

# **Fan Filter Unit (FFU)**

## **for Clean Room System**

### **Technical Submittal**

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# 1. Specification & Drawing

## Specification

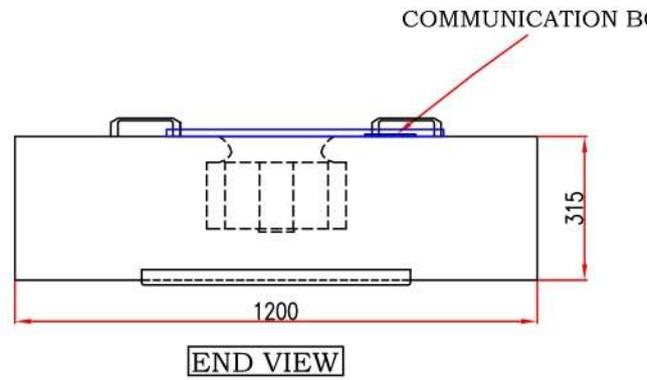
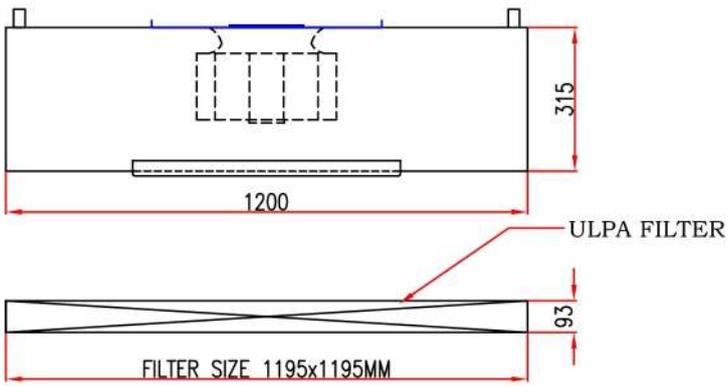
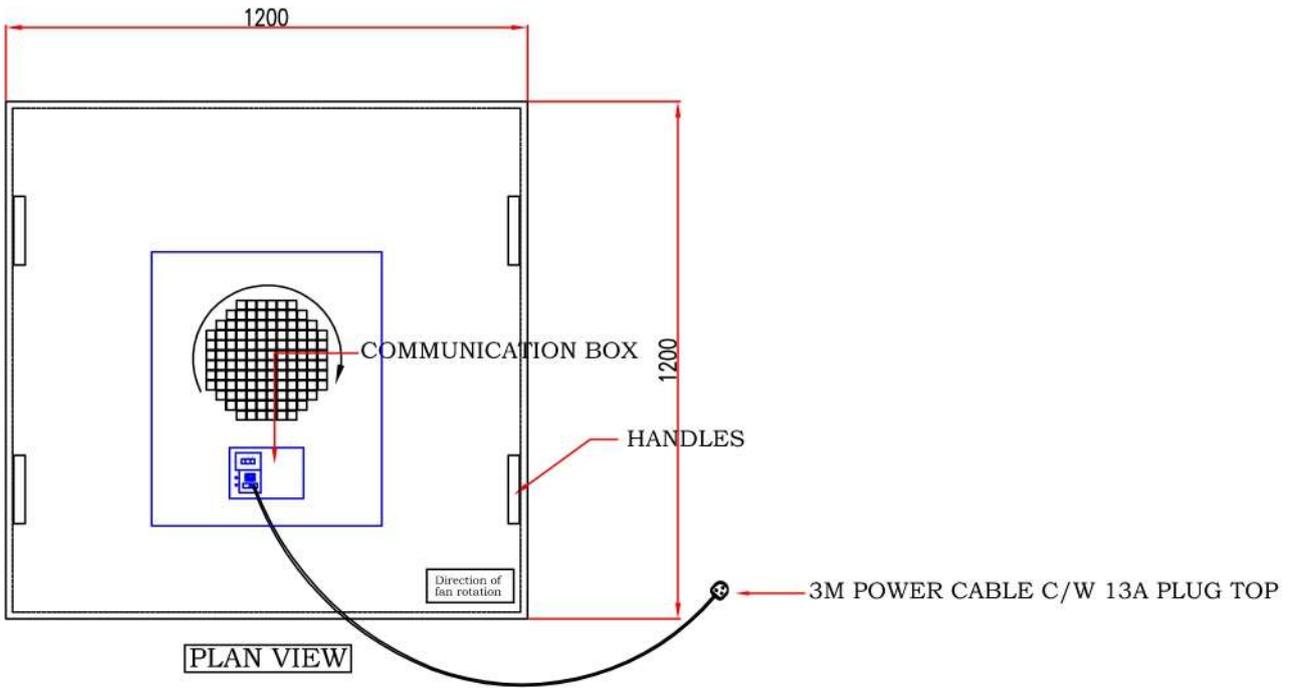
### **filtex EC FFU (EC Fan + eLisa 7.0 control)**

#### Fan filter Unit

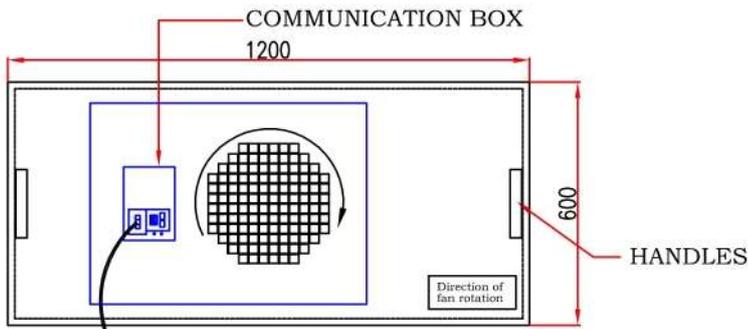
- Dimension: 1200 x 1200 mm (4' x 4')  
600 x 1200 mm (2' x 4')
- Power supply: 1 Phase/230V/50Hz
- Fan: Wide voltage range EC Fan, build- in EC, brushless
- Designed running condition: TSP 210 Pa at 0.45 m/s face velocity
- Fan Model: EBM R3G400 AC30-61
- Fan access type: Top Access
- Housing: Galvalume 0.8 mm thick
- Others: Dual ABS handles, Protection air inlet guard, air guiding plate

