When run command is 081h the inverter will use whatever setpoint is available from the terminals (e.g. analog input, selected fix frequencies, etc), and for run command 101h the setpoint is taken from Input Frequency Setpoint register (in Frequency mode), or Input Speed Setpoint register (in Speed mode).

Status from inverter is reported in parameter Inverter status which can be read from Modbus register addresses 02A4h and 02A5h. Both will reply the same status code, but reading the former will also trigger an acknowledge of alarm or fault condition, if such is active. Table below shows code, corresponding text shown on inverter display, and a short description. The codes in *italic* are merely status, while other codes indicate an alarm or fault condition.

Code	Text	Description
0	*Erased*	*Error log was erased*
1	**Par Fail**	**Internal parameter error**
2	**AC Fail**	**Mains power error**
3	**Temp Hi**	**Too high temperature on heat sink**
4	**PTC Temp**	**Motor temperature sensor trip**
5	**Overload**	**Electronic motor overload protection trip**
6	**Ain Fail**	**Analog input out of range**
7	**DC Low**	**Internal undervoltage warning**
8	**DC High**	**Internal overvoltage warning and trip**
9	**GND Fail**	**Ground fail/Earth leakage current**
10	**Imagn Low**	**Magnetization current too low or too high**
11	**Cur Low**	**Output current too low**
12	**Cur High**	**Output current too high**
13	**Run Fail**	**Locked rotor / unable to control motor**
14	**Sio Fail**	**Serial communication error**
15	**Bus Fail**	**Fieldbus communication error**
16	**Tun Fail P**	**Tuning error, parameter value**
17	**Tun Fail M**	**Tuning error, measurement**
18-21	**Internal Err**	**Internal communication errors**
22	**Par Range**	**Parameter out of range**
23	**Internal Err**	**Internal communication error**

Code	Text	Description
24	*Stop*	*Inverter is stopped*
25	*Wait*	*Inverter is waiting to become ready*
26	*Brake Ch*	*Brake chopper is operating*
27	*Cur Limit*	*Current limit has been reached*
28	*Tuning*	*Tuning is ongoing*
29	*Stand Still*	*Inverter active but with zero setpoint*
30	*Final Freq*	*Inverter has reached final frequency*
31	*Loc Acc*	*Inverter is accelerating, Manual mode*
32	*Loc Ret*	*Inverter is decelerating, Manual mode*
33	*Ext Stby*	*Inverter ready for run cmd, External mode*
34	*Ext Run*	*Inverter is running, External mode*
35	*Ext Acc*	*Inverter is accelerating , External mode*
36	*Ext Ret*	*Inverter is decelerating , External mode*
37	*Bus Stby*	*Inverter ready for run cmd, Bus mode*
38	*Bus Run*	*Inverter is running, Bus mode*
39	*Bus Acc*	*Inverter is accelerating, Bus mode*
40	*Bus Ret*	*Inverter is decelerating, Bus mode*
41-44	*Unused*	*Reserved for future use*
45	*Tuning Ok*	*Full tuning successful*
46	*RsMeas Ok*	*Stator resistance measurement successful*
47	*ParCalc Ok*	*Parameter calculation successful*