AEW110 系列无线通讯转换器

AEW110 Series Wireless Communication Converter

安装使用说明书 V1.2

Installation and Use Manual V1.2

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1 概述 Overview

　　AEW110 系列无线通讯转换器主要用于辅助 RS485 设备进行无线组网，通过将通讯数据在 RS485 信号与无线信号之间互转，完成普通 RS485 设备的无线通讯。降低用户通讯组网的施工成本与改造时间，产品具有体积小、通讯稳定、传输距离远、安装方便等优点。可与 RS485 通讯设备灵活安装，实现局部通讯的无线组网。

　　AEW110 series wireless communication converter is mainly used to assist RS485 devices in wireless networking. It completes wireless communication between common RS485 devices by transforming communication data from RS485 signals to wireless signals and vice versa.It saves construction cost and renovation time for user's communication networking. The product boasts of advantages including compact size, stable communication, long distance transmission and easy installation. It can be flexibly installed together with RS485 communication devices to realize wireless network for local communication.

2 产品型号规格 Product model and specification
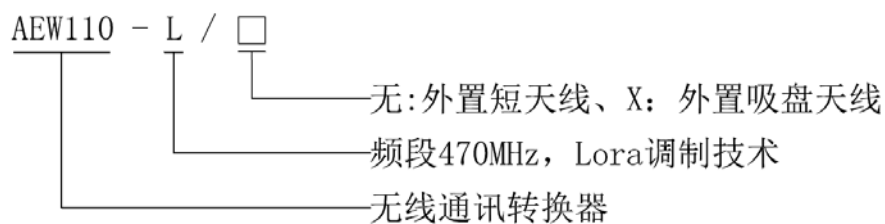
Without: external short antenna, X: external sucker antenna\
Frequency range 470MHz, Lora modulation technology
Wireless communication converter

注：外置吸盘天线标配线长 2 米。Note: external sucker antenna is provided with 2m long cable as standard.

3 技术参数 Technical parameters

技术参数	指标
辅助电源	AC 85～265V，DC100～350V
通信	红外通讯；波特率：1200bps
	RS485 接口通讯； 波特率：1200bps、2400bps、4800bps、9600bps、19200bps、38400 bps

	（可设）							
	无线通讯	传输速率(bps)	600	1200	2500	4500	7500	12000
		扩频因子（可设）	12	11	10	9（默认）	8	7
		工作频段	470MHz，分为 46 个频道可设（0～45，默认 5）					
		传输距离	空旷时最远传输距离：1kM					
安全性	工频耐压：电源、RS485 接口、天线端口两两之间 AC 2kV 1min							
	绝缘电阻：输入、输出端对壳体>100MΩ							
环境	工作温度：–25℃～+55℃；储存温度：–40℃～+70℃							
	相对湿度：5%～95% 不结露；海拔高度：≤2000m							

表 1 技术参数指标

Technical parameters	Indicators							
Auxiliary power	AC 85～265V，DC100～350V							
Communication	Infrared communication:Baud rate:1200bps							
	RS485 interface communication: baud rate:1200bps,2400bps, 4800bps,9600bps,19200bps,38400 bps (settable)							
	Wireless communication	Transmission rate (bps)	600	1200	2500	4500	7500	12000
		Spreading factor (settable)	12	11	10	9 (default)	8	7
		Working frequency range	470MHz, 46 channels settable (0～45,default 5)					
		Transmission distance	Max. transmission distance in open space:1kM					
Safety	High-voltage test at working frequency: AC 2kV 1min between any two of the power supply, RS485 interface and antenna port							
	Insulating resistor:Input,output terminal to housing>100MΩ							

Environme nt	Working temperature:-25℃～+55℃;Storage temperature:-40℃～+70℃
	Relative humidity:5%～95% non-condensing; Elevation:≤2000m