#### eLisa 7.0 Network Control System

- Master Gateway and Slave gateway
- Software
- Controller on FFU

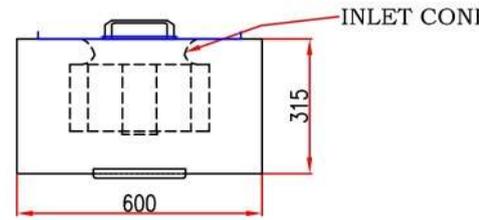
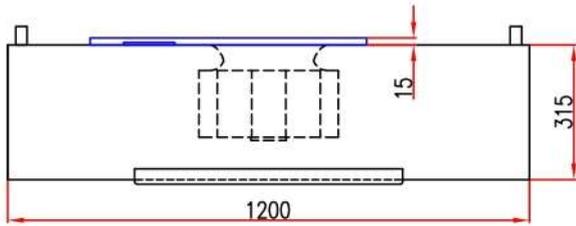


Title		
FAN FILTER UNIT		Job :

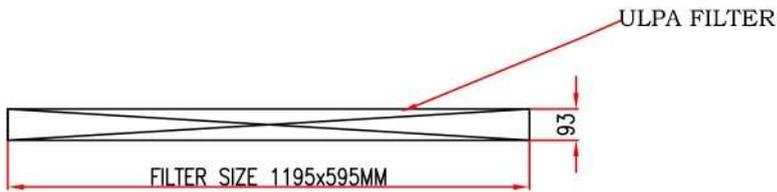


PLAN VIEW

3M POWER CABLE C/W 13A PLUG TOP



END VIEW



SECTION SIDE VIEW

Title	
FAN FILTER UNIT	Job :

**filtex**<sup>®</sup>

## 2. Performance Curve

**R3G400-AC30-61** (melD:73076)

1200 x 1200x 315 mm

# EC centrifugal fan

backward curved, single inlet

epM inlet nozzle

### Nominal data

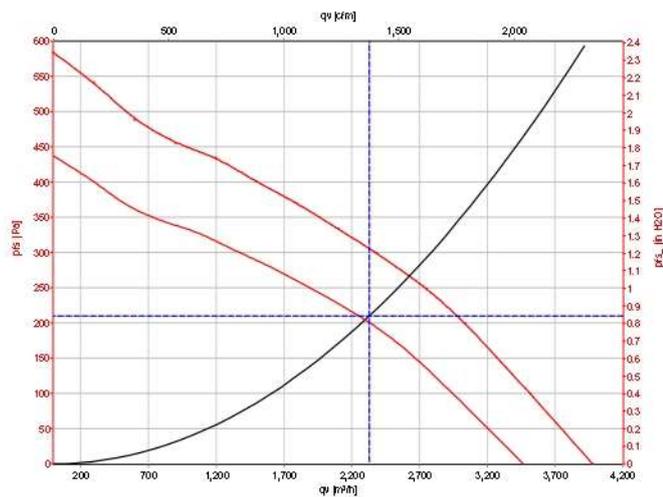
Nominal voltage range	V	1~ 200 .. 277
Frequency	Hz	50/60
Fan speed	min <sup>-1</sup>	1370
Input power	W	380
Current draw	A	1.7
Mass	kg	5.78
Min. ambient temp.	°C	-25
Max. ambient temp.	°C	30
Protection class		20
Approvals		CSA C22.2 Nr.113; UL 507; CCC
Number of blades		6
Mounting position		Shaft horizontal or rotor on top rotor on bottom on request

Air performance measured as per ISO 5801 Installation category A. For detailed information on the measuring set-up, please contact ebm-papst  
Suction-side noise levels: L<sub>WA</sub> measured as per ISO 13347 / L<sub>pA</sub> with 1 m distance to fan axis. The values given are valid under the measuring conditions mentioned above and may vary according to the actual installation situation. With any deviation from the standard set-up, the specific values have to be checked and reviewed with the unit installed.

q<sub>v</sub> = Airflow  
p<sub>fs</sub> = static pressure  
p<sub>f</sub> = total pressure (static + dynamic pressure)  
n = fan speed)  
P<sub>ed</sub> = Power input)  
I = current draw))  
L<sub>WA</sub>(A.in) = Sound power Inlet)  
L<sub>WA</sub>(A.out) = Sound power Outlet)  
ρ = air density  
SFP = specific fan power  
η<sub>ed</sub> = eta(impeller) x eta(motor) = overall efficiency (from total pressure)  
η<sub>es</sub> = overall static efficiency

### Data in operating point

q <sub>v</sub>	m <sup>3</sup> /h	2330
p <sub>fs</sub>	Pa	210
p <sub>f</sub>	Pa	222
n	min <sup>-1</sup>	1198
P <sub>ed</sub>	W	268.7
SFP	kW/(m <sup>3</sup> /s)	0.415
η <sub>ed</sub>	%	53.5
η <sub>es</sub>	%	50.6
I	A	1.18
L <sub>WA</sub> (A.in)	dB(A)	-
L <sub>WA</sub> (A.out)	dB(A)	-
L <sub>WA</sub> (A.in+out)	dB(A)	-
U <sub>control</sub>	V	8.8
<b>Settings</b>		
ρ <sub>calculated to</sub>	kg/m <sup>3</sup>	1.14
ρ <sub>measured at</sub>	kg/m <sup>3</sup>	1.15



