

1 General Descriptions

ATMS0307C is a controller for single-phase AC charging. The module is compatible with IEC 61851 standard. ATMS0307C provides a simple and cost effective solution to build EV charging station.

ATMS0307C provides a wide range of protections:

- Under-voltage/Over-voltage protection
- Under/Over input frequency
- Overload protection
- Residual current protection
- PE lost protection
- Welding relay protection

Features:

- DIN rail compatible
- Included LED interface
- Configurable protection threshold
- Extending contact life by zero-crossing method
- Software update



Figure 1: 3D view



2 Connect Diagram

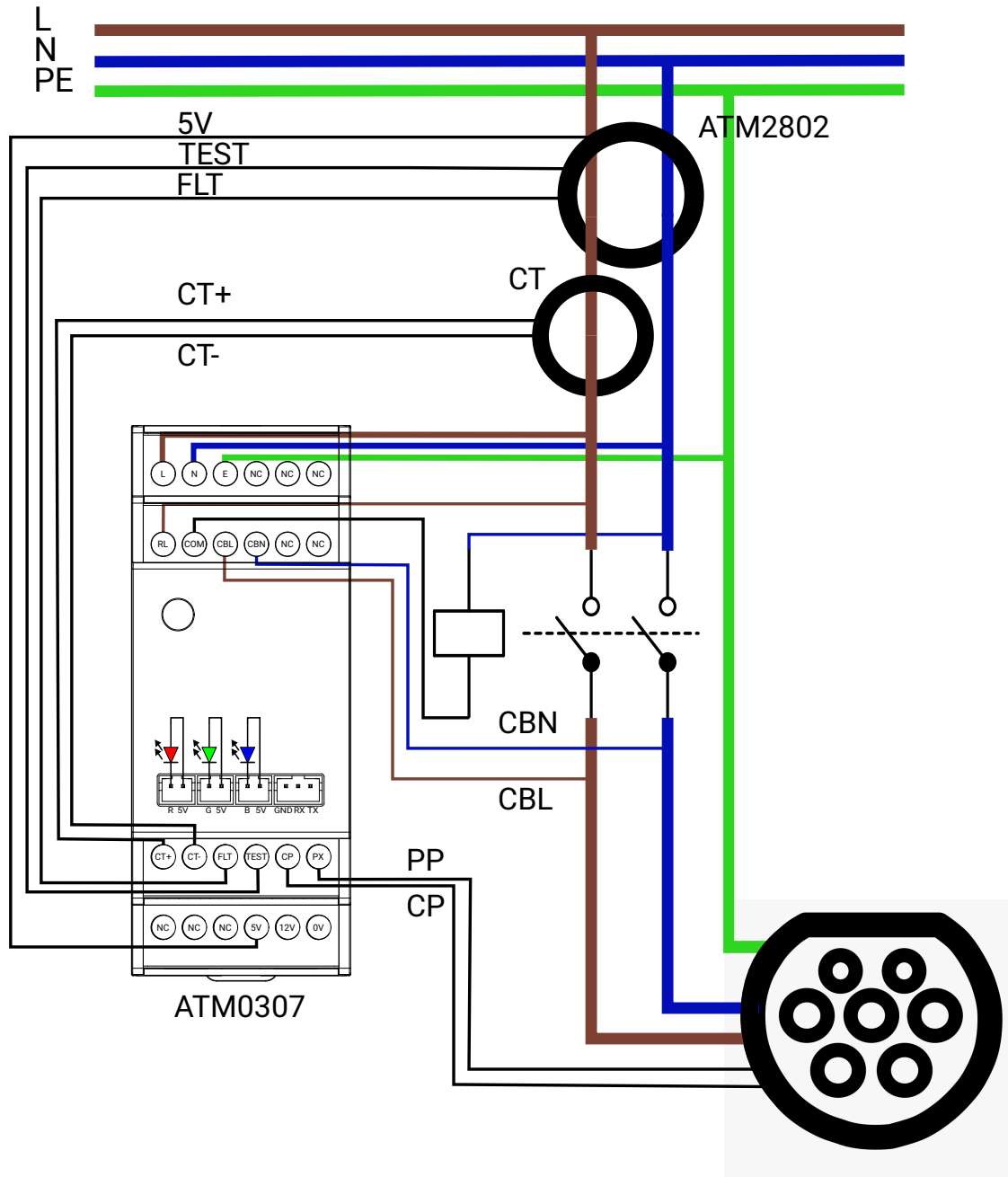


Figure 2: Typical connection diagram (see Table 1 for pin assignment)

WARNING: According to IEC 61851, the EVSE shall open the contactor within 100 ms on transition from state C to state A. Therefore, user should choose a contactor with the release time no more than **95 ms** (because the release time of the internal relay is 5 ms).

3 Pin Description

Name	Description
Terminals	
L	AC Line
N	AC Neutral
E	Earth
NC	Not connected
RL	Relay NC contact
COM	Relay common contact
CBL	Contactor feedback for line
CBN	Contactor feedback for neutral
CT+	Current transformer input +
CT-	Current transformer input -
FLT	Residual current fault detect pin
TEST	Residual current self-test pin
CP	Control pilot (CP) on IEC61851 EVSE connector
PX	Plug present (PP) on IEC61851 EVSE connector
12V	12V output
5V	5V supply to provide power to ATMS2802
0V	GND output
Connectors	
R	External LED for red indication
G	External LED for green indication
B	External LED for blue indication
5V	5V output
GND	GND for serial interface
RX	UART RX
TX	UART TX

