

Programmable LoRaWAN Cellular Gateway Your Smart Link to Reliable IoT Connectivity

WR322GR-EC-LTE-LORAWAN
WR312GR-EC-LORAWAN

Industrial Programmable LoRaWAN LTE / Ethernet Gateway

The WR322GR-EC-LoRaWAN is a powerful and flexible gateway engineered for LoRaWAN communication, with support for both cellular and Ethernet connections. It provides long-range wireless connectivity to multiple LoRaWAN end-node devices, converting LoRaWAN data into MQTT and transmitting it to the cloud via LTE or Ethernet WAN. Featuring integrated Node-RED flow-based programming and a quick wizard installation, this gateway simplifies IoT deployment. Paired with the LR140/LR144 LoRaWAN controllers, the ThingsMasterOTA Cloud platform, and various environmental sensors, WoMaster delivers a complete IoT Environment Monitoring solution.



Features & Benefits

Programmable Edge Computer and Gateway

- Dual core processor 880MHz processor, 512MBytes RAM
- 2x10/100/1000 Mbps Ethernet ports
- Pre-Installed 8GB SD for storage
- Linux OpenWRT 23.05
- Chirp stack, Node-RED

High speed 4G LTE

- LTE Cat.4, 2x2 MIMO, 150M downlink and 50M uplink
- LTE Cat.6 with 2CA, 2T2R MIMO provides 300M downlink and 50M uplink
- 4G/3G/2G full cellular network compatibility
- Dual SIM for Service Provider Redundancy
- Support GPS for location services*

Serial Communication & High Throughput Data Switching

- Dual serial ports with RS232/422/485 full functions for serial over LTE/ Ethernet data switching
- 2-port Gigabit Ethernet supports routing and bridging mode

Cloud Management Service

- ThingsMasterOTA cloud or other public/private cloud by request

LoRaWAN Gateway /Network Server

- Built-in LoRaWAN™ Server, 1.0.2 protocol
- 8x8 channels LoRa Packet detectors, 8 x SF5~SF12 demodulators, or 8 x SF5~SF10 demodulators (SX1303)
- one 125/250/500Khz LoRa demodulator, one (G)FSK demodulator
- MQTT v3.1 Bridging with TLS encryption, Support up to 100 LoRaWAN™ End-node devices*

Quick Wizard to join End-Device

- OTAA, ABP dual mode
- Easy to modify End-Node profile
- End-Node Device Batch Import/ Export in CSV

Programming Environment

- GCC C/C++ cross development tool chain
- Ash, bash* System Shell
- vim, nano* text editor
- Lua, Perl*, Python* programming language

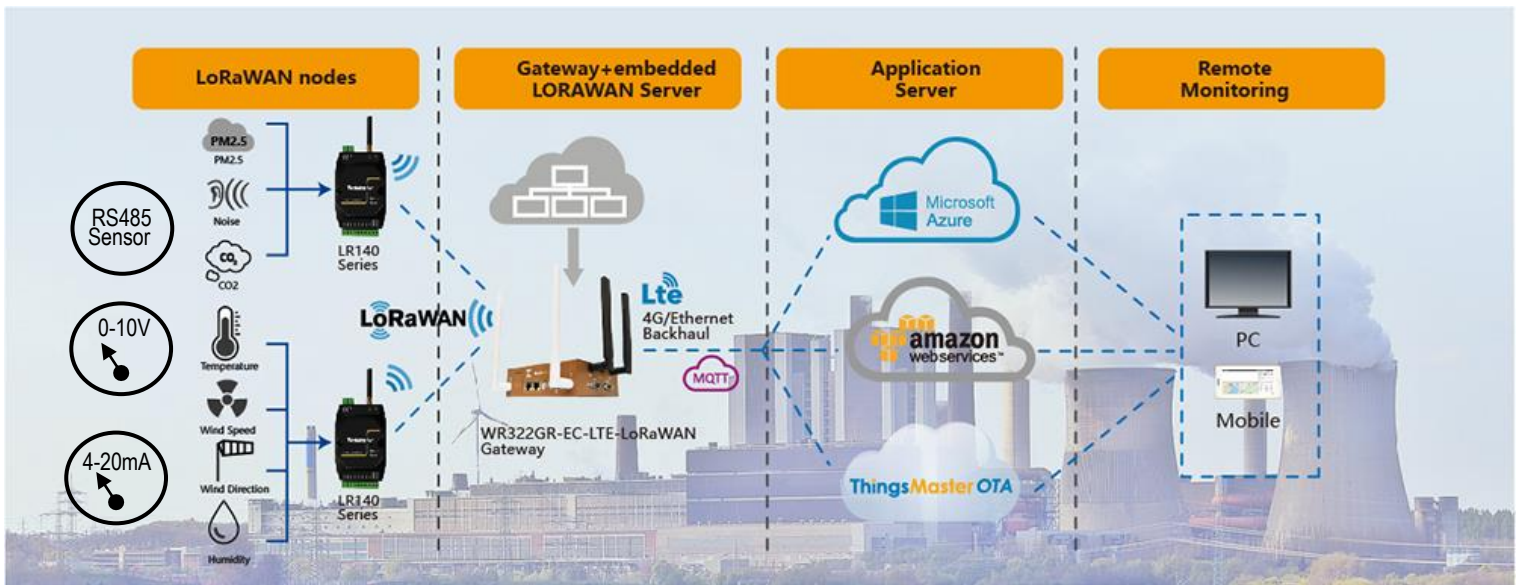
Internet Security Suite and Cryptographic