R3G400-AC30-61 (meID:73076)

600 x 1200x 315 mm

# EC centrifugal fan

backward curved, single inlet

epM inlet nozzle

## Nominal data

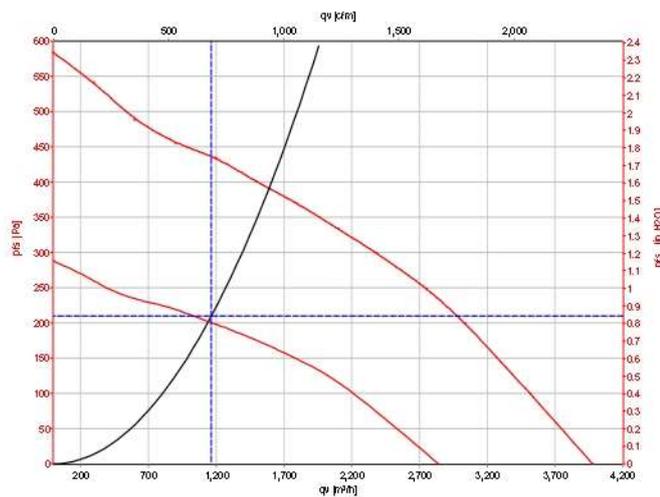
Nominal voltage range	V	1- 200 ... 277
Frequency	Hz	50/60
Fan speed	min <sup>-1</sup>	1370
Input power	W	380
Current draw	A	1.7
Mass	kg	5.78
Min. ambient temp.	°C	-25
Max. ambient temp.	°C	30
Protection class		20
Approvals		CSA C22.2 Nr.113; UL 507; CCC
Number of blades		6
Mounting position		Shaft horizontal or rotor on top rotor on bottom on request

Air performance measured as per ISO 5801 Installation category A. For detailed information on the measuring set-up, please contact ebm-papst  
Suction-side noise levels: L<sub>WA</sub> measured as per ISO 13347 / L<sub>pA</sub> with 1 m distance to fan axis. The values given are valid under the measuring conditions mentioned above and may vary according to the actual installation situation. With any deviation from the standard set-up, the specific values have to be checked and reviewed with the unit installed.

q<sub>v</sub> = Airflow  
p<sub>fs</sub> = static pressure  
p<sub>f</sub> = total pressure (static + dynamic pressure)  
n = fan speed))  
P<sub>ed</sub> = Power input)  
I = current draw))  
L<sub>WA</sub>(A.in) = Sound power Inlet)  
L<sub>WA</sub>(A.out) = Sound power Outlet)  
ρ = air density  
SFP = specific fan power  
η<sub>ed</sub> = eta(impeller) x eta(motor) = overall efficiency (from total pressure)  
η<sub>es</sub> = overall static efficiency

## Data in operating point

q <sub>v</sub>	m <sup>3</sup> /h	1165
p <sub>fs</sub>	Pa	210
p <sub>f</sub>	Pa	213
n	min <sup>-1</sup>	1000
P <sub>ed</sub>	W	145.1
SFP	kW/(m <sup>3</sup> /s)	0.448
η <sub>ed</sub>	%	47.5
η <sub>es</sub>	%	46.8
I	A	0.64
L <sub>WA</sub> (A.in)	dB(A)	-
L <sub>WA</sub> (A.out)	dB(A)	-
L <sub>WA</sub> (A.in+out)	dB(A)	-
U <sub>control</sub>	V	7.2
<b>Settings</b>		
ρ <sub>calculated to</sub>	kg/m <sup>3</sup>	1.14
ρ <sub>measured at</sub>	kg/m <sup>3</sup>	1.15



### 3. Performance summary of technical data

Brand name	<b>filtex</b>								
Model name	ffus FFU-TZ....								
Product type	EC Motor FFU								
Static Pressure	210 Pa								
Power supply	Single phase, 230V, 50Hz								
Nominal size (ft x ft)	Actual Size (mm)	Air Volume (CMH)	Air Velocity (m/s)	Fan Speed (RPM)	Motor Rating (KW)	Max. Current (A)	Power Consump. (KW)	Running Current (A)	Noise Level (dBA)
4' x 4'	1200+1200	2330	0.45	1198	0.38	1.7	0.268	1.18	54
2' x 4'	600+1200	1165	0.45	1000	0.38	1.7	0.145	0.64	52

The noise level is A-weighted, measured 1.5m below the filter downstream.

## 4. FFU control system-eLisa 7.0

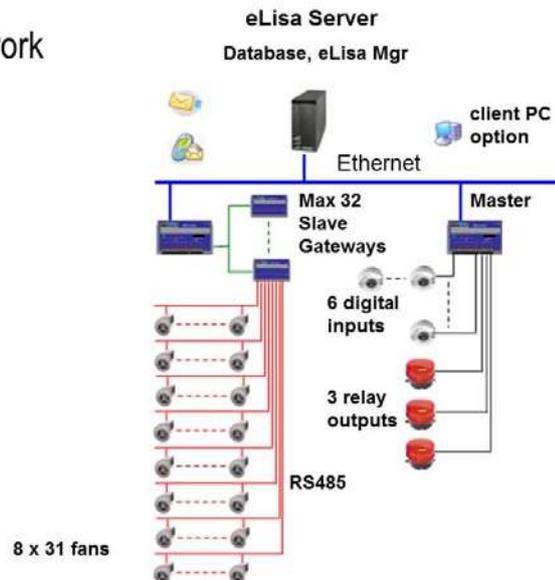
- Control system overview
- Hardware: Master & Slave Gateway
- Software and feature

