



# **RTU ANALOG INPUT MODULE TELEM-AI12G**

## **User manual**

**Martem AS**  
**2009**

## Preface

This document, User Manual edition 1.0 for RTU Analog Input Module TELEM-AI12G version 1.0, provides a general technical description of the module, its configuration and use. Although we have carefully checked the contents of this publication for conformity with the hardware and software described, we cannot guarantee complete conformity since errors cannot be excluded. The information provided in this manual is checked at regular intervals and any corrections that might become necessary are included in the next releases. Any suggestions for improvement are welcome.

The RTU Digital Input Module TELEM-AI12G has been designed and manufactured according to the quality principles of ISO 9001.

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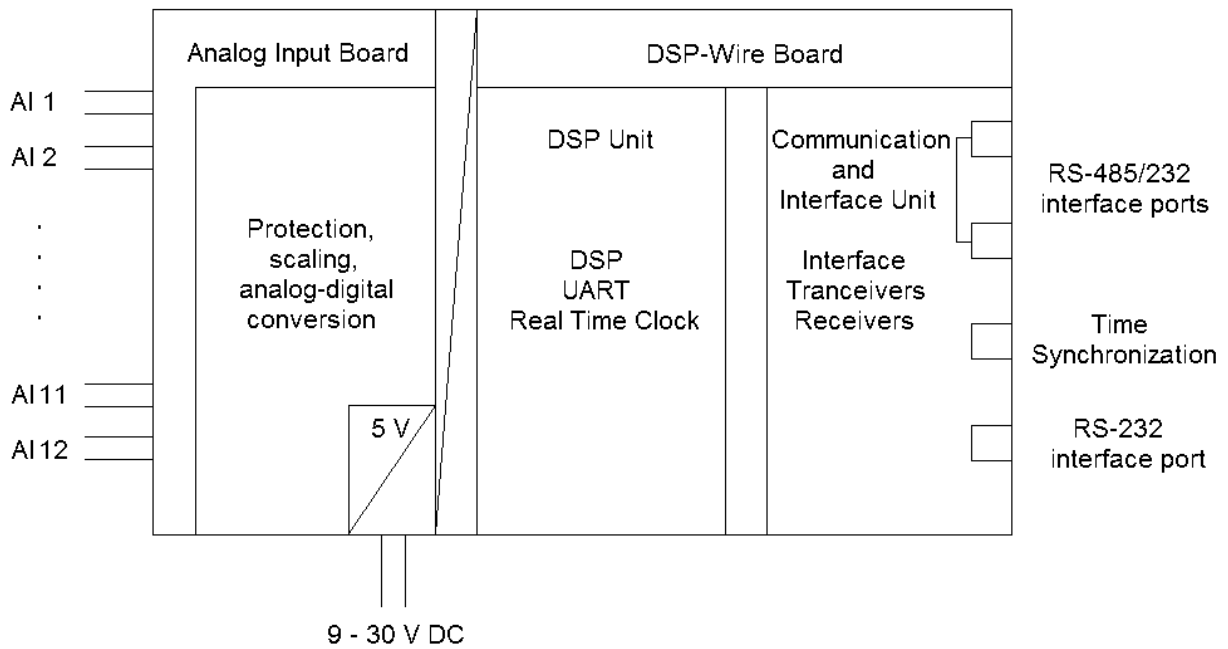
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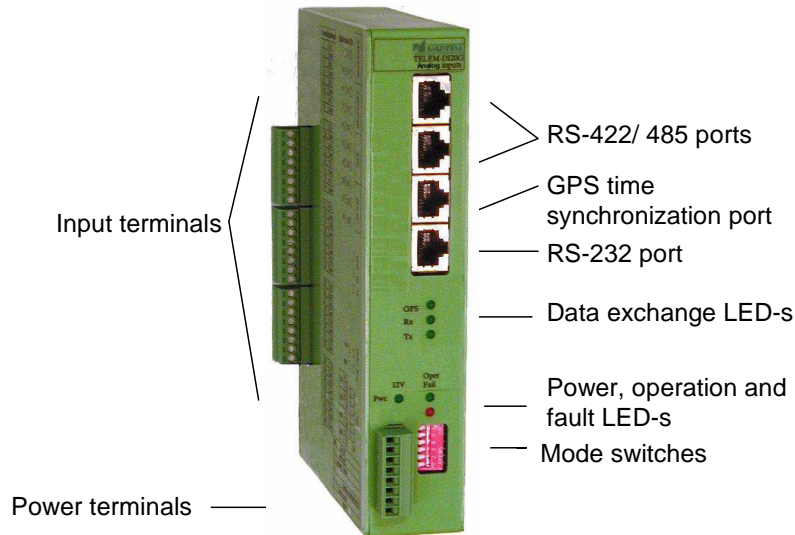
## 1. Application

