



GQ1016
Ethernet to Multi-E1 converter

User Handbook

V1.20

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Guangzhou Optical Bridge Communications Equipment Co. Ltd.

Document revision history

Revision	Date	Description
V1.0	July, 26 th , 2007	Preliminary release
V1.10	Sept., 6 th , 2007	1) Add Ethernet frame length description 2) Add Table6-6 Ethernet parameters 3) Modify GID and VCAT_ERR alarm description
V1.20	Nov. 22 th , 2007	1) The GQ1016 series product type are modified; 2) The main feature are modified; 3) Instruction of GFP_LOF, ETH_ERR, EX_LOOP, MASK/RELEASE, notes of DISPLAY SELECT are modified.

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1. System Brief

1.1 General Description

GQ1016 is the IP over TDM converter, which supports the conversion from MAC frames to 1 - 16 E1 lines. The maximum bit rate is 31.68Mbps (16E1 lines). With different LAN card, E1 card and power card, it can meet various requirements. It not only provides alarms and statuses of the E1 line and Ethernet interface together with advanced management functions, such as, throughput statistic of the Ethernet, but also supports the Unification Network Management via SNMP and CLI commands.

Adopting international standard protocol, GQ1016 can communicate with the similar product of other manufacturers.

GQ1016 series product type:

The type consist of 6 digits, see the figure below.

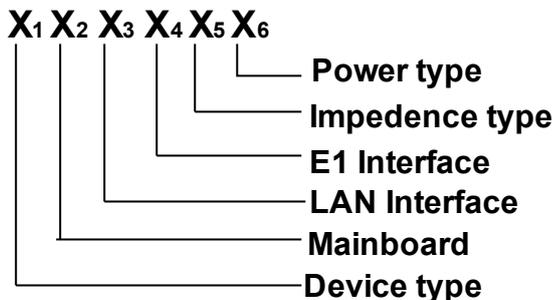


Table 1-1-1 LAN, E1, Impedance, E1 amount, power type description

X ₁	Device type	X ₂	Mainboard
1	GQ1004: standard Ethernet to 4-E1 converter. The mainboard is EOP4	1	EOP4: the mainboard of GQ1004, 4E1
2	GQ1008: standard Ethernet to 8-E1 converter. The mainboard is EOP8	2	EOP8: the mainboard of GQ1008, 4E1
3	GQ1016: standard Ethernet to 16-E1 converter. The mainboard is EOP16	3	EOP16: the mainboard of GQ1016, 16E1
X ₃	LAN interface	X ₄	E1 interface
1	4 electrical Ethernet ports	1	4 E1 are provided
2	3 electrical Ethernet ports, 1 optical Ethernet port(FC connector, dual fiber, 1310)	2	8 E1 are provided
3	3 electrical Ethernet ports, 1 optical Ethernet port(SC connector, dual fiber, 1310)	3	16 E1 are provided
4	3 electrical Ethernet ports, 1 optical Ethernet port(single fiber, 1550)		
5	3 electrical Ethernet ports, 1 optical		

	Ethernet port(single fiber,1310)		
6	3 electrical Ethernet ports, 1 optical Ethernet port(long-distance, dual fiber, 1310)		
7	3 electrical Ethernet ports,1 optical Ethernet port(long-distance, single fiber, 1550)		
8	3 electrical Ethernet ports,1 optical Ethernet port(long-distance, single fiber, 1310)		
X5	Impedance type	X6	Power type
1	75ohm,coaxial connector	1	-48V DC
2	75ohm, DB37 connector, 4E1	2	220V AC
3	75ohm, DB37 connector, 8E1	3	-48 DC & 220V AC
4	120ohm, RJ45 connector		
5	120ohm, DB37 connector		

User can customize the device type during ordering. For example, type **332313** means the assemblage is: Ethernet to 16-E1 converter, 3 electrical Ethernet ports, 1 optical Ethernet port(SC connector, dual fiber,1310), 16E1, 75ohms(coaxial connector), -48V DC & 220V AC.