### Control System overview

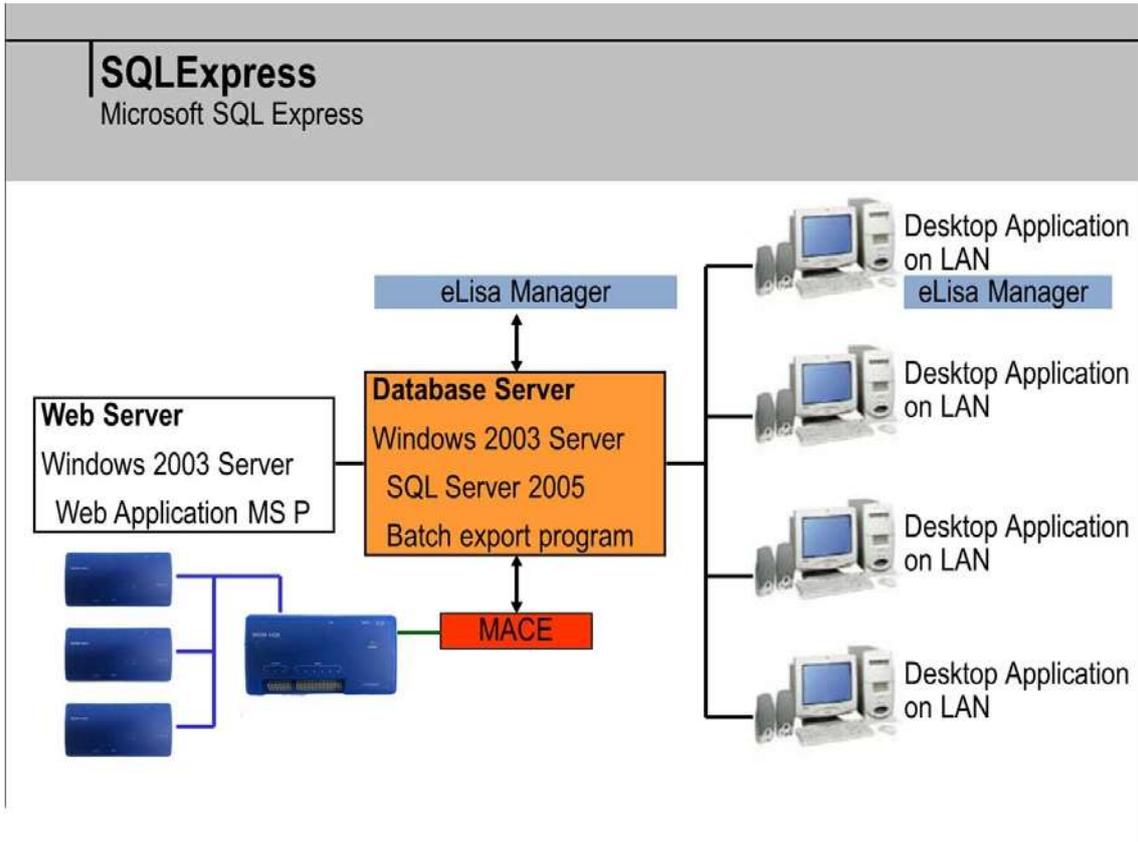
## eLisa 7.0

### Architecture

- Developed using **.Net** framework
- Design based on n-tier client/server model
- SQLEXPRESS Database
- Scalability
- Interoperability (support OPC server)