Table 1: Pin function

4 Dimensions

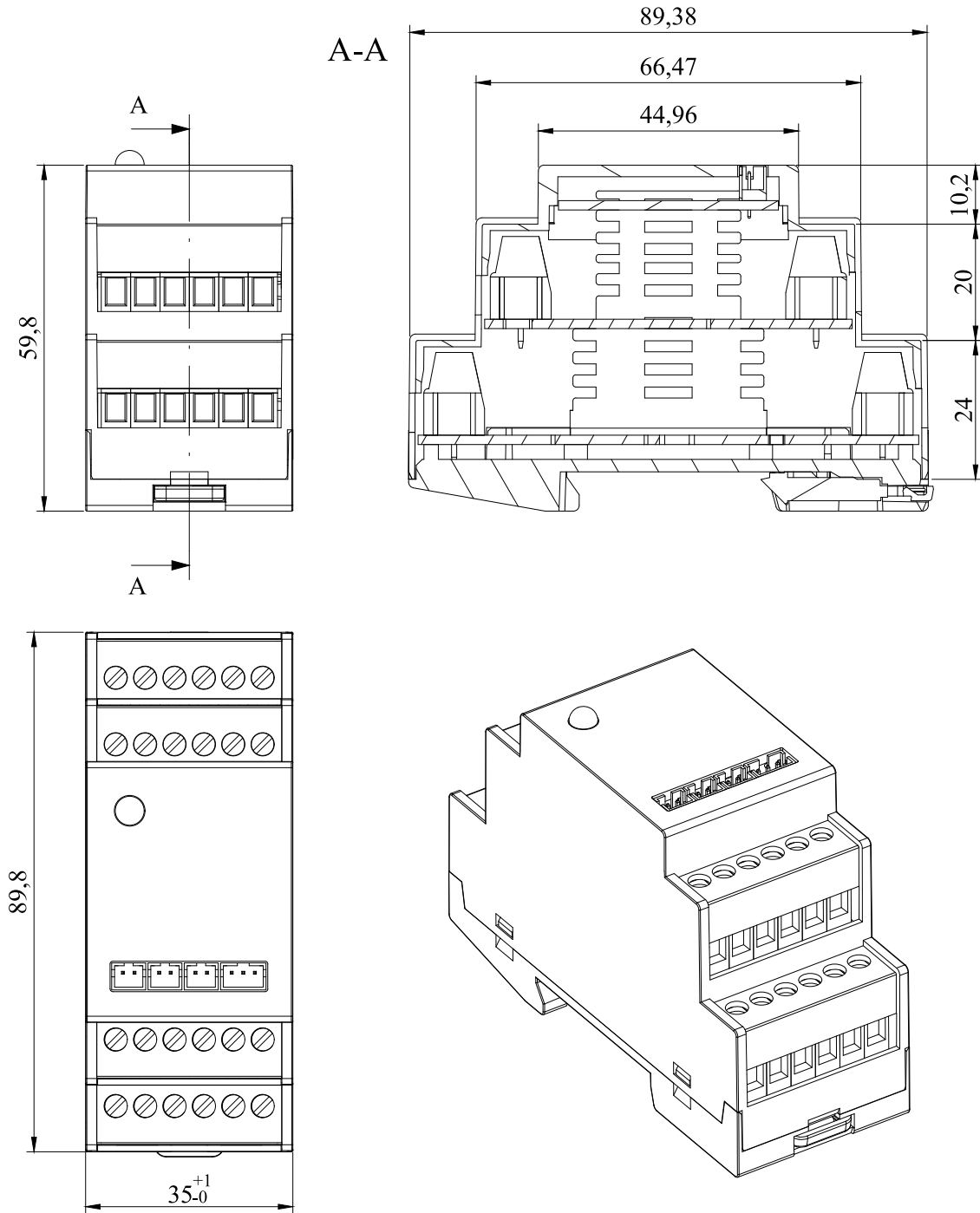


Figure 3: Dimensions (unit: mm)

5 Technical Specification

5.1 Maximum Absolute Rating

Characteristics	Symbol	Notes	Value	Unit
Operating Ambient Temperature	T_A		-30 to 50	°C
Storage Temperature	T_{STG}		-40 to 85	°C

5.2 ESD Ratings

Characteristics	Symbol	Notes	Value	Unit
Humman Body Model	VHBM	JEDEC JS-001	± 2	kV
Charged Device Model	VCDM	JEDEC JS-002	± 1	kV

5.3 Common Electrical Characteristics

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
DC characteristics						
12V output	V_{12}		-	12V	-	V
12V current output ¹	I_{O12}		-	-	200	mA
5V output	V_5		-	5V	-	V
5V current output	I_{O5}		-	-	450	mA
LED current	I_{LED}		-	-	23	mA
AC characteristics						
Voltage	V_{in}		90	-	380	V
Current	I_{in}		0.5	-	32 ²	A
Input frequency	f_{in}		47	-	63	Hz
CT ratio			-	2000/1	-	
Serial Interface						
Baudrate			-	19200	-	bps
Data length			-	8	-	bits
Stop bit			-	1	-	bits
Parity			-	None	-	

¹ The output current included output current from 5V pin.

² The maximum current depends on the external contactor.

5.4 Protection Characteristics

Characteristics	Symbol	Value ¹	Unit
Voltage protection			
Over voltage detection threshold	V_{OVP}	270	V
Over voltage detection time	t_{OVP}	3	s
Under voltage detection threshold	V_{UVP}	175	V
Over voltage detection time	t_{UVP}	3	s
Recovery range	V_{norm}	185 - 260	V
Ungrounded protection			
Ungrounded detection threshold	V_{PE}	40	V
Ungrounded detection time	t_{PE}	3	s
Overload protection			
Overload detection threshold	I_{OL}	38.4 ²	A
Overload detection time	t_{OL}	3	s

¹ All parameters in this table can be configured by serial interface (refer Section 6.2).

² Auto set to 1.2 I_{max} when the max current is changed (refer Section 6.2.1).

