



HIMax[®]

System Fans
Manual

SAFETY
NONSTOP



X-FAN

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Contact

HIMA contact details:

HIMA Paul Hildebrandt GmbH

P.O. Box 1261

68777 Brühl, Germany

Phone: +49 6202 709-0

Fax: +49 6202 709-107

E-mail: info@hima.com

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1 Introduction

This manual describes the technical characteristics of the different system fans (X-FAN) and their use. It provides information on how to install and start up the fans.

1.1 Structure and Use of this Manual

The content of this manual is part of the hardware description of the HIMax programmable electronic system.

This manual is organized in the following chapters:

- Introduction
- Safety
- Product description
- Start-up
- Operation
- Maintenance
- Decommissioning
- Transport
- Disposal

Additionally, the following documents must be taken into account:

Name	Content	Document no.
HIMax system manual	Hardware description of the HIMax system	HI 801 001 E
HIMax safety manual	Safety functions of the HIMax system	HI 801 003 E
Communication manual	Description of communication and protocols	HI 801 101 E
SILworX online help (OLH)	Instructions on how to use SILworX	-
SILworX first steps manual	Introduction to SILworX	HI 801 103 E

Table 1: Additional Valid Manuals

The latest manuals can be downloaded from the HIMA website at www.hima.de and www.hima.com. The revision index on the footer can be used to compare the current version of existing manuals with the Internet edition.

1.2 Target Audience

This document addresses system planners, configuration engineers, programmers of automation devices and personnel authorized to implement, operate and maintain the plants and systems. Specialized knowledge of safety-related automation systems is required.

1.3 Writing Conventions

To ensure improved readability and comprehensibility, the following writing conventions are used in this document:

Bold	To highlight important parts. Names of buttons, menu functions and tabs that can be clicked and used in the programming tool.
<i>Italics</i>	For parameters and system variables.
<code>Courier</code>	Literal user inputs.
RUN	Operating states are designated by capitals.
Chapter 1.2.3	Cross-references are hyperlinks even if they are not particularly marked. When the cursor hovers over a hyperlink, it changes its shape. Click the hyperlink to jump to the corresponding position.

Safety notices and operating tips are particularly marked.

1.3.1 Safety Notices

Safety notices must be strictly observed to ensure the lowest possible risk.

The safety notices are represented as described below.

- Signal word: warning, caution, notice.
- Type and source of risk.
- Consequences arising from non-observance.
- Risk prevention.

The signal words have the following meanings:

- Warning indicates hazardous situations which, if not avoided, could result in death or serious injury.
- Caution indicates hazardous situations which, if not avoided, could result in minor or modest injury.
- Notice indicates a hazardous situation which, if not avoided, could result in property damage.

SIGNAL WORD



Type and source of risk!
Consequences arising from non-observance.
Risk prevention.

NOTICE



Type and source of damage!
Damage prevention.

1.3.2 Operating Tips

Additional information is structured as presented in the following example:

i The text for additional information is located here.

Useful tips and tricks appear as follows:

TIP The tip text is located here.

2 Safety

All safety information, notices and instructions specified in this document must be strictly observed. The product may only be used if all guidelines and safety instructions are adhered to.

The product is operated with SELV or PELV. No imminent risk results from the product itself. The use in the Ex zone is only permitted if additional measures are taken.

2.1 Intended Use

HIMax components are designed for assembling safety-related controller systems.

When using the components in the HIMax system, comply with the following general requirements.

2.1.1 Environmental Conditions

All the environmental conditions specified in this manual must be observed when operating the HIMax system. The environmental requirements are listed in the product data.

2.1.2 ESD Protective Measures

Only personnel with knowledge of ESD protective measures may modify or extend the system or replace components.

NOTICE



Damage to the HIMax system due to electrostatic discharge!

- When performing the work, make sure that the workspace is free of static, and wear an ESD wrist strap.
- If not used, ensure that the components are protected from electrostatic discharge, e.g., by storing them in their packaging.

2.2 Residual Risk

No imminent risk results from a HIMax X-FAN module itself.

Residual risk may result from:

- Faults related to engineering.
- Faults related to the wiring.

2.3 Safety Precautions

Observe all local safety requirements and use the protective equipment required on site.