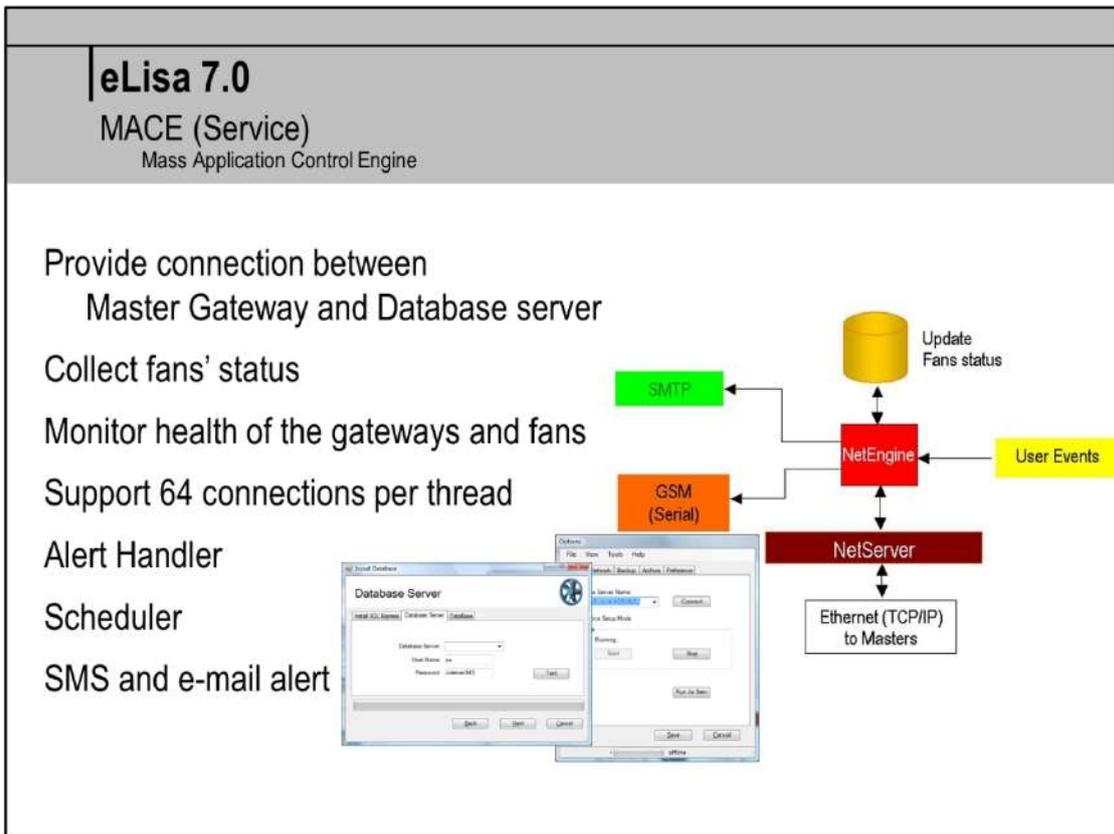


Database serve



## Mass Application Control Engine(MACE)

- Provide connection between Master Gateway and Database server



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## Hardware: Master Gateway and Slave Gateway

### Master Controller with IP Enabled(MGW-1420)



The Intelligent Master Controller with IP Enabled Module provides interface up to 3 Master RS 485 interface and a 10 Base-T port.

The IP Enabled Controller provides an ease of use for system integrator.

User can plug the Controller to any LAN points connected to a Network follow by a simple software configuration and it is ready for operations.

The Master Controller is software configurable to one of the following configuration:

- One set of 255 RS-485 Repeaters (7905 Fan Controllers) for direct replacement for upgrading current design
- Master / Slave. In this mode Master can connect up to 255 Slave with the enhanced Fan BUS protocol or the Maximum Number of Fans (7905) with unique Fan Address and Group.

To improve the performance and efficiency of the System, more Master Gateway should be installed.

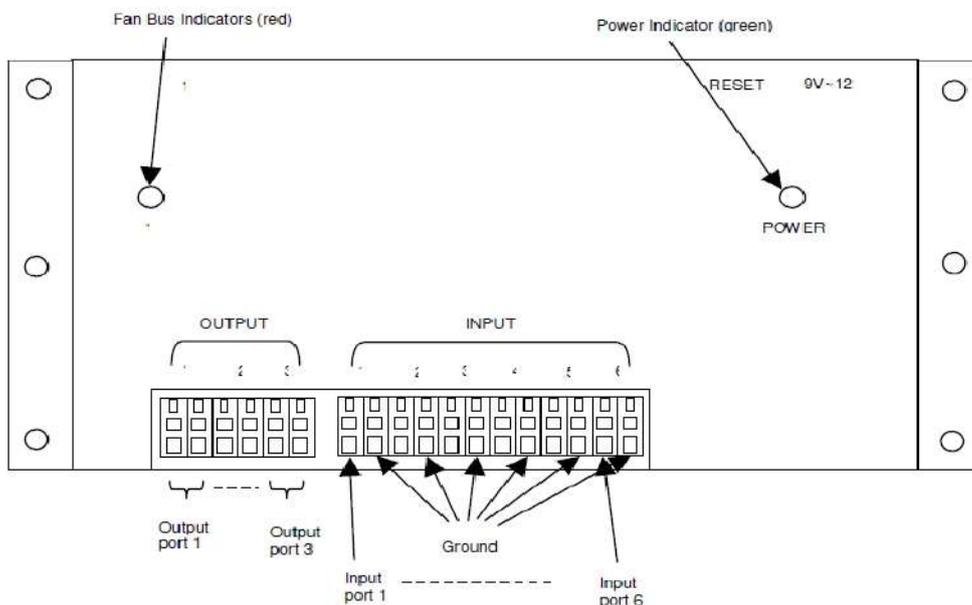


Figure 1: Master Gateway Top View

1. Power Indicator - Green
2. Fan Bus indicator – Red, turn on when there is communication between Slave Gateway and fan
3. Output port 1~3 – dry contact output port.
4. Input port 1~6 - Digital (TTL) input port with alternate ground connector

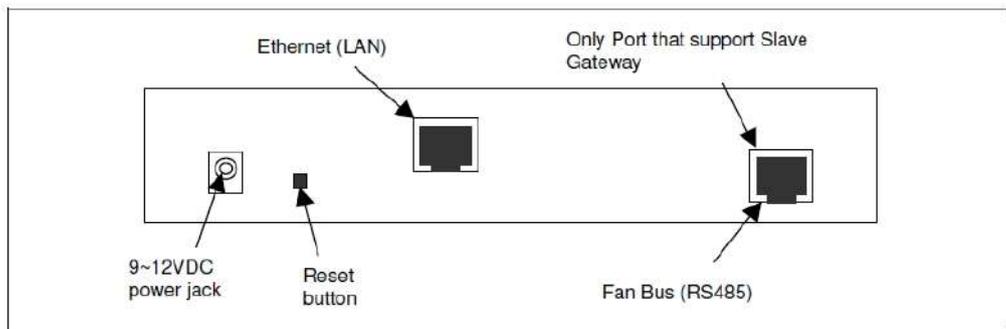


Figure 2: Master Gateway Side View

1. Power – 9 to 12 VDC, 1A.
2. Reset Button – Reinitialise Slave Gateway.
3. Ethernet (LAN) – Connect to the Local Area Network

Product Specification

Model:	MGW 1420
Size	222 x 102 x 35 mm
Interfaces (RJ45)	<ul style="list-style-type: none"> <li>• Single</li> <li>• Up to 255 slave with enhanced Fan BUS protocol</li> </ul>
Isolation (opto)	2.5KVrms
Host Interface	Ethernet (10 Base-T)
Host Protocol	TCP / IP and UDP
Power Supply	9 ~ 12VDC, 1A
LED Signal	1 Red, 1 Green LEDs
Operating Temperature	0°C to +70°C
Memory	1 Mega Byte Non-volatile Memory
Digital I/O	6 Digital Input and 3 output
Weight	250g (±25g) may vary with configurations
Casing	IP20

## Slave Gateway with 8 ports(SGW-1421)



The Slave Gateway provides interface up to 8 RS 485 interface (RJ45) and a RS485 to Master Gateway interface. And provide auto-polling to reduce work load on the Master Gateway and improve performance for the report rate from approximately 2 min to 25 seconds.