Table 2: Protection Characteristics

6 User Interface

6.1 LED Interface

Green	Blue	Red	Description
Off	Off	Off	Power lost
Blink	Blink	Blink	Power on
On	On	Off	Standby
Blink	Blink	Off	Gun plug in, not charging
Off	On	Off	Charing
Off	Off	Blink 1 second	Reserved
Off	Off	Blink 2 seconds	Ungrounded protection
Off	Off	Blink 3 seconds	Communication failure
Off	Off	Blink 4 seconds	Input voltage failure
Off	Off	Blink 5 seconds	Overload protection
Off	Off	Blink 6 seconds	Residual current protection
Off	Off	Blink 7 seconds	Input frequency out of range
Off	Off	Blink 8 seconds	Stuck relay
Off	Off	Blink 9 seconds	Other errors

The blink period is 1 second (0.5s on then 0.5s off).

Table 3: LED display status

6.2 Serial Interface

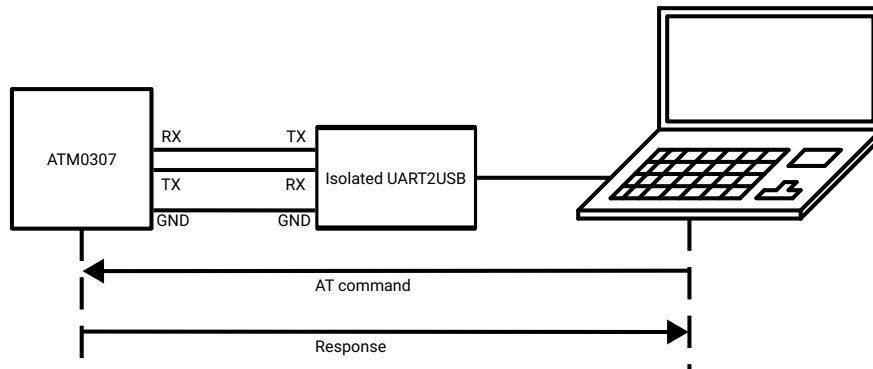


Figure 4: Serial interface diagram

For safety reason, we recommend using an isolated UART2USB converter to interact with ATMS0307C through serial interface.

6.2.1 AT commands

Each AT command starts with **AT+** and ends with **CR LF (0x0D and 0x0A)**. There are three types of commands (note that <x> means the “x” is required, and [y] means the “y” is optional):

- Write command **AT+<x>=<...>**: This command sets user-definable parameters.
- Read command **AT+<x>?<...>**: This command gets parameters or statuses. It also provides an optional parameter to indicate which channel to get.
- Execution command **AT+<x>**: This command executes a function of the module.

Depend on the requested command, the meter may or may not return a response. If there is a response, it starts with **+<x>**: where **<x>** is the requested command. If the command does not need any specific reply, the meter returns OK instead. If there is something wrong when the module is executing the command, it sends back an error message. The format of an error message is **ERROR:<reason>** (see Table 4).

Figure 5 shows how to send an AT command to ATMS0307C module with Hercules (the \$0D\$0A means sending 2 bytes with value 0x0D and 0x0A). Other terminal softwares can be use similarly.