2.4 Emergency Information

A HIMA system is a part of the safety equipment of a plant. If the controller fails, the system enters the safe state.

In case of emergency, no action that may prevent the HIMA system from operating safely is permitted.

3 Product Description

The X-FAN system fan is an integral part of the HIMax system and absolutely required for its operation. The system fan must be installed directly above the base plate.

The system fan ensures the ventilation of the modules that are equipped with vents on the bottom and top side. Hot air is vented to the top. Provide sufficient distance to objects to ensure good heat dissipation.

The following table specifies the system fans that can be used with the various base plates:

System fan	Mounting	Number of fans	Base plate
X-FAN 10 01	Backplane	2	X-BASE PLATE 10 01
X-FAN 15 01	Backplane	3	X-BASE PLATE 15 01
X-FAN 15 02	19-inch frame	3	X-BASE PLATE 15 02
X-FAN 18 01	Backplane	4	X-BASE PLATE 18 01
X-FAN 10 03	Backplane	2	X-BASE PLATE 10 01
X-FAN 15 03	Backplane	3	X-BASE PLATE 15 01
X-FAN 15 04	19-inch frame	3	X-BASE PLATE 15 02
X-FAN 18 03	Backplane	4	X-BASE PLATE 18 01

Table 2: System Fans

The system fans listed in Table 2 additionally differ from one another in the air flow rate and sound pressure level.

- The system fans X-FAN 10 01, 15 01, 15 02 and 18 01 have a high air flow rate and a high sound pressure level.
- The system fans X-FAN 10 03, 15 03, 15 04 and 18 03 have a normal air flow rate and a low sound pressure level.

HIMA recommends using the system fans X-FAN 10 01, 15 01, 15 02 and 18 01 to ensure high air flow rate in the following cases:

- If high ambient temperature is to be expected.
- In unmanned environments, in which repair measures cannot be performed directly.

HIMA recommends using the system fans X-FAN 10 03, 15 03, 15 04 and 18 03 in the following cases:

- At ambient temperatures of less than 40 °C.
- In noise sensitive environments, e.g., in manned switch rooms.

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A distance of 2 RU must be maintained above system fans X-FAN 10 03, 15 03 and 18 03. A distance of 1 RU must be maintained above system fans X-FAN 10 01, 15 01 and 18 01 for mounting on a backplane. In system fans X-FAN 15 02 and 15 04 (19-inch frame), a rear opening is sufficient if the space behind the opening is unobstructed.

The system fan can be powered redundantly to ensure that the system fan can function even if one power supply unit fails, see Chapter 3.4.3.

The system fan has a fan monitoring function with fault relay. The fault relay drops out if the voltage or fan speed is too low, see Chapter 3.4.4.

The function of the system fan is indicated by two LEDs on the front side. The green *Run* LED is lit if sufficient supply voltage is available. The red *Error* LED is lit if the voltage or fan speed is too low, see Chapter 3.4.4.

The system fan is equipped with a swiveling cover plate. This must be opened when mounting and removing the modules.

3.1 Safety Function

No safety function is performed by the system fan.

3.2 Scope of Delivery

The system fans are delivered without accessories.

Mounting kits are available to mount the system fans in a 19-inch frame, see Chapter 4.1.2. The mounting kits are not included within the scope of delivery of the system fans.

3.3 Type Label

The type label specifies the following important details:

- Product name
- Mark of conformity
- Bar code (2D or 1D code)
- Part number (Part-No.)
- Hardware revision index (HW-Rev.)
- Operating system revision index (OS-Rev.)
- Supply voltage (Power)
- Ex specifications (if applicable)
- Production year (Prod-Year:)



Figure 1: Sample Type Label

3.4 Structure

The following chapters describe the structure of the system fans.