1.2 Main Features

- E1 interface
 - Supports automatic removal and recovery of E1 channels that used for carrying payload. The E1 channels that have urgent alarm, such as LOS and LOF, or the Bit Error Rate (BER) exceeds 1E-6, are removed automatically, and during this period, some Ethernet packets may be lost; It will be resumed when the fault dismisses
 - The differential delay between any two of the 16 E1 can be up to 220ms; when the factual differential delay exceeds 220ms, alarm is generated and Ethernet is cut off
 - Jitter tolerance and jitter transfer characteristic compliant to ITU-T G.823
- Ethernet interface
 - Provides up to 4 shared Ethernet interfaces
 - 1024 MAC address table and 5-minute aging time
 - Accepts frames with length between 64 and 1916 bytes (otherwise filtering)

- VLAN function based on tags compliant to IEE 802.1Q
- Throughout statistic of the Ethernet packets based on port, such as error packets
- Configurable pause flow control
- Optional optical Ethernet interface compliant to IEEE 100BASE-FX standard(can communicate with remote optical transceiver) and electrical Ethernet interface compliant to IEEE 802.3 standard
- Management interface
 - CLI command via serial RS232 port and telnet
 - GQ1016 network management platform based on SNMP(V1 and V2C)
- Timing mode
 - Optional local timing mode and tracing E1 line
 - The source of tracing E1 line can be switched according to the signal quality. For instance, the system is set as tracing the first E1 link, when some malfunction occurs to it (i.e., urgent alarm LOS/AIS/LOF/LOMF or the signal is looped back), the system will automatically change to tracing the second E1 link; when the fault disappear, the system will be re-tracing the first E1 link.
- Compliant to ITU-T standards
 - GFP-F encapsulation recommendation G.7041
 - Virtual concatenation(VCAT) and Link Capacity Adjustment Scheme (LCAS) recommendation G.7042
 - Ethernet to nxE1 mapping recommendation G.7043
 - Ethernet to single E1 mapping recommendation G.8040
- Bandwidth is increased without damaging the Ethernet data, and can be decreased hitlessly through management
- The E1s in the local and remote sides can be arranged arbitrarily, such as, the remote E1 port 1 can communicate with local E1 port 3
- Supports bandwidth unbalanced usage – when some E1s cannot work properly (i.e. the bandwidth of the sending and receiving can be 5E1 and 3E1 respectively)
- Provides the E1 connection-ship between local and remote system (accessed via

CLI command)

- E1 tributary signal loopback automatic detect and cut off; when some E1 signal is detected as looped back, it will be not employed for carrying payload temporarily, and when the loopback is broken, this E1 will resume to be used
- Remote/local E1 loopback function will be convenient for E1 line(transmission system included) testing
- Complete alarm which is selectable to be shown between local and remote
- Single-board design with small dimension, 1 U high and low power consumption

1.3 Functional Diagram

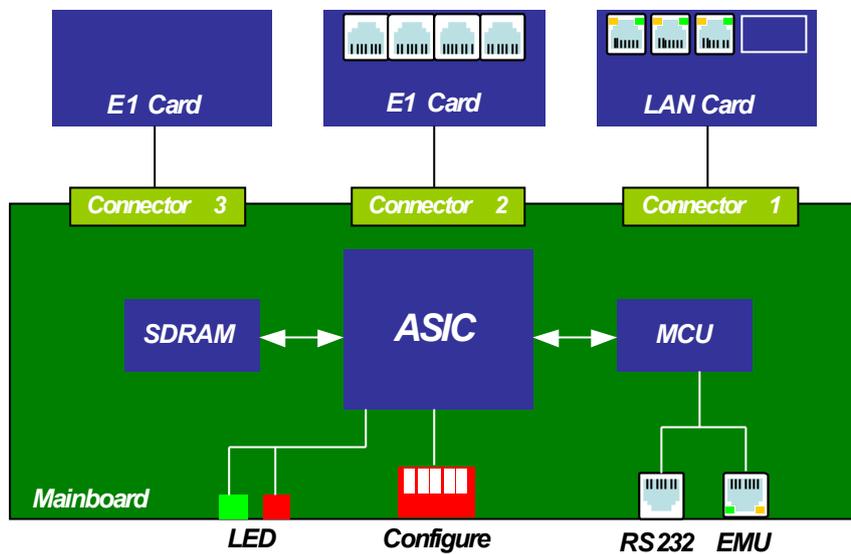


Figure 1-3-1 GQ1016 device functional diagram

Note: LAN Card should be inserted to Connector 1 , E1 Card can be installed to Connector 2 or Connector 3