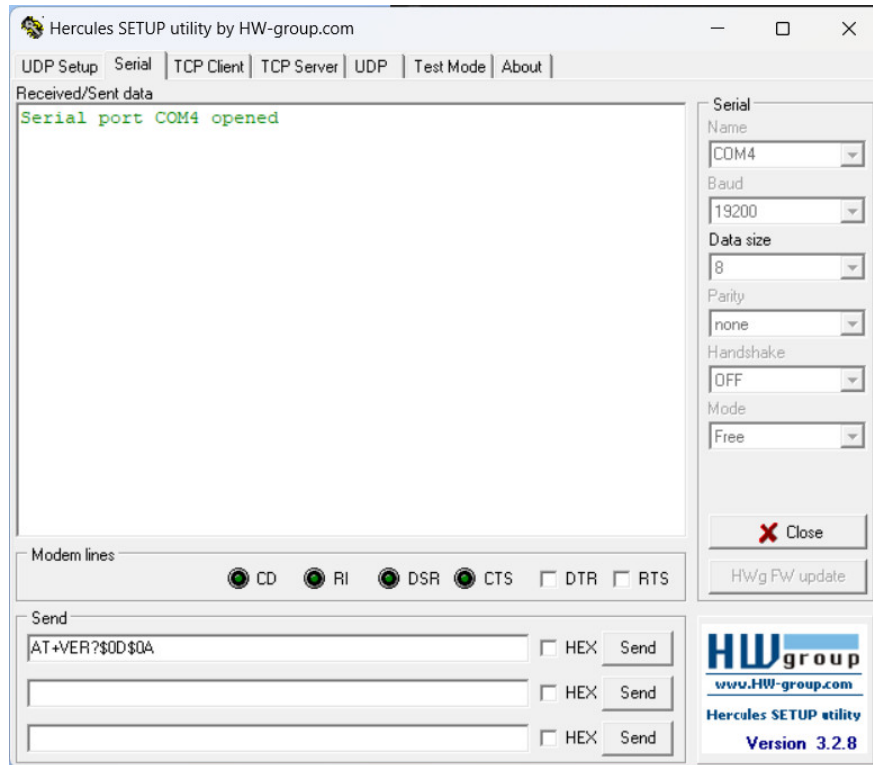


Figure 5: Sending AT+VER?

READ – Read AC parameters This command reads AC parameters of the module.

Syntax:

AT+TOTAL?

Response:

+TOTAL:<voltage>,<current>,<power>,<energy>

OVERLOAD – Setting the Overload Protection Threshold Set the overload protection limit for the module. The module switches off the relay if the current of exceeds the threshold value for the “delay time”. Users can disable this feature by setting the current threshold to the rating current. See Table 2 for default value.

Syntax:

AT+OVERLOADTOTAL=<current in mA>,<delay time in ms>

Users can check these parameters by using its query form.

Syntax:

AT+ OVERLOADTOTAL?

Response:

+OVERLOAD=<current in mA>,<delay time in ms>

OVERVOLT – Setting Over-Voltage Threshold Set the over-voltage protection threshold for the module. The module switches off all relays if the voltage is bigger than a threshold after the “delay time”. Users can disable this feature by setting the threshold to a large value. See Table 2 for default value.

Syntax:

AT+OVERVOLT=<threshold>,<recover threshold>,<delay time in ms>

Syntax:

AT+OVERVOLT?

Response:

+OVERVOLT:<threshold>,<recover threshold>,<delay time in ms>

Example:

AT+OVERVOLT=30000,25000,1000

UNDERVOLT – Setting Under-Voltage Threshold Set the under-voltage protection threshold for the module. The module switches off all relays if the voltage is smaller than a threshold after the “delay time”. And it will stop alert if the voltage larger than the recover threshold. Users can disable this feature by setting the threshold to 0V. See Table 2 for default value.

Syntax:

AT+UNDERVOLT=<threshold>,<recover threshold>,<delay time in ms>

Syntax:

AT+UNDERVOLT?

Response:

+UNDERVOLT:<threshold>,<recover threshold>,<delay time in ms>

Example:

AT+UNDERVOLT=20000,21000,1000

MAXCURRENT – Set the maximum current This command set the maximum current of the module. The current value is in mA.

Syntax:

AT+MAXCURRENT=<current>

Response:

+MAXCURRENT:<current>

Example:

+MAXCURRENT:32000

The response means the maximum current is 32 A.

DELAY - Set the delay time for contactor When the module receives a relay close request, it waits for a zero-cross and then wait a specific time before energize the relay coil. User should tune this value to have a suitable value for the external contactor. The process is described in Figure 6 .The delay time unit is 1/4 milliseconds.