TELEM-AI12G analog input module is used for analog info acquisition and data exchange with higher level devices or systems. Its functionality allows it to be flexibly used for distributed process automation in systems to measure analog values using different transducers, data processing and acquisition where excellent noise immunity with respect to environmental and electromagnetic influences is important. It may be used as a standalone device or in a daisy chain connection with other modules.

## 2. Construction

The mechanical design is based on a plastic enclosure that can be readily mounted on 35-mm rails. It contains a DSP-WIRE board and an ANALOG INPUT board that are universal among the TELEM family modules. The input screw terminal blocks are located on the left side of the enclosure. Max 1,5 mm<sup>2</sup> conductors can be connected to each terminal. A connector diagram, switch position and the meaning of indication LEDs are also shown on the left side of the enclosure.





### 3. Features

- GPS time synchronization with 1 ms accuracy
- Two level input filters
- Binary signals are recorded with a time resolution of 1 ms
- Measurements are periodically saved
- Online leased line or offline dial-up mode operation, data GSM communication request by an event in substation or by the remote control center
- Configuration / parameterization with IEC protocol at the same line with data communication
- Daisy chain master – slave connection of 30 modules is possible when using the RS 232/422 interface
- Self diagnostics and supervision simultaneously with data acquisition
- Quick value changes can be registered with time tags (min and max value)
- Periodical time-tagged measurements

## 4. Technical Data

### Input

Number of differential independently configurable analog inputs	12
Input ranges	0-5 mA, 0-20 mA, 4-20 mA, +/- 5 mA, +/-10mA, +/-20 mA On request: 0-1 V, 0-10 V, +/-1 V, +/- 10 V
Measurement accuracy	0.2% (automatically scaled)
Resolution	12 bit (16 bit A/D conversion)
Scanning period	1 ms
Form of transfer measured values	normalized
Buffer size for each input	126 values

### Power requirements

Supply voltage	9-30 V DC, 3 W
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### Installation, terminals and environment

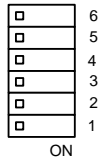
Enclosure (wxhxd)	38x174x127
Weight	0,3 kg
Mountable	DIN 35
Plug connector for input	MC1,5/8-ST-3,5
Plug connector for power	MCVW1,2/8-ST-3,5
Plug connector for communication	RJ45
Over voltage protection	IEC-60255-4, 5 kV pulse protection IEC-60255-5, 2 kV DC
Ambient temperature in operation	-20...+50°C

### Disturbance

Emission	EN-55022A
Static discharge	EN-61000-4-2
Fast transients	EN-61000-4-4
Surge	EN-6100-4-5
Conducted HF field	EN-61000-4-6
Emitted HF field	EN-61000-4-3

## 5. Mode Switches

Mode of operation and type of interfaces are determined using switches on the DSP-Wire board



- 1) ON - reset the device
- 2) OFF - operation mode, ON - firmware load mode
- 3) ON - restore default setup
- 4) Not used
- 5) ON - Master mode operation, OFF - Slave mode operation
- 6) ON - Port 1 and 2 interface RS-485, OFF - Port 1 and 2 interface RS-422.