3.4.1 Block Diagram

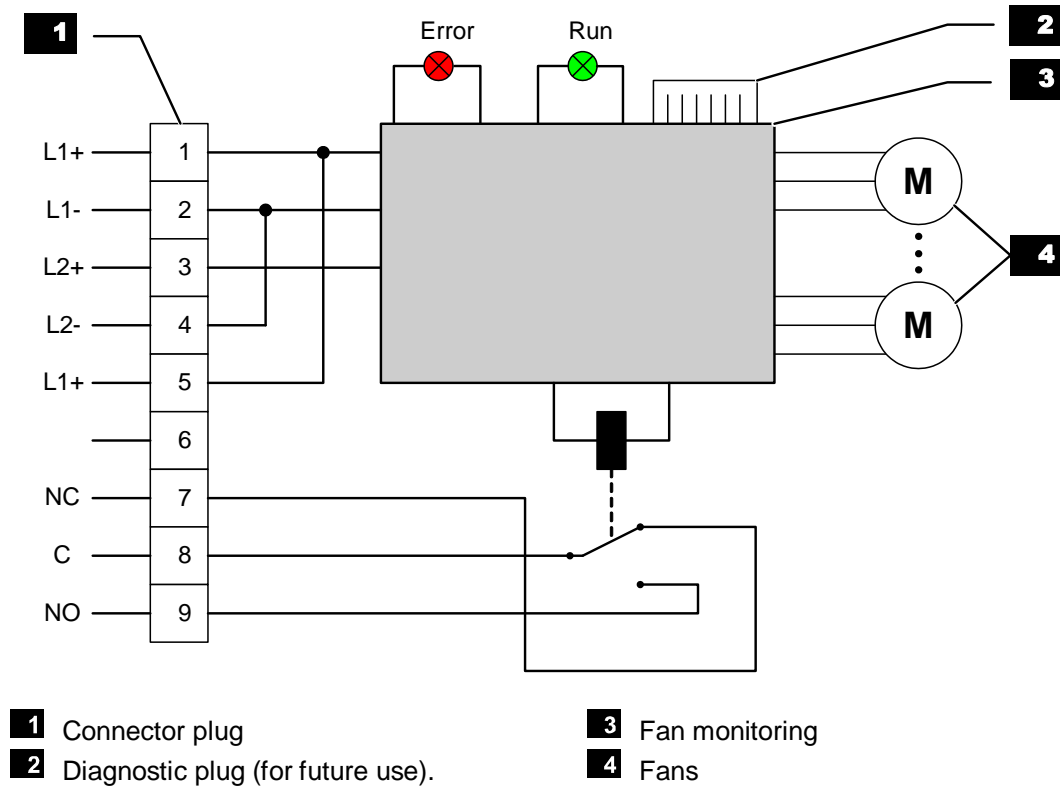


Figure 2: Block Diagram for X-FAN

3.4.2 Mechanical Structure

The following figures show the 19-inch system fan X-FAN 15 02:

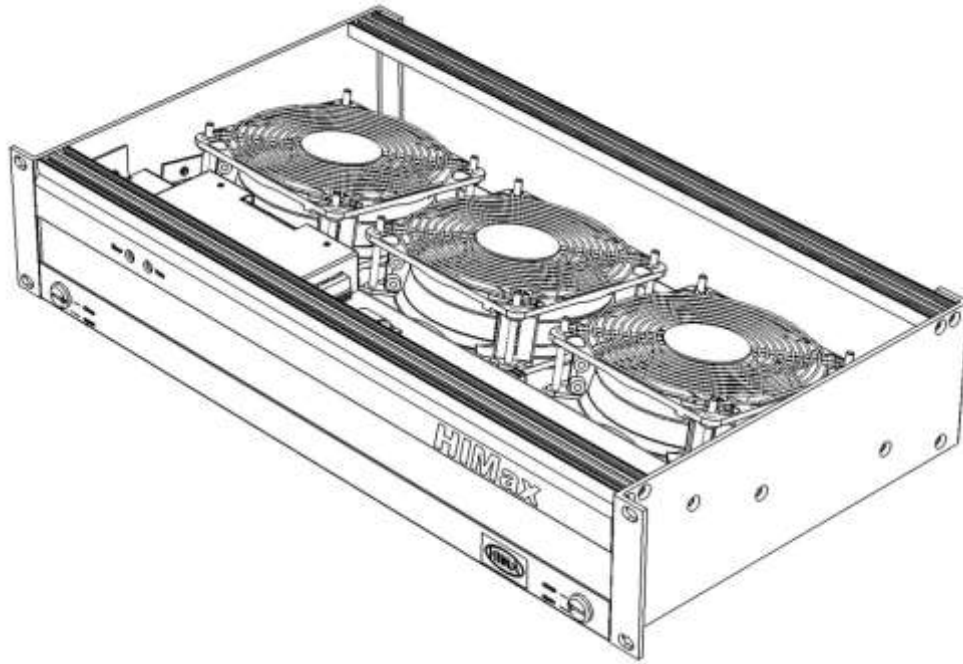


Figure 3: General View



Figure 4: Front View

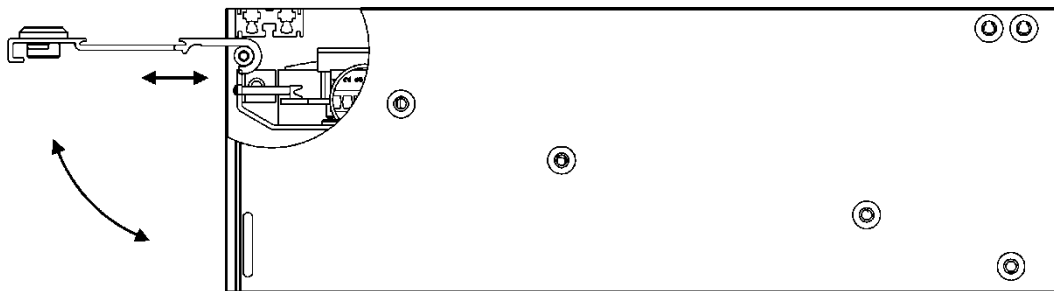


Figure 5: Side View with Open Swiveling Cover Plate

3.4.3 Power Supply

Only connect the system fan to 24 V power supply units that meet SELV or PELV requirements. The power supply can be set up redundantly. The power supply must be connected to terminals 1 to 4 of the connector plug, see Table 3.

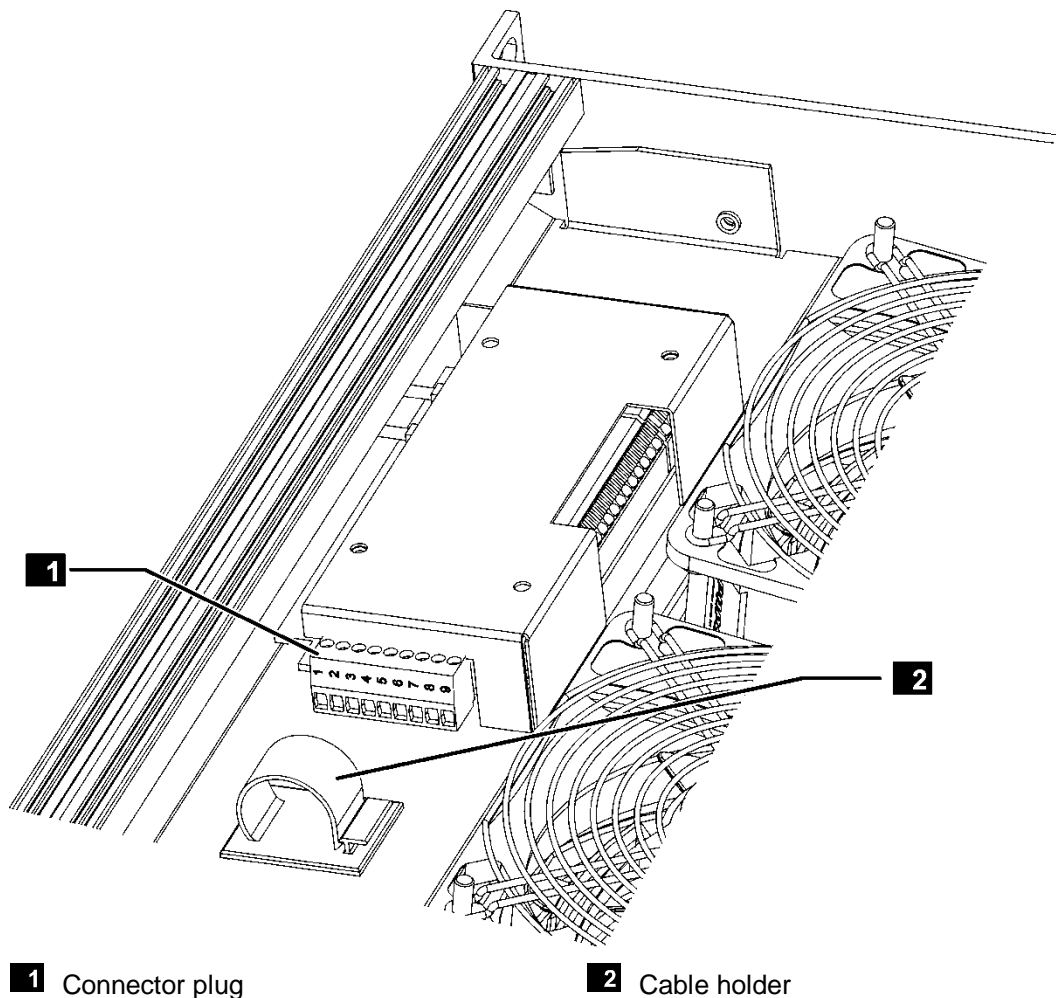
Using redundant power supply increases the system fan availability. If the system fan receives power from parallel sources, it uses the voltage with the highest voltage potential.