Table1 Technical Parameter Indicators

4 安装指南 Installation guide
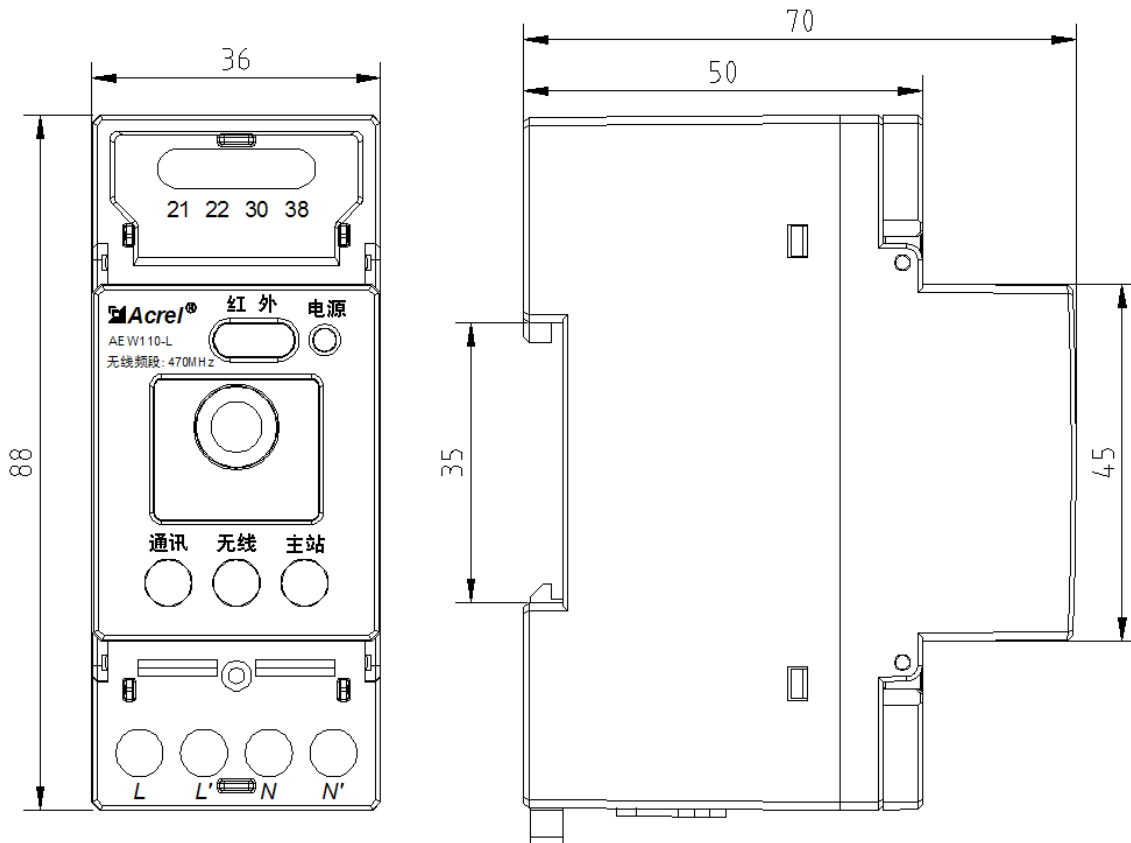
4.1 外形尺寸（单位：mm）Overall dimensions (unit: mm)

图 1 无线通讯转换器外形尺寸 Fig. 1 Overall dimensions of wireless communication converter
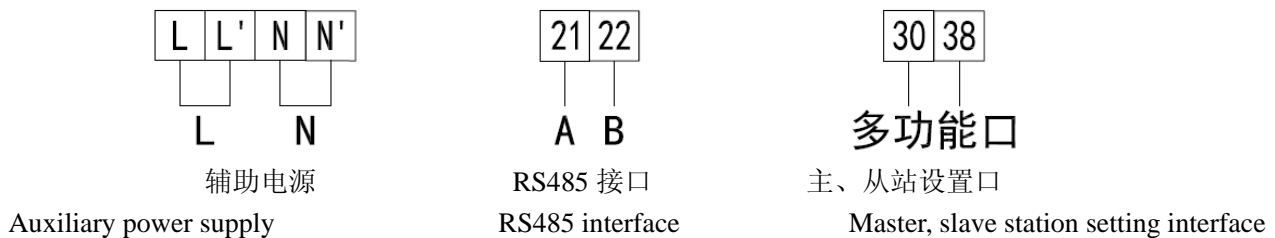
4.2 产品安装使用 Product installation and use