## 6. Communication

- Transmission rate 200...38400 bit/s
- Communication mode asynchronous, data bits 8, no parity, stop bits 1
- Communication protocol unbalanced IEC60870-5-101 slave/master,
- Link address length 1 byte
- ASDU address length 2 byte
- Object address length 2 byte
- GPS time synchronization input 9600 bps (RS422/485 RX),
- Time synchronization protocol ASCII (Motorola), device TLM-
- Communication interface selectable RS-232,422 or 485
- Communication interface isolation optically to 2,5kV RMS

## 7. Configuration Parameters

The RTU Module is configurable by Telem-2000 software or by other configuration software that supports the IEC60870-5-101 protocol. Configuration parameters are altered using the parameter setting commands of the IEC60870-5-101 protocol. Specification of parameter setting commands for this module is available on request. Telem-2000 RTU configuration software runs under Windows 95, 98, 2000, XP and NT4.0 operating systems on any standard PC, communicates via COM port interface and performs the following principal functions:

- Configuration / parameterization of Telem RTU modules
- Back up of RTU configuration data
- Diagnostics and real-time supervision simultaneously with data acquisition.

### 7.1 Configuration Parameters for a Module

**Configuration of Telem controllers**

\_1\_ - No. of controller (look at Settings/Channels and controllers)

**Common parameters**

Link addr.:       Obj. base address:        Disable time sync. by protocol

ASDU address:       Comm. port control:       GPS e:

Comm. speed:        Only GPS min. and sec.

Parity:             **Loaded parameters are activated after Reset**     

Type/version: **AI 3.04**      ...           

**Analog inp.**

No.	In use (Y/N)	Range	Filtr. time	Zero zone	Deadb.1	Min.interv.	Deadb.2	Deadb.2 time
1	0 - In use	0 - +- 5 mA	0	0	0	0	0	0
2	0 - In use	0 - +- 5 mA	0	0	0	0	0	0
3	0 - In use	0 - +- 5 mA	0	0	0	0	0	0
4	0 - In use	0 - +- 5 mA	0	0	0	0	0	0
5	0 - In use	0 - +- 5 mA	0	0	0	0	0	0
6	0 - In use	0 - +- 5 mA	0	0	0	0	0	0
7	0 - In use	0 - +- 5 mA	0	0	0	0	0	0
8	0 - In use	0 - +- 5 mA	0	0	0	0	0	0
9	0 - In use	0 - +- 5 mA	0	0	0	0	0	0
10	0 - In use	0 - +- 5 mA	0	0	0	0	0	0
11	0 - In use	0 - +- 5 mA	0	0	0	0	0	0