If only one power supply is used, connect it to terminals 1 and 2. In addition, a jumper must be connected between terminals 5 and 3 so that the fan monitoring does not diagnose a voltage loss on L2.

The fan speed is slightly dependent on the supply voltage level since the voltage powering the fan is not stabilized.

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Ensure proper polarity when connecting the power supply. Otherwise the fans will not function. Protective diodes prevent damage caused by reversed polarity.



1 Connector plug

2 Cable holder

Figure 6: Connector Plug for System Fan

3.4.3.1 Connector Plug

The connector plug is used to connect the system fan to the power supply.

The following table lists the pin assignment:

Terminal	Def.	Function
1	L1+	Power supply L1+
2	L1-	Power supply L1-
3	L2+	Power supply L2+
4	L2-	Power supply L2-
5	L1+	Terminal with the same potential as the L1+ power supply; use a jumper to L2+ (terminal 3) if only one power supply is connected.
6	-	-
7	NC	Normally closed contact (break contact), Fault relay (switching load 4 A at 24 V)
8	C	Common contact Fault relay (switching load 4 A at 24 V)
9	NO	Normally open contact (make contact), Fault relay (switching load 4 A at 24 V)

Table 3: Connector Plug Contacts

3.4.4 Fan Monitoring

The fan monitoring continuously checks the function of the system fan. If a fault occurs, the fault relay drops out and the red *Error* LED is lit.

The following faults are detected:

- One of the two input voltages has failed.
- One or more fans are blocked.
- The fan speed is too low.
- The input voltage is too low.
- The connection to one or more fans is interrupted (open circuit).

Fault Relay

The fault relay contacts can be used to connect optical and acoustic detectors with current consumption up to 4 A.

The following table describes the statuses of the fault relay contacts:

C-NO	C-NC	Relay state
Open	Closed	De-energized, fault within the system fan
Closed	Open	Energized, normal function

Table 4: Fault Relay Contacts

3.4.5 Diagnostic Plug

Diagnostic plug for future use.