- Netfilter suite for firewall
- Iptables suite for NAT/NAPT and port forwarding
- OpenVPN, IPsec for secure remote connection
- HTTPs/SSH for secure login
- AES, SHA, OpenSSL, random generator

Rugged Design for Wayside Surveillance, ITS Application

- Design for Industrial IoT, ITS applications
- Effective heat dissipation design for operating in
- -40~75°C operating environments
- CE Marking
- IEC61000-6-2/IEC61000-6-4 heavy industrial EMC compliance

✓ LR140/LR144 collects Analog and RS485 Data to LoRaWAN Gateway



✓ Quick Wizard Setup to join LoRa Network

The screenshot shows the Womaster web interface with several steps for setting up a LoRaWAN Gateway and adding devices:

- LoRa Region and Radio Group Setting:** The 'LoRaWAN Gateway' page shows settings for Region Band (CN470), Band Frequency (470000000-510000000), and LoRaWAN Radio Group ID (000000).
- LoRa Network Server Tunnel Setting:** The 'Packet Forwarder' page shows settings for UpStream Port (1700), DownStream Port (1700), and Keepalive Interval (10).
- Check Gateway Status:** A table shows the status of the gateway:

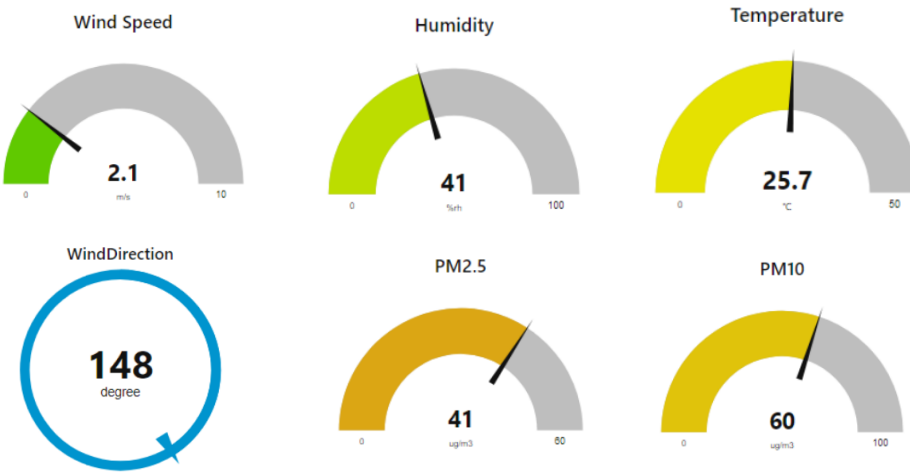
Gateway ID	Gateway Name	GPS coordinates	Altitude(m)	Radio Status	Last Seen At
aa55e90000000000	WR322-EC-LoRaWAN-default	0.0	0	Active	2024/07/26, 10:30:41 AM
- Create Application:** The 'Application List' table shows an application named 'sw1' with 2 endnode devices. A 'Create Application' dialog box is shown with fields for Application Name and Application Description.
- Add Device:** The 'Add new End-Node Device...' dialog box shows fields for Device Name, Device Description, Device Profile (Default-ABP), Device EUI, Application Name (sw1), Application Key, Device Addr, Network Session Key, and Application Session Key.
- End-Node Profile:** The 'End-Node Profile' page shows a table of end-node devices:

Device Name	Device Description	Device EUI	Device-Profile	Application Name	Last Seen At
LR140-CN470	LR140-CN470	81d671e62d7ae3d9	Default-OTAA	sw1	2024/07/26, 5:01:28 AM
LR140-US915	LR140-US915	0611020e71487998	Default-OTAA	sw1	null

✓ Node-RED – Flow Based Programming and Processing

The screenshot shows the Node-RED interface within the WoMaster web application. The top navigation bar includes 'WoMaster', 'Status', 'System', 'Services', 'Network', 'LoRaWAN', 'VPN', 'Node-red', and 'Log out'. The main workspace displays a flow titled 'LoraDownlink Parse'. The flow starts with a 'receive publish cmd' node, which branches into several MQTT decoder nodes: 'MQTTDecoderCurVolPWMToHex', 'MQTTDecoderRTUToHex', 'MQTTDecoderIntervalToHex', 'MQTTDecoderRTUWriteCMDToHex', and 'MQTTDecoderRTUReadCMDToHex'. These nodes feed into a 'CheckErrorCode' node, which then connects to 'msg payload' nodes. The flow continues through 'downlinkpub' and 'HexToBase64' nodes, finally connecting to a 'local LoraWan Interface' node. A sidebar on the left lists various nodes under 'common' and 'function' categories. A right sidebar shows the 'LoraDownlink Parse' flow details and a message: 'Your flow configuration nodes are listed in the sidebar panel. It can be accessed from the menu or with ctrl-g c'.

✓ Dashboard and Parsing



```

1 //ES106 data parsing
2 var data = msg.payload;
3 var dir = data["Dir"];
4 var speed = data["Speed"];
5 var hum = data["Hum"];
6 var tem = data["Tem"];
7 var pm25 = data["PM2.5"];
8 var pm10 = data["PM10"];
9 var relay = data["relaystate"];
10 if (relay == 1 || relay == 0)
11 {
12     //control relay opening
13     "echo 1 > /sys/class/gpio/gpio491/value";
14 }
15 else
16 {
17     msg.payload = speed / 10;
18     return msg;
19 }

```

JavaScript Code

✓ Pre-installed Environment Sensor, JavaScript sample code

This screenshot shows the 'Import nodes' dialog in Node-RED. The 'Clipboard' tab is active, showing a list of pre-installed nodes under the 'Local' category. The list includes various sensor nodes such as 'ES101-AT Sensor.json', 'ES101-CO-2000 Sensor.json', 'ES101-CO2-5000 Sensor.json', 'ES101-LL Sensor.json', 'ES101-NL Sensor.json', 'ES101-PM Sensor.json', 'ES101-RG Sensor.json', 'ES101-SEC Sensor.json', 'ES101-SM Sensor.json', 'ES101-SR Sensor.json', and 'ES101-WD Sensor.json'. The 'Import to' dropdown is set to 'current flow'. 'Cancel' and 'Import' buttons are visible at the bottom.

This screenshot shows the 'Import nodes' dialog in Node-RED. The 'Clipboard' tab is active, showing a list of pre-installed nodes under the 'Local' category. The list includes various sensor nodes such as 'ES101-WS Sensor.json', 'ES102-TH Sensor.json', 'ES105-PM Sensor.json', 'ES105M-CH4-H2S Sensor.json', 'ES105M-NO2-H2S Sensor.json', 'ES105M-O3-CO-NO2.json', 'ES105M-TVOC-CH4-H2 Sensor.json', 'ES105M-TVOC-SO2-NO2 Sensor.json', 'ES106.json', 'ES107-CO2 Sensor.json', 'lorawan_downlink_parse.json', and 'lorawan_uplink_parse.json'. The 'Import to' dropdown is set to 'current flow'. 'Cancel' and 'Import' buttons are visible at the bottom.