0=300 ms    0=0.5 %    0=2 %    0=3000 ms    0=10 %    0=600 ms

Parameters of all types are read

           **Loaded parameters are activated after Reset**

**OK**

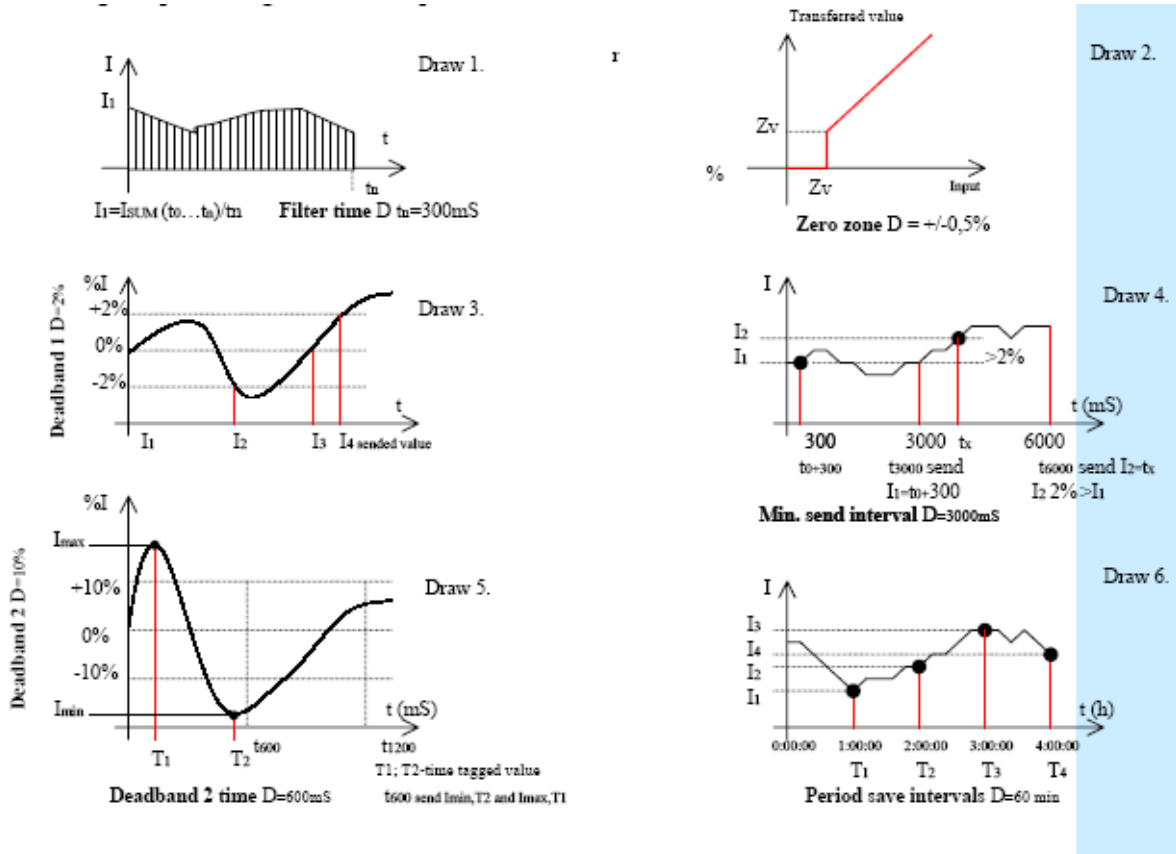
Parameter	Value	Default value
1. Communication speed	200 – 38400 bps	9600
2. Link Address	1-255	1
3. ASDU address	1-255	1
4. Object's base address	0-65534	0
5. Communication mode	Online Online with RTS/CTS Offline with RTS/DCD	Online
6. Type of periodical analog measurements [On Spont. per. sends time-tagged values after specified interval (7.2.9). On Request per. collects the time-tagged measurements and sends them only on request.]	Spont. per. Request per.	Spont.per.
7. GPS enabled	Yes No	Yes
8. Buffer depth for each time-tagged input [Increases if some inputs are not in use , 12 I/O- depth is 20]		20
9. Referents voltage correction [factory setting ex. -40 ‰]		0
10. Type/version [Loaded module program version (ex. A30.4)]		

## 7.2 Configuration parameters for analog inputs

Parameter	Value	Default value
1. In use	Yes No	Yes
2. Input signal range	0...5	0...10; 0...20; +/-5 mA; +/-5; +/-10; +/-20; 4...20mA
3. Filtration coefficient [Determines, how many samples are averaged (1 ms time resolution). Drawing 1]	1- 65535 ms	300 ms (0)
4. Zero zone [If the value in this range is around zero then it is transferred as zero. Drawing 2.]	0,01- 25,5%	0,5 % (0)
5. Dead Band 1 [for events without a time tag. Drawing 3]	0,01- 25,5%	2 % (0)