辅助电源	RS485 接口	主、从站设置口
Auxiliary power supply	RS485 interface	Master, slave station setting interface

图 2 无线通讯转换器接线端子说明

Fig.2 Illustration of wire terminals of wireless communication converter

多功能口说明：瞬间短接多功能口，即可切换 AEW110-L 主、从站工作模式，短接 5 秒以上通讯配置恢复出厂设置。

L 与 L'仪表内部短接，N 与 N'仪表内部短接，
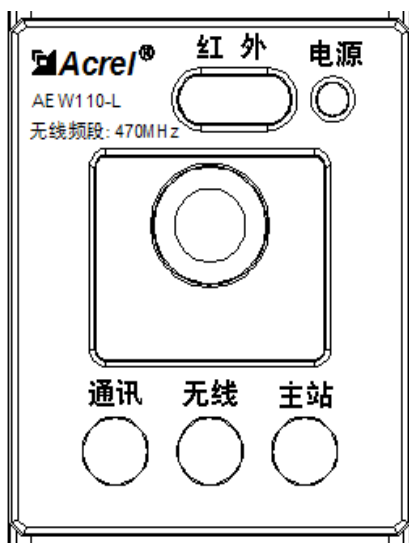**辅助电源接线时不能将 L 与 N 线同时接在 L、L'或 N、N'处，**
接错线导致仪表烧毁或人体触电危险。

Short circuit between L and L', short circuit between N and N' inside the instrument.
When connecting the auxiliary power supply, L and N wire shall not be connected to L and L' or N and N' simultaneously.
Wrong connection will cause instrument burnout or electric shock risks.

5 使用指南 Use guide

5.1 面板说明 Panel description

红外　　　Infrared
电源　　　Power
无线频段　Wireless freq.
通讯　　　Communication
无线　　　Wireless
主站　　　Master

指示灯	闪烁	亮	熄灭
电源灯	/	仪表正常工作	/
通讯灯	正确接收到无线数据并通过RS485 转发	/	/
无线灯	正确接收到无线数据	/	/
主站灯	/	作为"主站"功能使用	作为"从站"功能使用

Indicator light	Flash	On	Off
Power light	/	The instrument works normally	/

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Communication light	Wireless data properly received and forwarded via RS485	/	/
Wireless light	Wireless data properly received	/	/
Master station light	/	Used as Master Station	Used as Slave Station

图 3 无线通讯转换器面板说明 Fig. 3 Illustration of wireless communication converter panel

5.2 工作方式介绍 Operation method

AEW110-L 通过内部 RS485 接口与无线接口之间的数据转换实现辅助"主站"与"终端设备"无线组网的功能，数据为完全透传，因此可支持以 RS485 接口为硬件的各种通讯协议（如 Modbus 协议、DL/T645 电力规约等）。

AEW110-L realizes the function of assisting the wireless networking between the Master Station and Terminal Device via data conversion between the internal RS485 interface and wireless interface. Due to transparent transmission of data, it can support all comunication protocols with RS485 interface as hardware (such as Modbus protocol, DL/T645 multi-function watt-hour meter communication protocol).

AEW110-L 分为两种工作模式：主站模式与从站模式，可短接多功能口进行切换，也可由通讯进行设置，具体寄存器地址见 7 通讯说明，两种工作模式具体介绍如下。

AEW110-L has two operation modes: Master station mode and Slave station mode. The mode can be switched by short circuiting the multifunction interface or set via communication. See 7 Communication description for specific register address.The two operation modes are introduced below.

主站模式：

Master station mode:

一般用于通讯的主站端，"主站"灯亮。AEW110-L 优先等待 RS485 信号输入，接收到有效的 RS485 信号之后，会将其转成无线信号发出，在超时时间内，将接收到的有效无线信号转成 RS485 信号发出，完成数据处理流程。

Generally used for the Master station end of the communication and the "Master station" light is on. AEW110-L will give priority to waiting for RS485 signal input. After receiving effective RS485 signals, it will convert it into wireless signals for transmission. During the timeout period, it will send off the RS485 signals converted from received effective wireless signals and finish the data processing procedure.