Interfaces

	WR322GR-EC-LTE-LORAWAN	WR312GR-EC-LORAWAN
Ant 1		LoRa
Ant 2	LoRa	--
Ant 3	LTE-Main	--
Ant 4	--	--
Ant 5	LTE-Diversity	--

System LED

- 1 x Power
- 1 x System Status
- 1 x DO
- 2 x Ethernet Port
- 2 x Serial Port
- 6 x Radio LED (Ra~Rf)

Internal MicroSD

- 8GB On-Board

SIM Card

- WR322GR-EC-LTE-LORAWAN
- 2 x SIM Sockets

USB Extension Port

- External Storage

DIN Clip

Gigabit Ethernet

- 2 ports 10/100/1000M RJ45
- WAN + LAN configurable

Integrated Power Connector

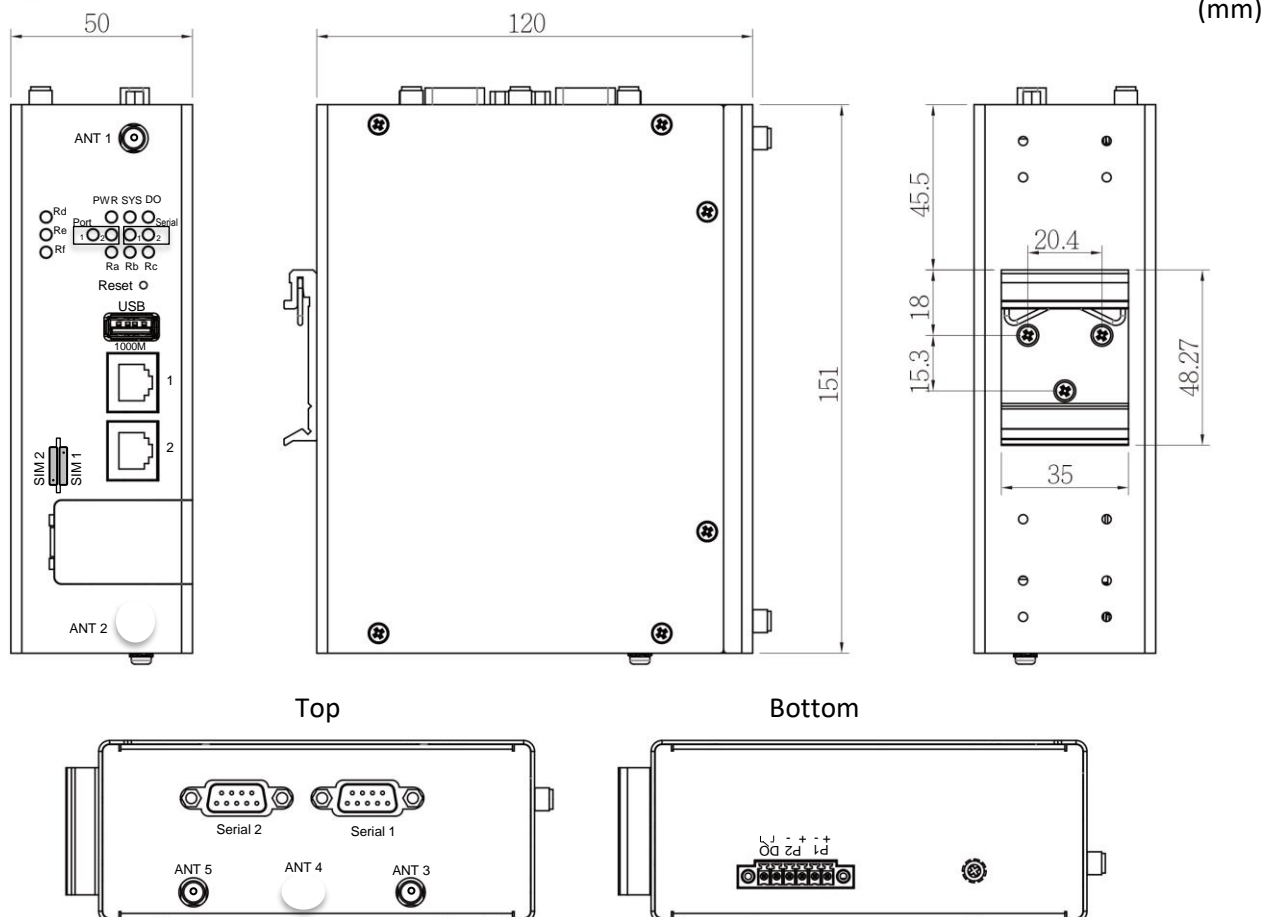
- 1 x 6-pin terminal block
- 4 pin for redundant power
- 2 pin DO (Dry Relay)