6. Min. interval [Min. interval for events. Drawing 4]		
7. Dead Band 2 [for a time-tagged event. If this value change takes place within the time period specified on p. 7 then two events are created with min. and max. values of this time period. Drawing 5]	0,01- 65%	10 % (0)
8. Time interval for Dead Band 2	1- 65535 ms	600 ms (0)
9. Time interval for a periodical time-tagged event and the tagged values (p. 7.1.6) [Drawing 6]	1- 65535 sec.	3600 sec.(0)



## 8. Connection to Signal Lines

X1 layout of the terminals of analog input signals

Contacts	Analog inputs
1	1 AI+
2	1 AI -
3	2 AI+
4	2 AI -
5	3 AI+
6	3 AI -
7	4 AI+
8	4 AI -
9	5 AI+
10	5 AI -
11	6 AI+
12	6 AI -
13	7 AI+
14	7 AI -
15	8 AI+
16	8 AI -
17	9 AI+
18	9 AI -
19	10 AI+
20	10 AI -
21	11 AI+
22	11 AI -
23	12 AI+
24	12 AI -

## 9. Pin Layout of Communication Ports

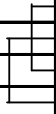
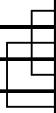
X3

TELEM DI20G		
Port	Signal	Pin
X 6-1 RS -422/485	+ CTS	1
	-CTS	2
	+RTS	3
	-RTS	4
	+RX	5
	-Rx	6
	+TX	7
	-TX	8
X 6-2 RS -422/485	CTS	1
	-CTS	2
	+RTS	3
	-RTS	4
	+RX	5
	-Rx	6
	+TX	7
	-TX	8
GPSX 6-3 RS-422/485	+RX	1
	-RX	2
		3
	GND	4
	GND	5
		6
	-RX	7
	+RX	8
X 6-4 RS -232		1
	CTS	2
	GND	3
	RXD	4
	TXD	5
	FGND	6
	RTS	7
		8

Connectors RJ 45

## 10. Connection to Power Supply

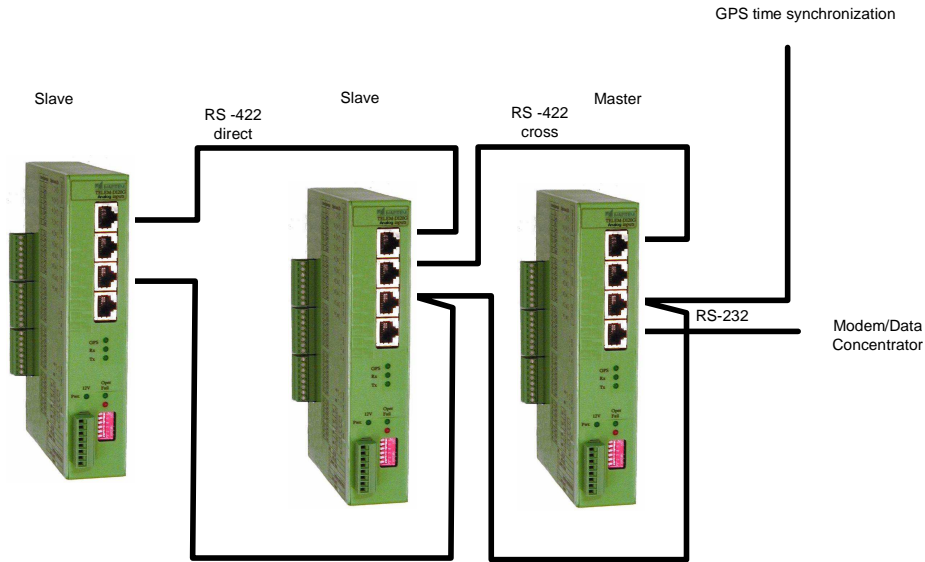
X2

TELEMAI12G			
Terminal	Voltage		Pin
X5	+9-30 V		1
	- 9-30 V		2
	+ 9-30 V		3
	- 9-30V		4
			5
			6
			7
			8

Connector

MCVW 1,5/8-ST-3,5

## 11. Connection Example



## 12 . Connection Cables