从站模式：Slave station mode:

一般用于通讯的从站端，"主站"灯熄灭。AEW110-L 优先等待无线信号输入，接收到有效的无线信号之后，会将其转成 RS485 信号发至自身的串口上，然后等待回送，在超时时间内，将收到的有效 RS485 回送信号通过

无线转发出去，完成数据处理流程。

Generally used for the Master station end of the communication and the "Master station" light is off. AEW110-L will give priority to waiting for wireless signal input. After receiving effective wireless signals, it will convert them into RS485 signals and send them to its own serial port then wait for loopback. During the timeout period, it will forward received effective RS485 loopback signal via wireless communicaton and finish the data processing procedure.

由以上介绍可知，普通的 RS485 设备，若需无线组网，至少需要两台 AEW110-L，并且一台需为主站模式与通讯管理机或其他集抄设备连接，一台为从站模式与普通的 RS485 设备连接。若设备本身支持无线通讯（如 AEW100 无线计量模块），则只需要一台主站模式的 AEW110-L 与通讯管理机或其他集抄设备连接即可完成无线组网。

Judging from the above introduction, if a common RS485 device needs wireless networking, it takes at least two AEW110-L wireless communication converters. One needs to be in Master station mode and connected to a communication management machine or other concentrated meter reading instrument; the other must be in Slave station mode and connected to an ordinary RS485 device. If the equipment itself supports wireless communication (such as AWE100 wireless measuring module), it takes only one Master station mode AEW110-L connected to a communication management machine or other concentrated meter reading instrument to finish wireles networking.

AEW110-L 内置透传数据的超时时间为传输 250 字节所用时间（RS485 传输时间加无线传输时间），因此在使用 AEW110-L 轮询终端设备时，要注意轮询的间隔时间需大于内置超时时间，超时时间可由当前 RS485 接口波特率与扩频因子对应无线传输速率算出，如 AEW110-L 为出厂默认参数时：

The timeout period for AEW110-L's built-in data transmission is the time used for transmission of 250 bytes (RS485 transmission time plus wireless transmission time). Therefore, when using AEW110-L polling the terminal equipment, it must be noted that the interval of polling must exceed the built-in timeout period. The timeout period can be calculated based on the baud rate and spreading factor of current RS485 interface in relation to wireless transmission rate. For example, when AEW110-L uses default parameters:

RS485 接口波特率为 9600bps：传输 250 字节时间约为 $T1 = 250ms$。

The baud rate of RS485 interface is 9600bps: the approximate time for transmission of 250 bytes $T1 = 250ms$.

无线传输速率为 4500bps：传输 250 字节时间约为 $T2 = 540ms$。

Wireless transmission rate is 4500bps: the approximate time for transmission of 250 bytes $T2 = 540ms$.

因此内置超时时间应为 $T = T1 + T2 = 250ms + 540ms = 790ms$。

So the built-in timeout period $T = T1 + T2 = 250ms + 540ms = 790ms$.

由此可知，在使用默认参数轮询"终端设备"时，轮询的间隔时间应大于 790ms，若使用其他参数，均应按照此法算出内置超时时间，并且使轮询间隔时间大于内置超时时间。

We can see from above when polling the "terminal equipment" with default parameters, the interval of polling should exceed 790ms. If other parameters are used, the same method shallbe used to calculate the built-in timeout period. And the polling interval must be more than the built-in timeout period.

注意：一组 AEW110-L 通讯时，需要扩频因数与频道均相同才可正常通讯。在无线通讯距离内，从站接入数量由主站的特性（如个别通讯管理机单个串口接入设备的数量有限制）与通讯协议的规定决定（如 Modbus 协议要求从站的通讯地址小于 255），但基于稳定性与数据实时性的考虑，推荐从站少于 30 个。

Note: during communcation between a group of AEW110-Ls, their spreading factors and channels must be identical to begin normal communication. Within the wireless communication distance, the number of Slave station depends on

the characteristics of the Master station (for example, individual communication management machine has limit on the number of equipment connection to single serial interface) and the provisions of communication protocols (for example, Modbus protocol requires the communication address of the Slave station is less than 255). However, considering stability and real time data, it is recommended to have no more than 30 Slave stations.