2. Application Diagram

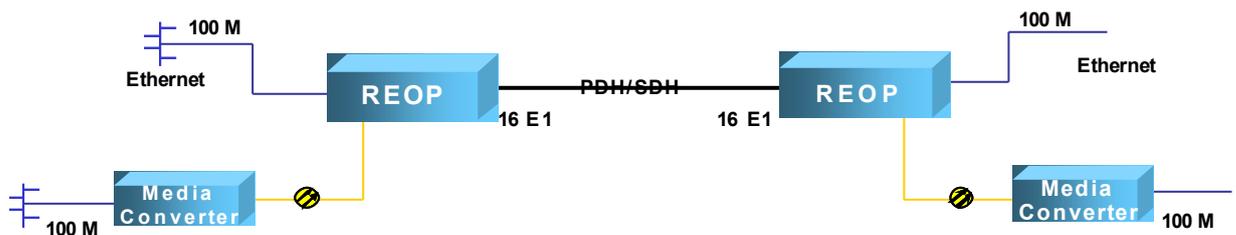


Figure 2-1 GQ1016 application diagram

3. Front panel and back panel

3.1 Front panel

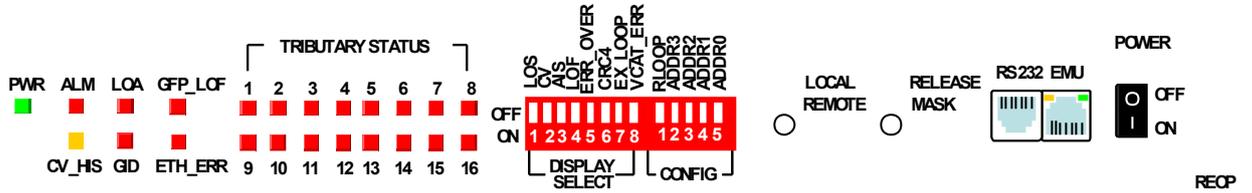


Figure 3-1-1 Front panel diagram

The indicator LED on the GQ1016 front panel consists of Global and E1 tributary status indication. The indication of E1 tributary status LED depends on the setup of the “DISPLAY SELECT” switch.

Table 3-1-1 Description of global status indicator

Item	Name	Description
1	PWR	Indication of power supply, green; On when power is supplied; Off when power is cut off.
2	ALM	Indication of general alarm, red; On when any alarm exist; Off when no alarm.
3	CV_HIS	Indication of historical CV, yellow; On when Code Violation has occurred to some E1; Off when Code Violation has never occurred to any E1. Note that this alarm can be got rid of when the switch “DISPLAY SELECT” is set to all-off from another state.
4	LOA	Indication for threshold exceeding of the differential delay; On when the maximum differential delay of the E1 lines exceed the threshold (220ms). Note: 1) The big differential delay in the transmission system may cause this alarm. E1 links with less differential delay are recommended to allocated to the device; 2) E1’s loopback may also cause this alarm.
5	GID	Indication for the mismatch of the Group ID, red; On when the device’s Group ID mismatch; Off when the device’s Group ID matches; Note that the cause of this alarm may be 1) Mistaken E1 circuit allocation, such as wrong E1-cable group

		<p>distribution</p> <p>2) Some E1's loopback</p>
6	GFP_LOF	<p>Indication for the Loss of Frame(LOF) of Generic Framing Procedure, red;</p> <p>On when LOF of GFP present;</p> <p>Off when LOF of GFP doesn't exist;</p> <p>Note:</p> <p>1) When this alarm present, and the remote device is of other manufacturer, the encapsulation format of the remote side should be adjusted to GFP(our device only support GFP encapsulation format);</p> <p>2) Mistaken E1 circuit allocation may also cause this alarm.</p>
7	ETH_ERR	<p>Indication of historical Ethernet error, red;</p> <p>On when Ethernet error has occurred to any of the Ethernet ports;</p> <p>Off when Ethernet error has never occurred to the Ethernet ports.</p> <p>Note:</p> <p>1) When Ethernet packets of undersize, CRC error etc are detected by the four LAN interfaces or the WAN interface, this alarm will be generated;</p> <p>2) When this alarm happens, please check whether the Ethernet interface working mode is half-duplex, whether the Ethernet interface is connected well, whether errors occur to the E1 lines</p> <p>3) This alarm can be get rid by clear the Ethernet performance with CLI command "clearperform" or management software.</p>

E1 "TRIBUTARY STATUS" indicator LED has dual color, the signification is shown in the Table 3-1-2.