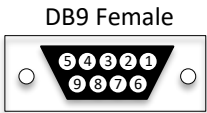
Serial Communication

- RS232/422/485 Full functions
- DB9 female



Dimensions



Interface																																									
CPU	800Mhz Dual Core																																								
OS (preinstalled)	Linux (OpenWRT LEDE, Kernel 5.15)																																								
USB	USB 2.0 hosts x 1, Type A connector																																								
DRAM	DDR3 512MB																																								
Main Storage	8GB Micro SD on-board pre-installed																																								
Storage Expansion	Micro SD expansion to 16GB/32GB/64GB																																								
Ethernet Port	2 x 10/100/1000MBase-T RJ45, Auto-Negotiation, Auto-MDI/MDIX																																								
System LED	1 x PWR: Green On 2 x Ethernet Ports: Link: Green On, Activity: Green Blinking Programmable: 1x SYS, 2 x Serial Ports (s1, s2), 1 x DO: Red On Programmable: Ra(LoRa Ready –on / Active-Blinking), Rb, Rc, Rd, Re (Reserved for programming) Rf: Base station connected: Green On for 2 sec period, Base station disconnected: Green Off for 2 sec period																																								
Reset	1 x Reset button (Programmable)																																								
SMA Socket	Up to 3 x RP-SMA Female LTE 2T2R: ANT3 for LTE Main, ANT5 for LTE AUX (diversity) LoRa: ANT1 GPS: ANT4 (Reserved)																																								
SIM Socket	2 x Nano SIM with redundancy																																								
Serial	Up to 2 x RS232/422/485, DB9  <table border="1" data-bbox="922 846 1401 1160"> <thead> <tr> <th>Pin</th> <th>RS232</th> <th>RS485-4w/422</th> <th>RS485-2w</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>DCD</td> <td>TX-</td> <td>Data-</td> </tr> <tr> <td>2</td> <td>TXD</td> <td>RX+</td> <td>-</td> </tr> <tr> <td>3</td> <td>RXD</td> <td>TX+</td> <td>Data+</td> </tr> <tr> <td>4</td> <td>DSR</td> <td>-</td> <td>-</td> </tr> <tr> <td>5</td> <td>GND</td> <td>GND</td> <td>GND</td> </tr> <tr> <td>6</td> <td>DTR</td> <td>RX-</td> <td>-</td> </tr> <tr> <td>7</td> <td>CTS</td> <td>-</td> <td>-</td> </tr> <tr> <td>8</td> <td>RTS</td> <td>-</td> <td>-</td> </tr> <tr> <td>9</td> <td>RI</td> <td>-</td> <td>-</td> </tr> </tbody> </table>	Pin	RS232	RS485-4w/422	RS485-2w	1	DCD	TX-	Data-	2	TXD	RX+	-	3	RXD	TX+	Data+	4	DSR	-	-	5	GND	GND	GND	6	DTR	RX-	-	7	CTS	-	-	8	RTS	-	-	9	RI	-	-
Pin	RS232	RS485-4w/422	RS485-2w																																						
1	DCD	TX-	Data-																																						
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3	RXD	TX+	Data+																																						
4	DSR	-	-																																						
5	GND	GND	GND																																						
6	DTR	RX-	-																																						
7	CTS	-	-																																						
8	RTS	-	-																																						
9	RI	-	-																																						
Power Input, Digital Output	6-Pin Removable Terminal Block Connector 4 Pin for Redundant Power 2 Pin for DO (Relay Alarm) DO: Dry Relay Output , Maximum 1A, 24Vdc																																								