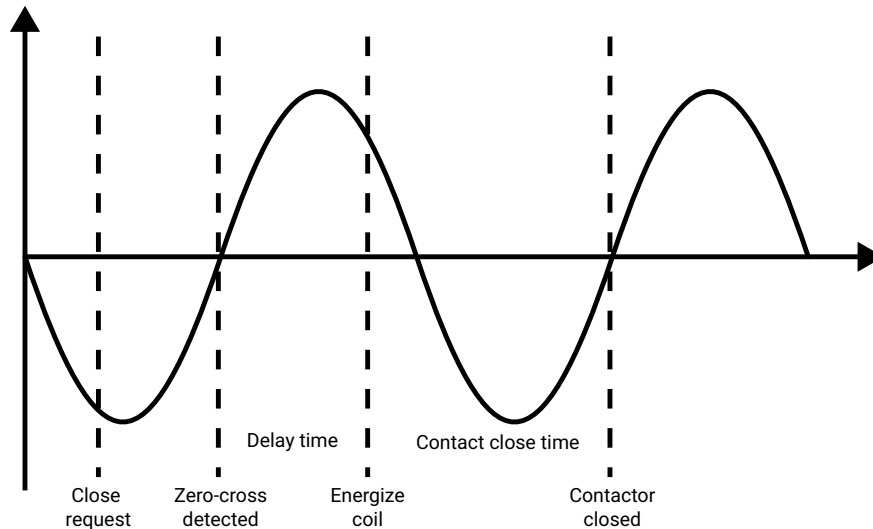


Figure 6: Close contactor with zero-cross method

Syntax:

AT+DELAY=<delay time>

Response:

+DELAY:<delay time>

Example:

+DELAY:28

In the example, the number 28 means 7 ms.

FREQ – Getting the Frequency This command gets the current frequency of the voltage signal. The scale factor of the frequency is 100.

Syntax:

AT+FREQ?

Response:

+FREQ:<frequency>

Example:

+FREQ:5000

The response means the frequency of the voltage signal is 50 Hz.

SAVE – Save settings This command saves the current settings to non-volatile memory.

Syntax:

AT+SAVE

VER - Get the version number This command gets the software version number of the module.

Syntax:

AT+VER?

Response:

+VER:<Version number>

Example:

+VER:1.0.0

ID - Get the ID number This command gets the unique 128-bit ID number of the module. The result of this command is in hexadecimal format.

Syntax:

AT+ID?

Response:

+ID:<id number in hexadecimal>

Example:

+ID:F151000054EA00260025200331534E42

REBOOT - Reboot the module When a module receives this command, it resets immediately without any reply.

Syntax:

AT+REBOOT

START_JIG_TEST - Start test mode Start test mode, in this mode user can trigger some command to test hardware.

Syntax:

AT+START_JIG_TEST

STOP_JIG_TEST - Stop test mode The module will reboot the module.

Syntax:

AT+STOP_JIG_TEST

RELAY - Control relay This command controls the relay of the module. This command must be executed in the test mode.

Syntax:

AT+RELAY=<status>

PWM_CP - Control PWM on CP pin This command controls the PWM status of the module. This command must be executed in the test mode.

Syntax:

AT+PWM_CP=<status>

GFCI_TEST - Test the ATMS2802 module This command tests the ATMS2802 module and return the result. This command must be executed in the test mode.

Syntax:

AT+GFCI_TEST?

Response:

+GFCI_TEST:<result>

The <result> is 0 means success and 1 means fail.

GET_CP - Get CP voltage Get the voltage of CP pin.

Syntax:

AT+GET_CP?

Response:

+GET_CP:<positive voltage>,<negative voltage>

The voltage is in mV.

RESIDUAL_VALUE - Get the status of ATMS2802 module Get the voltage of CP pin.

Syntax:

AT+RESIDUAL_VALUE?

Response:

+RESIDUAL_VALUE:<status>

The <status> is 0 mean no residual current and 1 means residual current detected.

Error Codes Table 4 describe causes and solutions for each error code.