Table 3-1-2 signification of dual-color LED

Color	Description
Green	Normal operation .
Red	Alarm present.
Off	<p>1. The E1 doesn't exit. When the device has only 4 or 8 E1s, the alarm indicator of the not existent E1 (5th-16th/9th-16th) will be off;</p> <p>2. Invalid indication of the remote E1 alarm. When the button "LOCAL/REMOTE" is down(remote alarm will be displayed on the LEDs), the E1 alarm indicator will be off;</p> <p>3. The corresponding E1 is not activated;</p> <p>4. Power is not supplied.</p>

Table 3-1-3 “DISPLAY SELECT” switch description

Item	Name	Description	Malfunction Diagnosis
1	LOS	Loss of E1 signal	High-quality cables and connectors should be adopted, and they should be touched tightly.
2	CV	Code Violation of the HDB3	1) Check the cable to confirm a high-quality connection; 2) Check if the device's PGND, GND, shield of E1 signal are processed well.
3	AIS	Alarm Indication Signal of E1 tributary	1) See description in “LOS”; 2) Check if the alarm generated by the transmission system; Check if E1 cable is connected wrongly.
4	LOF	Loss of Frame of E1 tributary	1) See description in “LOS”; 2) Check if E1 cable is connected wrongly.
5	ERR_OVER	Indication of Bit Error Rate exceeding E-6	1) See description in “LOS”; 2) Check if E1 lines is interfered. If so, please let the device be away from the interference generator.
6	CRC4	Indication of CRC4 Error of E1 tributary	See description in “ERR_OVER”.
7	EX_LOOP	Indication of E1 tributary's loopback	Please get rid of unexpected E1 loopback if not having a test. This alarm may be caused by the situations: 1) The E1 signal is looped back by the transmission system or the remote device; 2) The E1 tributary is set as line loopback by the RLOOP bit of remote CONFIG switch; 3) The E1 tributary is set as line loopback by the CLI command or management software; Therefore, when this alarm present, please check the three cases.
8	VCAT_ERR	Virtual concatenation alarm of E1 tributary	1) See description in “LOS”; 2) wrong configuration should be avoided 3) If there are some framed-E1 device during transmission, this alarm may also be caused.

Note:

1)Several alarms can be selected together, the indicator LED will be lit if any of the selected alarm presents. For example, if LOS, LOF and AIS are set as “ON”, the LED will be on if any

of them occurs;

2) If the “DISPLAY SELECT” switch is set as all “OFF”, the E1 “tributary status” LED will be green for ever no matter whatever alarm occurs; while if it is set as all “ON”, the E1 “TRIBUTARY STATUS” LED will be red if any of the E1 alarm happens.

3) When the MASK/RELEASE button is up(RELEASE), all “OFF” means that all the E1 “TRIBUTARY STATUS” LED will be green whatever alarm occurs; all “ON” means that the E1 “TRIBUTARY STATUS” LED will be red if any of the E1 alarm happens;

4) When the MASK/RELEASE button is down(MASK), the “TRIBUTARY STATUS” LED of activated E1 tributaries(If the E1 LOS alarm present when the button MASK/RELEASE is pressed down, this E1 can be regarded as un-activated E1. Otherwise, this E1 will be seen as activated) is as identical as described in 2); while the “TRIBUTARY STATUS” LED of un-activated E1s will be off all time(is unrelated to the settings of “DISPLAY SELECT”).