3.5 Product Data

X-FAN	
Number of fans	2...4
Material	Aluminum
Operating voltage	24 VDC, L1+/L1- and L2+/L2- -15...+20 %, $r_p \leq 5$ %. Ensure proper polarity!
Supply	Redundant L1+ and L2+ or only via L1+
Current consumption	max. 4 A
X-FAN 10 01	2 A
X-FAN 15 01	3 A
X-FAN 15 02	3 A
X-FAN 18 01	4 A
X-FAN 10 03	0.4 A
X-FAN 15 03	0.6 A
X-FAN 15 04	0.6 A
X-FAN 18 03	0.8 A
Fault relay switching current	30 VDC / 4 A
Operating temperature	0...+60 °C
Storage temperature	-40...+85 °C
Humidity	max. 95 % relative humidity, non-condensing
Degree of protection	IP20
Sound pressure level ¹⁾ :	
X-FAN 10 01	approx. 63 dB (A) at 24 VDC
X-FAN 15 01	approx. 65 dB (A) at 24 VDC
X-FAN 15 02	approx. 65 dB (A) at 24 VDC
X-FAN 18 01	approx. 67 dB (A) at 24 VDC
X-FAN 10 03	approx. 45 dB (A) at 24 VDC
X-FAN 15 03	approx. 47 dB (A) at 24 VDC
X-FAN 15 04	approx. 47 dB (A) at 24 VDC
X-FAN 18 03	approx. 49 dB (A) at 24 VDC
Air flow rate:	
X-FAN 10 01	240...440 m ³ /h
X-FAN 15 01	360...660 m ³ /h
X-FAN 15 02	360...660 m ³ /h
X-FAN 18 01	480...880 m ³ /h
X-FAN 10 03	160...250 m ³ /h
X-FAN 15 03	240...375 m ³ /h
X-FAN 15 04	240...375 m ³ /h
X-FAN 18 03	320...500 m ³ /h
Dimensions (H x W x D):	
X-FAN 10 01	88.1 x 358 x 259.5 mm
X-FAN 15 01	88.1 x 505.5 x 259.5 mm
X-FAN 15 02	88.1 x 483 x 259.5 mm
X-FAN 18 01	88.1 x 594 x 259.5 mm
X-FAN 10 03	88.1 x 358 x 259.5 mm
X-FAN 15 03	88.1 x 505.5 x 259.5 mm
X-FAN 15 04	88.1 x 483 x 259.5 mm
X-FAN 18 03	88.1 x 594 x 259.5 mm
¹⁾ Data refers to one system fan (running at free air). The values were measured under operating-like conditions.	

X-FAN	
Weight:	
X-FAN 10 01	approx. 2.7 kg
X-FAN 15 01	approx. 3.5 kg
X-FAN 15 02	approx. 3.5 kg
X-FAN 18 01	approx. 4.5 kg
X-FAN 10 03	approx. 2.7 kg
X-FAN 15 03	approx. 3.5 kg
X-FAN 15 04	approx. 3.5 kg
X-FAN 18 03	approx. 4.5 kg

Table 5: Product Data

4 Start-Up

This chapter describes how to install the system fans. For more information, refer to the HIMax system manual (HI 801 001 E).

4.1 Installation and Mounting

When choosing the mounting position for the system fans, observe the operating conditions.

