

# **SATEL i-LINK MODBUS**

## **Pulse counter and I/O-converter**

### **USER GUIDE**

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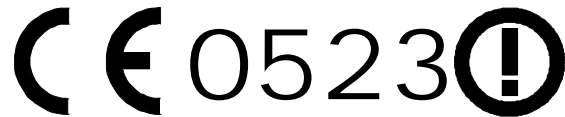
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Salo, Finland, 2011

## PRODUCT CONFORMITY

### SATEL i-LINK MODBUS

Hereby, SATEL Oy declares that SATEL i-LINK MODBUS I/O-converters are in compliance with the essential requirements and other relevant provisions of Directive 89/336/EEC. Therefore the equipment is labelled with the following CE-marking.



**DECLARATION of CONFORMITY**  
In Accordance with  
**89/336/EEC Directive**  
of the European Council of 3<sup>rd</sup> May 1989 on the approximation of the laws of the Member States relating of electromagnetic compatibility

Doc No: SATEL-DC-EMC-089

**Manufacturer:** SATEL Oy  
**Address:** P.O.Box 142, (Meriniitynkatu 17)  
24101 Solo  
FINLAND  
**Product:** SATEL i-LINK 100 / 200 / 300 I/O Converters  
SATEL C-LINK Pulse Counter  
SATEL i-LINK I/O Converter and Pulse Counter  
**Application:** External products for SATELINE Radio Modems

We, the manufacturer of the above mentioned products, hereby declare that these products conform to the requirements of the European Council directive 89/336/EEC. This Declaration of Conformity is based on that the manufacturer has tested the Products according to the following standards: ENV 50140 ( RF Immunity ), EN 55022 / CISPR 22 ( RF Emission ), EN 61000-4-2 ( ESD ) and EN 61000-4-4 ( EFT/Burst ).

Solo on the 9<sup>th</sup> of August, 2010.

SATEL OY  
  
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## WARRANTY AND SAFETY INSTRUCTIONS

Read these safety instructions carefully before using the product:

Warranty will be void, if the product is used in any way, which is in contradiction with the instructions given in this manual, or if the housing of the radio modem has been opened or tampered with.

The radio modem is to be used only on frequencies allocated by local authorities and without exceeding the given maximum allowed output power ratings. SATEL is not responsible, if any products manufactured by it are used in unlawful ways.

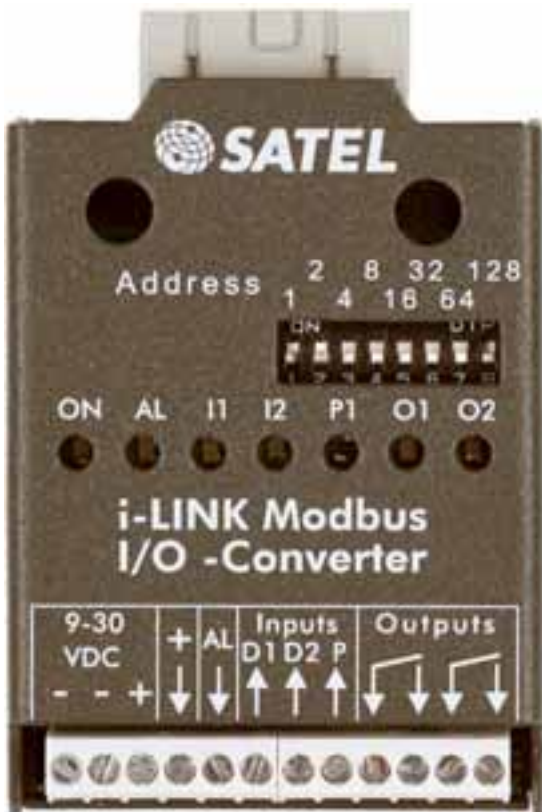
The devices mentioned in this manual are to be used only according to the instructions described in this manual. Faultless and safe operation of the devices can be guaranteed only if the transport, storage, operation and handling of the devices are appropriate. This also applies to the maintenance of the products.

To prevent damage both the radio modem and any terminal devices must always be switched OFF before connecting or disconnecting the serial connection cable. It should be ascertained that different devices used have the same ground potential. Before connecting any power cables the output voltage of the power supply should be checked.

## 1 GENERAL

### 1.1 SATEL i-LINK MODBUS pulse counter and I/O- converter

The SATEL i-LINK MODBUS is pulse counter and I/O-converter for Modbus systems. The device works together with SATELLINE-1870 and -1870E radio modems. A status signal of the i-LINK MODBUS can be sent / received through the radio modem using the Modbus protocol.