Table 3-1-4 Description of “CONFIG” switch

Item	Name	Description
1	RLOOP	<p>Switch for E1 loopback of remote device; On will enable the remote loopback, and the EX_LOOP will be lit if it is activated.</p> <p>Note:</p> <p>1) This button is the loopback control of remote, and is mainly used for E1 line(transmission system included) testing during engineering installation. The loopback should be canceled in normal operation;</p> <p>2) When the loopback is set, the alarm EXLOOP of both local and remote devices will be generated(The E1 signal of local will be looped back, so the EXLOOP alarm is generated; the remote E1 is set as line loopback, so the EXLOOP alarm also is generated. See table 3-1-3 for more), and the loopback will be canceled automatically in the case that some failure present in all the E1 line of the remote device(i.e., LOS/LOF/AIS alarm present). Therefore, at least one E1 line should be in well communication during testing to ensure the E1 loopback status of remote.</p>
2	ADDR3-0	<p>Network Element Address;</p> <p>2-bit coding, ON=1, OFF=0. For example, address 1001 is 9;</p> <p>Note that the address of the local and remote devices can't be identical.</p>

Table 3-1-5 Button and interface on front panel

Item	Name	Description
1	LOCAL/REMOTE	<p>Alarm Display selection for remote or local;</p> <p>“UP”: the alarm of local device will be present by indicators;</p> <p>“DOWN”: the alarm of the remote device will be shown by indicators;</p> <p>The alarm that can be shown remotely consists of ALM、CV_HIS、LOA、</p>

		<p>GID、GFP_LOF、ETH_ERR、LOS、CV、AIS、LOF、ERR_OVER、CRC4、EX_LOOP、VCAT_ERR.</p> <p>Note that if alarm present at E1 tributary of local device and this button is pressed to down, the E1 tributary indicator will be off no matter what status the remote E1 is.</p>
2	MASK/RELEASE	<p>“Down”: All the E1 tributaries with LOS alarm will be shielded(also can be called un-activated E1), the corresponding “TRIBUTARY STATUS” LED indicator will be off all time, while the other E1 tributaries(also can be called activated E1) will display alarm normally;</p> <p>“Up”: Alarms of all E1 tributaries will be displayed normally.</p> <p>Note that this button is only valid to the E1 tributary with LOS alarm.</p> <p>Note:</p> <p>1) This button is valid when the E1 tributary has LOS alarm.</p> <p>2) The status of E1 activation and un-activation may convert.</p> <p>The un-activated E1 is activated by inserting a E1 cable with signal, and the alarm is displayed normally;</p> <p>when the E1 cable is removed, the corresponding E1 generates LOS alarm. The E1 is also in activated status, therefore the alarm LED indicator will not be off;</p> <p>when this button is pressed by an up-to-down transition, the corresponding alarm E1 indicator will be re-turned off.</p>
3	POWER	<p>Power switch</p> <p>“ON”: Power On;</p> <p>“OFF”: Power Off.</p>
4	RS232	<p>RS232 Serial Management Interface (RJ45) line setting:</p> <p>1.Data output;</p> <p>2.Data input;</p> <p>6.GND;</p> <p>19200bps baud, 8-bit data,1-bit stop, no parity check.</p>
5	EMU	<p>Ethernet Management Interface (RJ45);</p> <p>Cable: CAT-5 cross or straight through;</p> <p>Note: Checking the accessorial bag for the crystal connector.</p>

3.2 Back panel



Figure 3-2-1 Back panel diagram

Table 3-2-1 Indicators and interfaces on back panel

Item	Name	Description
1	NOP	No optical signal(NOP) alarm of the FX port; “ON”: No optical signal; “OFF”: The device receives optical signal.
2	LINK	Indication for the link status of the remote optical transceiver; “ON”: The remote optical transceiver has established link; “OFF”: No optical signal or the remote optical transceiver has not established link.
3	TX	Transmitting direction of optical Ethernet interface (Ethernet port 1).
4	RX	Receiving direction of optical Ethernet interface (Ethernet port 1).
5	ETH2-ETH4	Shared electrical Ethernet Interfaces (RJ45 connector, and are numbered as Ethernet port 2 to 4) supports cross and straight cable; The RJ45 connector includes green LINK/ACT and yellow SPD indicators; Green LINK/ACT indicator will shine when Ethernet interface has been connected; while blinking if the Ethernet interface is transmitting or receiving data; Yellow SPD indicator: Lighting for 100M, Non-Lighting for 10M.
6	1~16 E1	E1 interfaces, 120 ohm is the default impedance and 75 ohm is optional.
7	⊥	To GND.