Error string	Problems	Resolve
NOT-FOUND TOO-LONG	The command is wrong The line is too long to process.	Check the input command again Make sure all commands end with (<CR><LF>).
INVALID-PARAM	The parameters for the requested command are invalid	Check if all parameters are valid (enough number of parameter or all parameters are in valid range).
INVALID-CHARACTER	The command requested contains an invalid character.	If the module sends this code rapidly without any input, users should check the serial port connection. If the module sends this code after executing a command, retry the command. If the error code appears frequently, users should check the serial port connection.
DENIED	The module does not allow to execute the command	Check the precondition of the command.

Table 4: Error codes description

6.2.2 Logging

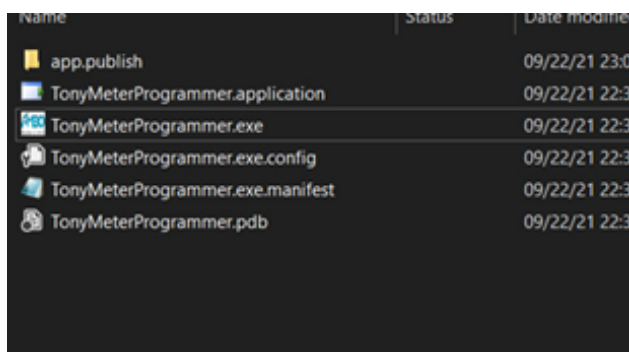
In addition to AT commands, ATMS0307C also transmits logging messages to assist in troubleshooting.

The format of logging message is:

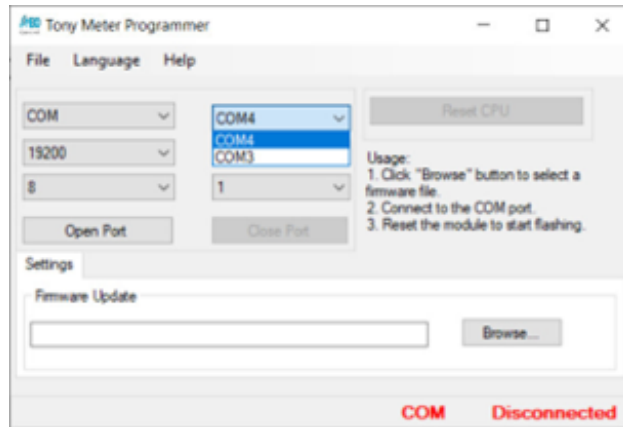
```
<time in ms>:<module>:<log level>:<message>
```

6.2.3 Firmware Update

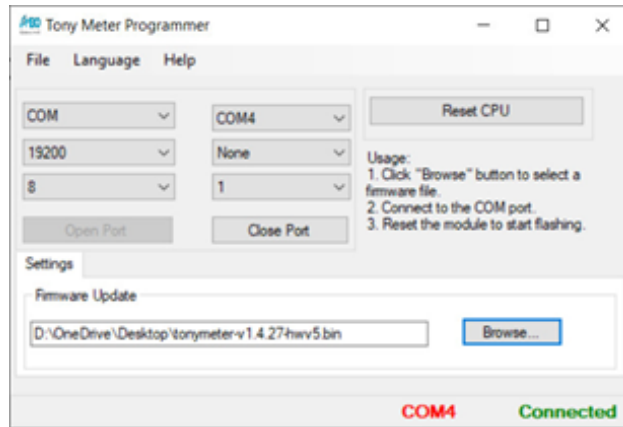
1. Download and extract Tonymeter-programmer.zip
2. Open TonyMeterProgrammer.exe file



3. Select a suitable COM port



4. Press "Browse..." to select a binary file
5. Press "Open Port" to connect to the COM port
6. Reset the module by re-apply power or press reset CPU to start updating



If the module cannot start even after turn off and turn on, please check the serial connection.

7 Revision History

Version	Date	Description
1	2023-11-20	First version.