#### Screw connectors from left to right

1, 2 = Minus	Ground
3 = 9-30 VDC / - +	Supply Voltage
4 = + OUT	+ out for other devices
5 = AL OUT	Alarm output
6, 7 = I1, I2	Digital inputs
8 = 10 kHz	Pulse Input
9 -12 = O1, O2	Digital outputs from internal relay contacts

#### Indicators

ON	Power ON/OFF
ALARM	Failure in transmission/device
I1, I2	Digital inputs
O1, O2	Digital outputs
P1	Pulse counter input

#### DIP-Switches 8 pcs

1....8 ADDRESS. Max 247.

## 2 SPECIFICATIONS

<b>FEATURE</b>	<b>min-max</b>	<b>typical</b>	<b>note</b>
Supply Voltage	9...30 Vdc		Supply Voltage to i-LINK regulated by the radio modem (5.3 Vdc)
Power consumption	0.03...0.1 VA	40 mA @ 12 Vdc	
Serial Interface	RS-232 ± 15 Vdc	± 6 Vdc	active RS-232
Response time	< 250 ms	< 300 ms	@ 9600 bps
Operational temperature	-25...+55 °C		
Transfer rate	9600 bps		
<b>PULSE COUNTER</b>			
Input, 1 pc	max. 10 kHz		
Minimum pulse width	5 μs		
<b>DIGITAL SIGNALS</b>			
Inputs, 2 pcs	0 – 35 Vdc	0 – 30 Vdc	resistive 4-5 kΩ,
Outputs, 2 pcs	0 – 30 V DC/AC/1 A		relay contacts (normal= open)
<b>INDICATORS</b>			
Indicators	Power ON/OFF, Digital IN/OUT, Alarm, Pulse IN.		
<b>OTHER OUTPUTS</b>			
Alarm Output	9 – 35 Vdc / 30 mA		Alarm= + supply voltage drive current 30 mA.
<b>GENERAL</b>			
Address	247 pcs		
Housing	Metal plate, painted		
Connectors	16 pins for SATELLINE-1870, -1870E 12 pins for other connections		
Size L x W x H	123 x 85 x 30 mm		
Weight	80 g		
Mounting	Wall plate		
IP	IP-20		
Modem compatibility	SATELLINE-1870, -1870E		

## 3 FUNCTIONS

### Screw connector functions

#### 3.1 Supply Voltage, 9 – 30 Vdc

- The minus contacts are in parallel. One is for the i-LINK and another can be used for external devices and connections. Plus (+) is for supply voltage.

#### 3.2 Alarm output, AL OUT

- The AL OUT is activated, when three transmission fails have occurred one after another. When activated the AL OUT goes to +VDC. Driving current is max. 30 mA.

#### 3.3 + OUT ↓

- + OUT is internally connected to + VDC through an automatic fuse. The supply voltage for other devices.
- Connections can be taken from the +OUT.

#### 3.4 Digital Inputs, I1, I2, and Outputs O1, O2

- Inputs: 2 pcs. Activated with + VDC. Minimum Voltage for "1"-state triggering is 7 Vdc.
- Outputs: 2 pcs. Open relay contacts. Max. rating 9– 30 VDC / AC / 1 A load.

#### 3.5 Pulse Input

- Edge triggering. Maximum frequency is 10 kHz.

#### 3.6 Indicators

- **ON.** Power ON/ OFF. Illuminated when +VCD is connected. Blinking, if the device is not working.
- **O1...O2, PO... PO1.** Showing the status of the input and output. Illuminated when the consequently pin is activated.
- **ALARM.** Illuminated, if a fail in transmission has occurred.
- **I1...I2, PI1...PI2.** Showing the status of the input. Illuminated when the consequently pin is activated.

#### 3.7 DIP-Switches

##### ADDRESS

Modbus address. The maximum number of addresses is 247.

1000 0000= address 1, 0100 0000= address 2, 1100 0000= address 3, etc.

## 4 OPERATION

### 4.1 Preliminary settings

- Connect one SATELLINE-1870 or -1870E radio modem to the PLC or to PC's COM-Port. This one will be the Master unit.
- Check that the radio modem parameters are "9600-E-8-1".
- Connect the SATELLINE radio modem to the i-LINK MODBUS. Make sure that the clips are locked to the i-LINK (blue arrows in the picture).
- Before connecting the device to a power supply, set first the address and connect all inputs/outputs that are to be used.
- When both units have these basic settings the supply voltage can be connected.



NOTE, that the parity bit is Even.

### Updates

The updates are controlled by the Modbus Master that sends messages to the substations or asks status information from them.