Table 3-2-2 Power connector

Name	Description
~220V	AC 220V power connector; Safety range: 176V to 264V
PGND	PGND connector.
GND	GND connector.
-48V	DC-48V power connector; Safety range: -36 to -72V

Description of E1 Cable for 75ohm



E1 Cable for 75ohm(4E1)



E1 cable for 75ohm(8E1)

Table 3-2-3 120ohm E1 interface (RJ45 connector) definition

Item	Name	Description
PIN1	TXD+	P-output of 120 ohm E1 interface
PIN2	TXD-	N-output of 120 ohm E1 interface
PIN3	-	Null
PIN4	RXD+	P-input of 120 ohm E1 interface
PIN5	RXD-	N-input of 120 ohm E1 interface
PIN6	-	Null
PIN7	-	Null
PIN8	-	Null

4. Network management

GQ1016 supports network management based on PC. The address of the network element should be set manually and can't be identical. On the front panel of the GQ1016 device, there is a 4-bit switch "ADDR[3:0]" for address. It is 2-bit coding and "ON" is 1,"OFF" is 0. For example "1001" is nine.

The device's default IP address is 192.168.0.155, subnet mask is 255.255.255.0, gateway is 192.168.0.1.

GQ1016 also support management via CLI command based on serial 232 port and telnet(Ethernet).

5. Device installation

- User should check whether the equipment, accessories type and amount are correct. If there is any damage or scarcity, please contact with the device supplier
- Install the device on 19" standard rack, connect the E1 cable and fiber orderly
- Connect the PGND connector of the device on the back panel to the earth of the

telecommunication house in a reliable way

- If the power supply is AC, use the cable in the accessorial bag; while if DC, the polarity should be not reversed during connection

6. Technical Parameters

Table 6-1 Optical Ethernet interface(General FC connector)

Subject	Description
Wavelength	1310nm
Bit rate	125Mb/s
Optical power	-4~-12dBm
Receiving sensitivity	Prior to -36dBm
Dynamic range	32dB
Transmission Distance	40KM is the default configuration ; 120KM is optional by changing optical transceivers.
Compliant to IEEE 100Base-Fx Standard	

Table 6-2 Optical Ethernet interface(single-fiber, 1550)

Subject	Description
Wavelength	1550nm
Bit rate	125Mb/s
Optical power	-4~-12dBm
Receiving sensitivity	Prior to -36dBm
Dynamic range	32dB
Relay-free Transmission Distance	25KM is the default configuration ; 60KM is optional by changing optical transceiver.
Compliant to IEEE 100Base-Fx Standard	

Table 6-3 Optical Ethernet interface(single-fiber,1550)

Subject	Description
Wavelength	1550nm
Bit rate	125Mb/s
Optical power	-4~-12dBm
Receiving sensitivity	Prior to -36dBm
Dynamic range	32dB

Relay-free Transmission Distance	25KM is the default configuration; 60KM is optional by changing optical transceiver.
Compliant to IEEE 100Base-Fx Standard	

Table 6-4 Electrical Ethernet Interface

Subject	Description
Connector	RJ-45
Working mode	Auto - negotiation is the default setting
Complies with IEEE 802.3 and 10/100 Base-Tx Ethernet Protocol	

Table 6-5 E1 interface

Subject	Description
Bit rate	2.048Mb/s±50ppm
Code format	HDB3
Impedance	75 ohm is default, Optional 120 ohm
Jitter transfer, Jitter tolerance comply with ITU-T G.703、G.704、G.823 recommendations	

Table 6-6 Ethernet parameters

Subject	Description	Remark
MAC address table capacity	1K	
MAC aging time	five minutes	
Minimum frame-length	64 bytes	
Maximum frame-length	1916 bytes	
Working mode	Support auto-negotiation compliant to IEEE802.3u. Enabled as default	Configured via CLI command or network management software
VLAN function	Disabled as default	
Flow control	Enabled as default	
Bandwidth	≈n×E1 (n=0~16) Default is 16×E1 ≈31.68Mbps	

Table 6-7 Dimension, weight and power consumption

Subject	Description
Dimension	434mm×44mm×155mm (width× height× depth)
Weight	2.0 kg
Power	8W±10%

consumption	
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Table 6-8 Environmental requirements

Subject	Description
Operating temperature	-5°C ~ 45°C
Storage temperature	-40°C ~ 70°C
Humidity	≤95%, free from condensing