Software	
OS	Linux OpenWRT
Web Server	uHttpd, luCI Web Interface, Apache*
Terminal Server (SSH)	Secure encrypted communications between two untrusted hosts over an insecure network
Kernel	GNU/Linux kernel v5.15
System Shell	ASH (default), BASH*
Text Editor	vim, nano*
File System	Ext4, VFAT, OverlayFS, NTFS
Linux Board Support Packages (BSP)	GCC C/C++ cross development tool chain Kernel/ filesystem
Internet Protocol Suite	TCP, UDP, IPv4, IPv6, ICMP, ARP, HTTP,DHCP, NTP, SSH, PPP, SFTP,SSL, SCP
Programming Language Support	Lua, Perl*, Python*
Flow-based programming	Node-RED (Modbus RTU, Modbus TCP and Serial contribution package included)
Internet Security Suite	OpenVPN, IPSec, Netfilter/iptables
Network Control Protocol	DHCP server, NAT/PAT, VLAN, QoS, NTP client/server, IGMP, PPP, PPPoE, SSL, port forwarding, Ethernet bridging
Network Security	HTTPS, SSH, VPN tunnels, SFTP, DMZ, firewall (IP filtering, MAC address filtering, inbound/outbound port filtering)
Cryptographic	AES, SHA, OpenSSL, random generator
Cellular Networking	QMI (Qualcomm MSM Interface): Glib-based library for talking to WWAN modems and devices that speak the Qualcomm MSM Interface (QMI) protocol
LoRa WAN	Build Chirp-Stack LoRa WAN Server support OTAA, ABP network join function and Node-RED function

Cellular Properties		WR322GR-EC-LTE-LORAWAN
Band Information: LTE-EUX (Europe)	LTE: FDD B1/B3/B7/B8/B20/B28A LTE: TDD B38/B40/B41 WCDMA: FDD B1/B8, GSM: B3/B8	
Band Information: LTE-AUX (South America)	LTE: FDD B1/B2*/B3/B4/B5/B7/B8/B28 LTE: TDD B40 WCDMA: FDD B1/B2/B4/B5/B8, GSM: B2/B3/B5/B8	
Band Information: LTE-G (Global)	LTE: FDD B1/B2/B3/B4/B5/B7/B8/B12/B13/B18/B19/B20/B25/B26/B28 LTE: TDD B38/B39/B40/B41 WCDMA: FDD B1/B2/B4/B5/B6/B8/B19, GSM: B2/B3/B5/B8	
GPS Properties*		WR322GR-EC-LTE-LORAWAN
GNSS	GPS/GLONASS/BeiDou/Galileo	
Performance	Cold start: 18s, Warm start: 2.2s, Hot start: 1.8s	
Sensitivity	Cold start: -146dBm, Reacquisition: -157dBm, Tracking: -157dBm	
Accuracy	<1.5M	
GNSS Frequency	GPS/Galileo: 1575.42±1.023 MHz GLONASS: 1597.5~1605.8 MHz BeiDou: 1561.098±2.046 MHz	
Antenna (Optional Accessory-A-GPS-27-RSM-3M)	Frequency range: 1561~1615MHz Polarization: RHCP or linear VSWR: <2 (Typ.) Passive antenna gain: >0dBi	
LoRa WAN Radio		
Semtech Radio	8x8 channels LoRa Packet detectors, 8 x SF5~SF12 demodulators or 8 x SF5~SF10 demodulators (SX1303)	
Version	LoRaWAN 1.0.2 default	
RF Band	EU868 (863~870MHz), US915 (902~928MHz), AS923 (915~925), AU915 (915~928Mhz),KR920, EU433 (433~434.6Mhz), CN470 (Other countries channel by request*)	
Max. TX Output	Maximum 27dBm	
RX Sensitivity	SF12: -139dBm, BW 125KHz	
Range	Urban: 2-4KM, Suburb/ Open Area: 5~10KM (By environment & signal lost rate)	
Antenna		
LTE Default Antenna	Frequency: 704~960/1710~2690 MHz	
	Gain: 2 dBi	
	Dimension: 161xΦ13 mm	
LoRa Antenna	Default in-door Rod-Type Antenna, Gain: 5dBi (Max)@900Mhz	
Power Requirement		
Input Voltage	24V (12~48VDC)	
Reverse Polarity Protect	Yes	
Input Current	0.36A@24V	
Power Consumption	Max 8W@24VDC full traffic, suggest to reserve 15% tolerance	
Mechanical		
Installation	DIN Rail	
Enclosure Material	Steel Metal	
Dimension	50 x 151 x 120 mm(W x H x D) / without DIN Rail Clip	
Ingress Protection	IP30	
Weight	~660g without package	
Environmental		
Operating Temperature & Humidity	-40°C~75°C , 5%~95% Non- Condensing	
Storage Temperature	-40°C~85°C	
MTBF	>200,000 hours at 25°C full cycle	
Warranty	3 years	