The Slave Gateway is customized with Enhanced Fan BUS protocol to upload all fan controllers status and extended. The Slave Controllers are design with built in 512K flash memory and processor to provide storage of fan Controller tables and polling of the Fan Controller status.

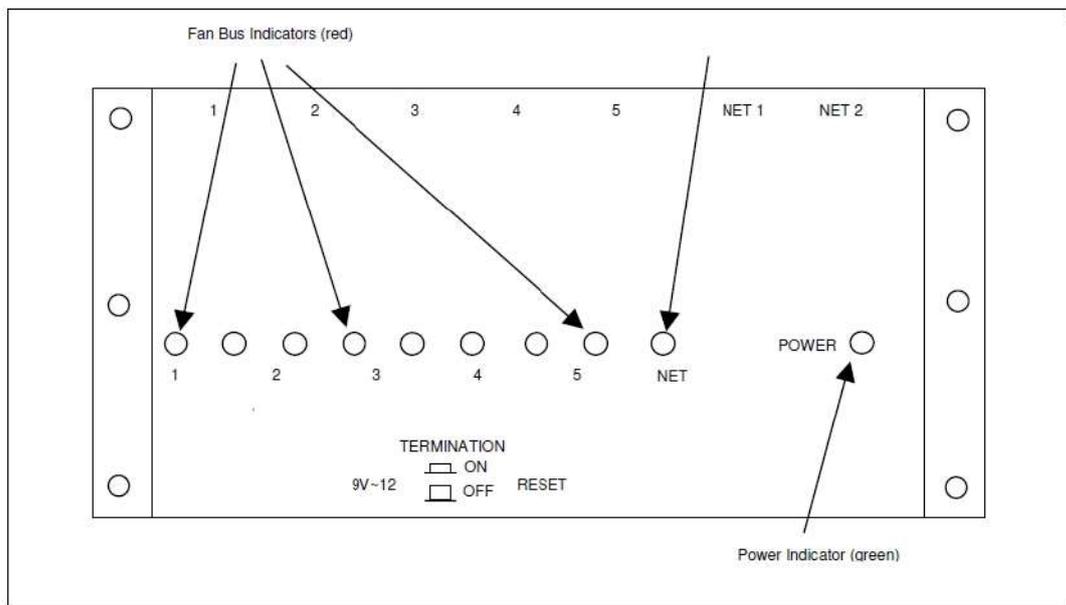


Figure 1: Slave Gateway Top View

1. Power Indicator - Green
2. NET indicator – Red, blink when there is communication between Master and Slave.
3. Fan Bus indicator – Red, turn on when there is communication between Slave gateway and fan.

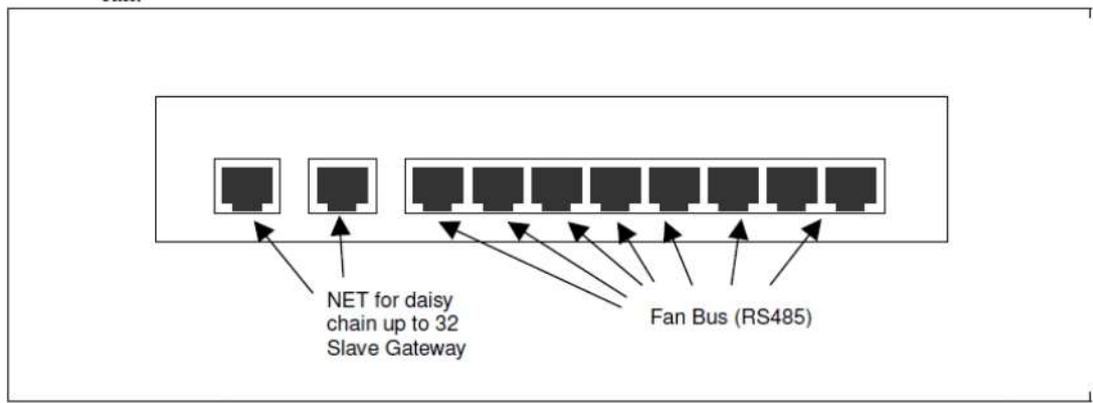


Figure 2: Master Gateway Side View

1. NET 1, 2 – for daisy chain Master and up to 32 Slave Gateway.
2. Port 1 to 8 - for daisy chain up to max 31 fans.

Product Specifications:

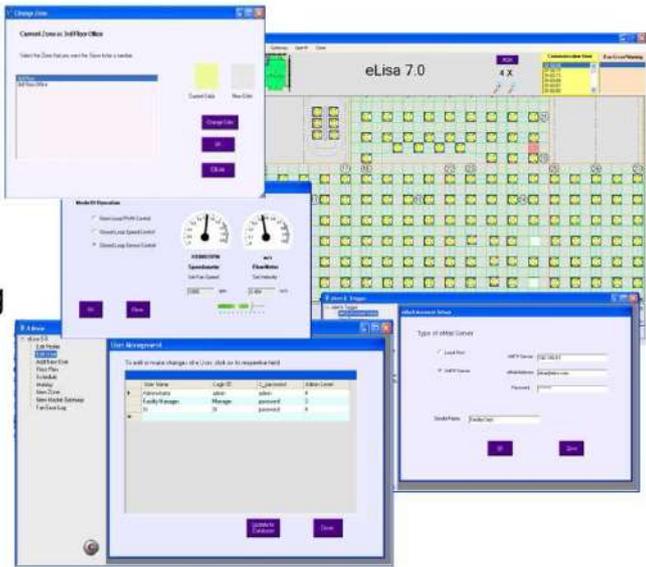
Model:	SGW 1421
Size	220 x 102 x 37 mm
Interfaces	8 independent RS485 ports
Master Interface	1 RS 485 interface
Isolation	2.5kVrms
Host Protocol	Enhanced Fan BUS protocol for performance
Casing	IP20
Power input	12VDC, 1A
LED Signal	2 LEDs (Red, Green) Customization is permissible
Operating Temperature	0°C to +70°C
Memory	512K Byte Flash Memory
Weight	200g (±25g) may vary with configurations

## eLisa 7.0(eLisa manager)

- Gateway/Fan management
- Admin. Module
- Security manager
- Alert Trigger
- Electrical Energy Monitoring and Analysis management
- Fan list

### eLisa 7.0 eLisa Manager

Gateway/Fan Management  
Administrative Module  
Security Manager  
Alert Trigger  
Electrical Energy Monitoring  
and Analysis Management  
Fan List



The screenshot displays the eLisa 7.0 software interface. It features a central dashboard with a grid of icons representing different system components. Overlaid on this are several windows: 'Change User' for user management, 'Monitor' for real-time data with gauges, 'User Management' for a user list, and 'Alert Manager' for configuring alerts. The user list window contains the following data:

User Name	Log ID	Operation	Admin Level
Administrative	admin	admin	4
Emergency Manager	emergency	emergency	3
Test	test	test	1

## Gateway/Fan Management

### ➤ View Image

### eLisa 7.0 Gateway/Fan Management- View Image

1. Fan Control panel
2. Project Explorer
3. Navigator
4. Floor plan
5. Comm. Error
6. Fan Error
7. Zone Trigger
8. Info Panel

The screenshot shows the eLisa 7.0 software interface. The title bar reads 'eLisa 7.0 Gateway/Fan Management- View Image'. The interface includes a top status bar with 'eLisa 7.0' and '4 X'. The left sidebar contains a 'Project Explorer' (2) and a 'Zone Trigger' panel (7). The central area is a 'Floor plan' (4) with a grid and various colored indicators. The right sidebar shows a 'Communication Log' (5) and a 'Fan Error/Status' panel (6). The bottom status bar displays 'Fan Flow' data and a legend.

## Gateway/Fan Management

### ➤ Fan Error Log

**eLisa 7.0**  
Gateway/Fan Management- Fan Error Log

- Fan Error Log
- Gateway
- Search

The screenshot displays the eLisa 7.0 software interface. It features a main window titled "Fan Error Log" and a sub-window titled "Gateway". The "Fan Error Log" window shows a table with columns: CID, Group, Fan ID, Date, and Error Message. The "Gateway" window shows a table with columns: CID, Description, Input 1 through Input 6, and Output 1 through Output 3. Below these windows is a search form with fields for CID (904), Group (1), and Fan ID (1), and a "Search" button. A floor plan diagram is visible in the background.

CID	Group	Fan ID	Date	Error Message
904	1	1	6/17/2008 3:13 PM	Comm Error
904	1	2	6/17/2008 3:13 PM	Comm Error
904	1	3	6/17/2008 3:13 PM	Comm Error
904	1	4	6/17/2008 3:13 PM	Comm Error

CID	Description	Input 1	Input 2	Input 3	Input 4	Input 5	Input 6	Output 1	Output 2	Output 3
787	FABES-0-08	(null)	(null)	(null)						
904	FABES-0-01	(null)	(null)	(null)						
905	FABES-0-02	(null)	(null)	(null)						
906	FABES-0-03	(null)	(null)	(null)						
101	FABES-0-04	(null)	(null)	(null)						
...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...

Personal Preference set up View Image Fan 1

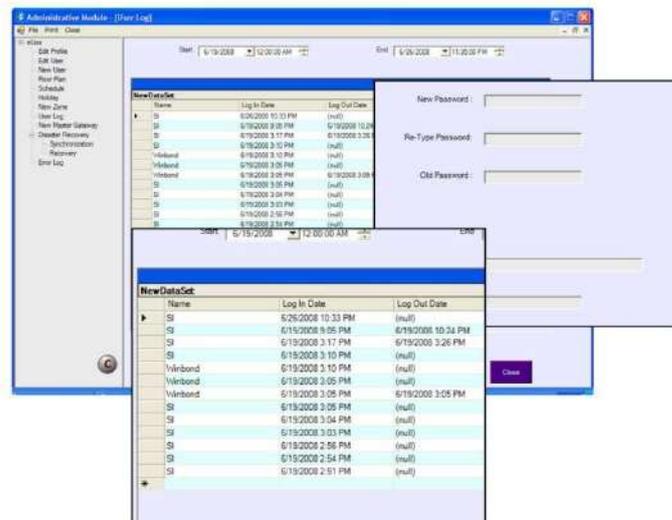
CID:

Group:

Fan ID:

## eLisa 7.0 Administrative Module

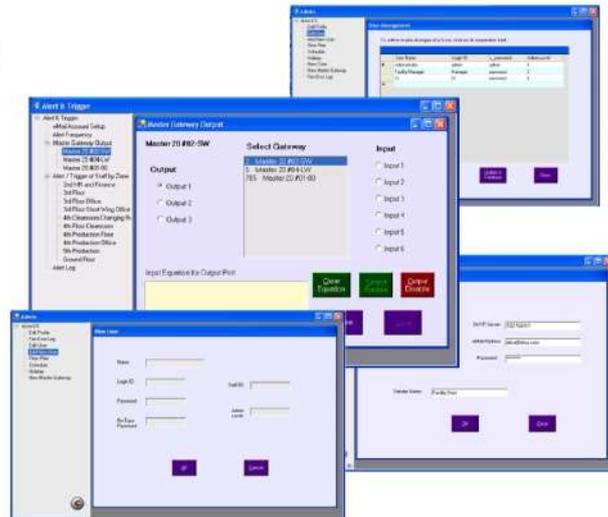
- Manage Users
- Manage Floor plan
- Scheduler
- Zone
- View User Log
- Disaster Recovery
- Error log



## Alert Trigger

### eLisa 7.0 Alert Trigger

- Verified user's access right
- SMS (using GSM modem)
- e-mailing
- Triggering Mechanism by setting equations
- Set fan speed upon trigger
- Trigger by fan error

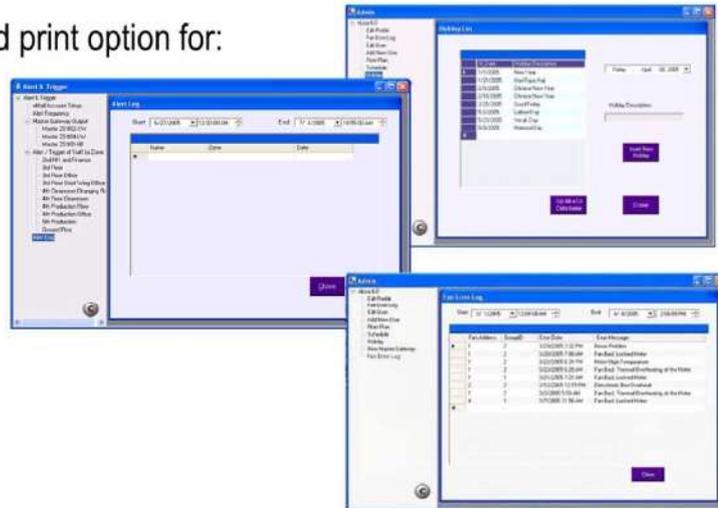


## eLisa 7.0 Manager

### Log and Lists

Provide view and print option for:

- Fan List
- Error List
- User Log



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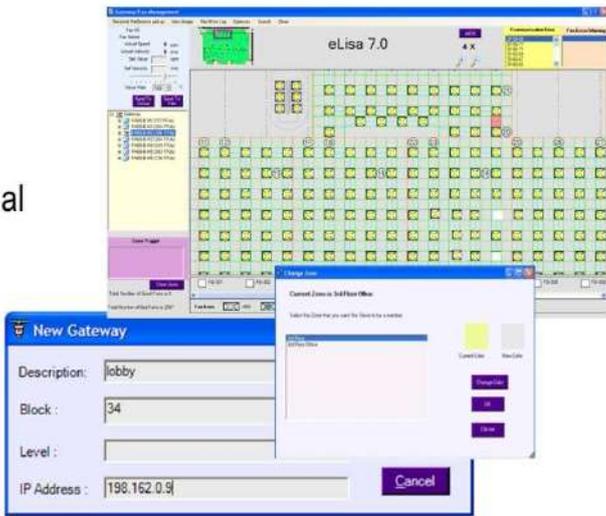
## New features of Gateway/Fan Management

- Search Fan
- Fan name
- Configurable view by personal preference
- Configure display of error
- Navigate through Navigator window
- Rotating fan orientation

### eLisa 7.0 Gateway/Fan Management

Here are some new features:

- Search fan
- Fan Name
- Configurable View by personal preference
- Configure display of error
- Navigate through Navigator window
- Rotating fan orientation



## New features of Gateway/Fan Management

- Floor plan adjustment
- Select error fan display options
- Configure error message display
- Configure panel visibility on floor plan

### eLisa 7.0

#### Gateway/Fan Management- Personal Preference Setup

- Floor plan adjustment
- Select error fan display options
- Configure error message display
- Configure panel visibility on floor plan

Angle

Width  Height

Global Offset

X

Y

Scale

Fan Image Size

Fan Position Locked

Fan Blink on Error

Magnify Fan on Error

Show Fan Error / Warning

Show Fan Warning

Show Zone Color

Show Fan / Zone Icon

## New features of energy monitoring and analysis

- Electrical energy analysis
- Zone Power monitoring
- Energy cost analysis

### eLisa 7.0 Electrical Energy Monitoring and Analysis Management

- Electrical energy Analysis
- Zone Power monitoring
- Energy Cost Analysis

The screenshot displays the eLisa 7.0 software interface. It features three overlapping windows:

- Electrical energy analysis by zone:** A pie chart showing energy distribution across different zones. The chart is titled "Electrical energy analysis by zone".
- Daily Energy Cost Analysis:** A line graph showing energy cost over time. The x-axis is labeled "Date/Time" and the y-axis is labeled "Cost/kWh". Below the graph is a table with columns for "Date/Time", "Cost/kWh", and "Total Cost".
- Data Table:** A window displaying a detailed table of energy data, including columns for "Date/Time", "Zone", "Power (kW)", "Energy (kWh)", and "Cost (€)".