## 5 FACTORY SETTINGS

The i-LINK MODBUS I/O-converter is shipped with the following default setting (unless specifically ordered with setting other than listed below):

### FIXED SETTING DEFINED AT THE TIME OF ORDER

ADDRESS	0000 0000
---------	-----------

## 6 MODBUS SERIAL TRANSMISSION MODE

This system supports only the RTU (Remote Terminal Unit) serial transmission mode. Each 8-bit message byte contains two 4-bit hexadecimal characters. The message is always transmitted in a continuous stream.

The message is considered finished after 7-9 ms delay in the message.

In the specification of the Modbus standard the message is considered finished if the delay is more than 3.5 characters.

**Supported baud rates and modes:**

<i>Mode</i>	<i>Connection settings</i>
RTU	9600, 8, E, 1

## 7 ADRESSES

The valid addresses are from 1-247 (selected by the address dip-switches). Address 0 is reserved for broadcast address. This device does not response to a broadcast message. All functions are not supported when using broadcast message.

## 8 SUPPORTED MODBUS FUNCTIONS

This device supports the following Modbus functions. H= bytes are described as hexadecimal characters.

<i>CODE</i>	<i>FUNCTION</i>	<i>MEMORY AREA</i>
01H	Read Coil status	0xxxx
02H	Read district inputs	1xxxx
03H	Read Holding Registers	4xxxx
04H	Read Input Registers	3xxxx
05H	Force Single Coil	0xxxx
0FH	Force Multiple Coils	0xxxx
10H	Set Multiple Registers	4xxxx
11H	Report Slave ID	Hidden

## 9 i-LINK MODBUS MAIN DEVICE DATA AREAS

Note! All addresses described in this documentation are written as "PC-mode". Internally the addresses are 1 less, so in the device the BASE is 0. In this document the BASE is 1.

### 9.1 Digital Inputs

These values are read only. Only the function 02H can be used.

<i>Register</i>	<i>Access</i>	<i>Description</i>
10001	Read only	Digital Input 1
10002	Read only	Digital Input 2

### 9.2 Digital Outputs

The usable functions are: 01H, 05H and 0FH.

<i>Register</i>	<i>Access</i>	<i>Description</i>
101	Read/Write	Digital output 1
102	Read/Write	Digital output 2

### 9.3 Pulse counter

The usable function is 04H.

<i>Register</i>	<i>Access</i>	<i>Description</i>
31001	Read only	FAST Counter highest 16 bits
31002	Read only	FAST Counter lowest 16 bits

### 9.4 Report Slave ID.

The report slave id function will response with slave information, SW-version etc.  
The information data is following:

<i>Data value</i>	<i>Description</i>
X	Slave ID. Selected slave ID. (1-247)
11H	Function code, always 11H
0CH	Response length, always 0CH

<i>Data value</i>	<i>Description</i>
XXXX	Response data. 6 characters, device model, 1 space, 5 characters device version. For example: MINI-LINK v1.0B
XX	Device status FFH device ON, 00H device Off.
CRC	CRC for message.

## 9.5 Safe Mode.

The Safe Mode supports functions 01H, 0FH, 05H, 03H and 10H.

<i>Register</i>	<i>Access</i>	<i>Description</i>
45001	03H/10H	0 = No safe mode. 1 = Alarm light ON. Alarm goes automatically off when a valid message is received. 2 = Alarm light ON. Outputs to safe mode settings. Alarm goes automatically OFF when valid message is received. 3 = Like 1, except alarm will not go OFF automatically. Master must turn it off. 4 = Like 2, except alarm will not go OFF automatically, Master must turn it OFF.
45011	03H/10H	High 16 bit off safe mode selected time. (32 bit value 100 <sup>th</sup> of seconds, 1000 = 10 seconds)
45012	03H/10H	Low 16 bit off safe mode selected time. (32 bit value 100 <sup>th</sup> of seconds, 1000 = 10 seconds)
5101	01H/05H/0FH	Safe mode digital output 1
5102	01H/05H/0FH	Safe mode setting for digital output 2
5501	01H/05H/0FH	0 = Alarm OFF, 1 = Alarm On

Notes!: When Alarm mode is 2 or 4 and alarm goes OFF, Digital outputs will remain in Safe Mode status until a new value is set to the Digital outputs.

Note! When these values are written, the response is delayed up to 2 seconds (writing to EEPROM takes some time). All Safe mode setting changes (except ALARM) are stored to EEPROM.

## 10 CONNECTION EXAMPLES

Modbus system with one master and two sub-stations.



Opening of the Radio  
modem's lock pins with  
a screw driver