Approval	
Safety	EN 60950-1 Compliance EN 62368-1:2014/AC:2017 Compliance IEC 60255-27:2013 Compliance
EMC	EN61000-6-2/EN61000-6-4 Compliance
EMI	CISPR 22, FCC part 15B Class A Compliance
EMS	EN61000-4-2 ESD, EN61000-4-3 RS, EN61000-4-4 EFT, EN61000-4-5, EN61000-4-6 CS, EN61000-4-8 Magnetic Field EN61000-4-12/16/17/18/29
Radio	RED Compliance Safety: EN 62368-1 EN 50385/EN62311 MPE assessment EN 301 489-1/17/19/52, EN 55032/55024 EN 300 328/EN 301 893 EN 301 908-1 FCC Part 15B
Environmental	EN 60870-2-2:1998 Compliance IEC 60068-2-21:2006 Compliance



Ordering Information

Model Name	Description
WR322GR-EC-LTE-LORAWAN-EU868	Industrial LoRaWAN Gateway, 2GbE+2COM, LTE 2SIM, FDD B1/3/7/8/20/28A, LoRaWAN 868MHz
WR322GR-EC-LTE-LORAWAN-EU433	Industrial LoRaWAN Gateway, 2GbE+2COM, LTE 2SIM, FDD B1/3/7/8/20/28A, LoRaWAN 433MHz
WR322GR-EC-LTE-LORAWAN-US915	Industrial LoRaWAN Gateway, 2GbE+2COM, LTE 2SIM, B1-5/7/8/12/13/18-20/25/26/28, TDD B38/39/40/41, LoRaWAN 915MHz
WR322GR-EC-LTE-LORAWAN-AS923	Industrial LoRaWAN Gateway, 2GbE+2COM, LTE 2SIM, B1-5/7/8/12/13/18-20/25/26/28, TDD B38/39/40/41, LoRaWAN 923MHz
WR322GR-EC-LTE-LORAWAN-CN470	Industrial LoRaWAN Gateway, 2GbE+2COM, LTE 2SIM, FDD B1/B3/B5/B8, TDD B38/39/40/41, LoRaWAN 470MHz
WR312GR-EC-LORAWAN-EU868	Industrial LoRaWAN Gateway, 2GbE+2COM, LoRaWAN 868MHz
WR312GR-EC-LORAWAN-EU433	Industrial LoRaWAN Gateway, 2GbE+2COM, LoRaWAN 433MHz
WR312GR-EC-LORAWAN-US915	Industrial LoRaWAN Gateway, 2GbE+2COM, LoRaWAN 915MHz
WR312GR-EC-LORAWAN-AS923	Industrial LoRaWAN Gateway, 2GbE+2COM, LoRaWAN 923MHz
WR312GR-EC-LORAWAN-CN470	Industrial LoRaWAN Gateway, 2GbE+2COM, LoRaWAN 470MHz
	Package List
	1 x Product Unit
	1 x 6-pin Removable Terminal Connector
	1 x Quick Installation Guide
	1 x Attached Din Clip
	Default In-door Antennas: WR322GR: 2x LTE Antennas, Black; 1 x Rod type Antenna for LoRa, Black color WR312GR: 1 Rod-type Antenna for LoRa, Black color

Optional Accessories	
MDR-40-24	Din Rail Power Supply, INPUT:85-264VAC, 120-370VDC, OUTPUT: 24VDC/1.7A, -20 ~ +70°C
A-LORA868-7dBi-SM-3M	Out-Door LoRa Antenna, Magnetic Sucker, SMA Male, 850-925MHZ, 7dBi, RG174 Cable, 3M Length, -40°C~65°C
A-LORA433-7dBi-SM-3M	Out-Door LoRa Antenna, Magnetic Sucker, SMA Male, 433MHZ, 7dBi, RG174 Cable, 3M Length, -40°C~65°C