6 通讯说明 Communication description

6.1 通信协议 Communication protocol

AEW110-L 无线通讯转换器采用 MODBUS-RTU 协议。具体协议格式请参照相关协议标准，此处不再赘述。使用 Modbus 协议进行通讯时，读数据命令功能码为 03H，写数据命令功能码为 10H。

具体寄存器地址表如下：

AEW110-L Wireless communication converter adopts MODBUS-RTU protocol. Refer to relevant protocol standard for specific protocol format. When using Modbus for communication, the function code for reading data instruction is 03H and the function code for writing data instruction is 10H.

起始地址	数据项名称	长度(字节)	读/写	备注
9000H	通信地址	2	R/W	1～247
9001H	波特率	2	R/W	1：1200bps 2：2400bps 3：4800bps 4：9600bps（默认） 5：19200bps 6：38400bps
9002H	扩频因数	2	R/W	7~12 （默认为 9）
9003H	频道	2	R/W	0~45 （默认为 5）
9004H	工作模式	2	R/W	0：主站模式（默认） 1：从站模式
9005H	校验方式	2	R/W	0：无校验（默认） 1：偶校验 2：奇校验
9006H	停止位	2	R/W	0：1 位（默认） 1：2 位 2：1.5 位

Beginning address	Data item name	Length (byte)	R/W	Remarks

9000H	Communication address	2	R/W	1～247
9001H	Baud rate	2	R/W	1：1200bps 2：2400bps 3：4800bps 4：9600bps (default) 5：19200bps 6：38400bps
9002H	Spreading factor	2	R/W	7~12 (default is 9)
9003H	Channel	2	R/W	0~45 (default is 5)
9004H	Operation mode	2	R/W	0: Master station mode(default) 1：Slave station mode
9005H	Check manner	2	R/W	0：No parity check (default) 1：Even check 2：Odd check
9006H	Stop bit	2	R/W	0：1 bit (default) 1：2 bit 2：1.5 bit

7 常见故障排查 Common troubleshooting

7.1 仪表无线通讯故障。Wireless communication failure of instrumentation

排查建议：请先使用 USB 转 485 串口线与仪表 RS485 接口相连，通过通讯读取表内参数，确认表内参数与另一端设备（AEW110 为主站模式时，指下端从站；为从站模式时，指上端主站）无线配置是否相同（频道与扩频因数），若不同，请修改仪表无线参数与主站一致后再重新测试；若相同，则有可能是仪表与另一端设备相距太远或现场干扰严重，此时可尝试使用外置吸盘天线，或者考虑就近新增设备，再行测试。

Throubleshooting tips: first connnect the USB to 485 serial port cable to RS485 interface of the instrument. Read the instrument parameters via communication. Confirm if the parameters in the instrument are are idential to the wireless configuration (channels and spreading factors) of the insttrument on the other end (when AEW110 is in Master mode, it refers to the lower end of Slave station; when it is in Slave mode, it refers to the upper end of Master station). If not identical, it is likely that the instrument is too far away from the device on the other end or severe on-iste interference. In this case, try the external sucker antenna or consider addition of device locally then make a test.

7.2 修改过仪表的 RS485 通讯参数，但是忘记具体设置导致无法正常通讯。You have changed the RS485

communication parameters of the instrument but forgotten the specific setting leading to failure of normal communication.

排查建议：可使用一根短接线，短接仪表的多功能口（30、38 端口）5 秒，待仪表所有灯都亮起时，断开短接线，此时仪表复位，所有参数初始化（注意：无线通讯相关的频道与扩频因数也会变为默认值），此时可使用默认的通讯参数与仪表通讯（具体参数见 6.1 仪表的通讯寄存器地址表）。

Troubleshooting tips: a short circuit wire can be used to short circuit the multifunction interface (30, 38 port) of the instrument for 5 seconds. When all lights of the instrument are lit up, disconnect the short circuit wire. At this time, the instrument is reset and all parameters are initialized (Note: channels and spreading factor related to the wireless communication will also become default value). At this time, default communication parameters can be used for communication with instrument (see 6.1 List of communication register address of the instrument for specific parameters).