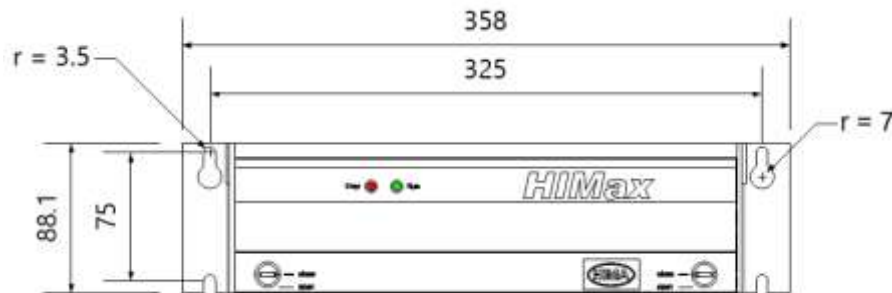


Figure 7: Dimension Drawing for System Fans 10 01 and 10 03

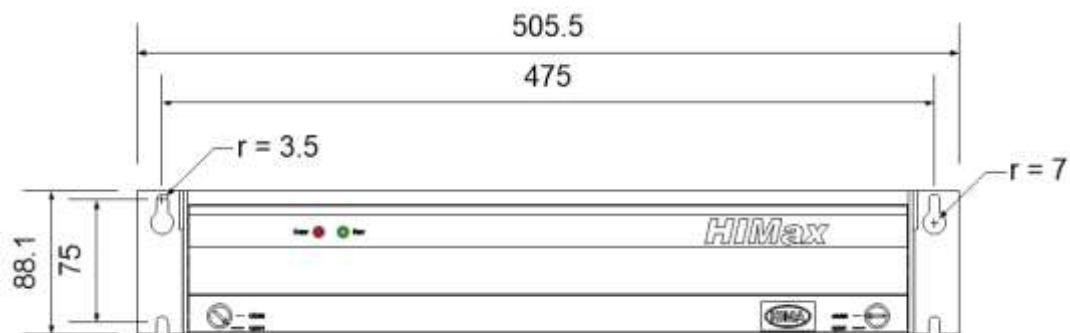


Figure 8: Dimension Drawing for System Fans 15 01 and 15 03

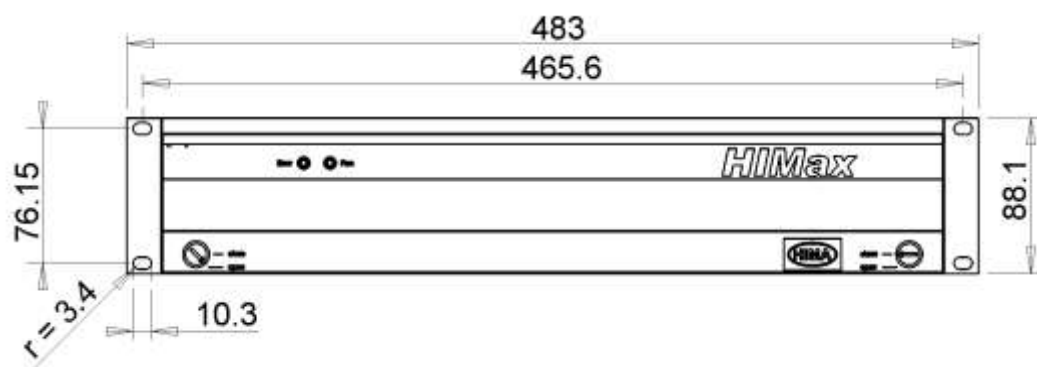


Figure 9: Dimension Drawing for System Fans 15 02 and 15 04

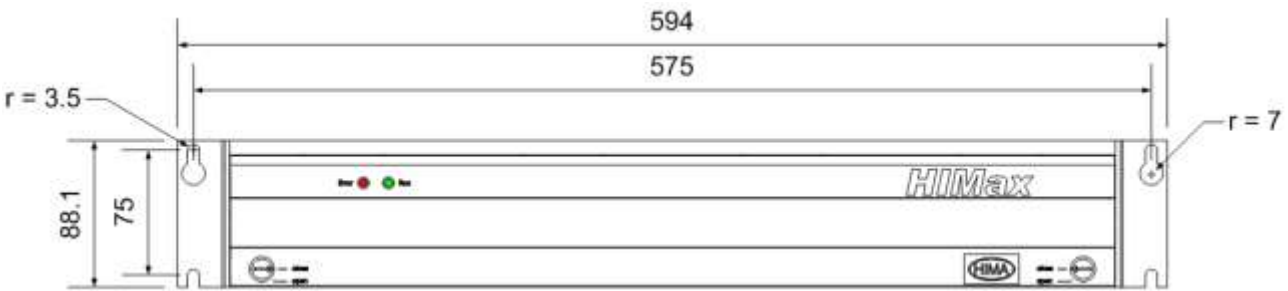


Figure 10: Dimension Drawing for System Fans 18 01 and 18 03

4.1.1 Mounting the System Fan on the Backplane

The system fan has a right and left mounting flange. To fasten the system fan to a backplane (e.g., a mounting plate), one keyhole slot and one groove are milled out of the back of each mounting flange. The screws and washers required for mounting the system fan are not included in delivery.

Observe the following points when attaching the system fan:

1. Fasten the system fan to a backplane (e.g., mounting plate) above the base plate.
2. The spaces between the threaded holes are given in the dimension drawings, see Figure 7, Figure 8 and Figure 10.
3. To attach the system fan, use bolts and washers of size M6, see Figure 11.
4. To mount the M6 bolts, drill holes and tap threads.
5. Screw the bolts and washers half way in without canting them.
6. Lock the system fan into the bolts so that it fits correctly into the locking bolts on the base plate.
7. Screw the system fan to the backplane firmly.
8. Establish a conductive connection between backplane and ground.
9. Ensure that the mechanical connections are secure.

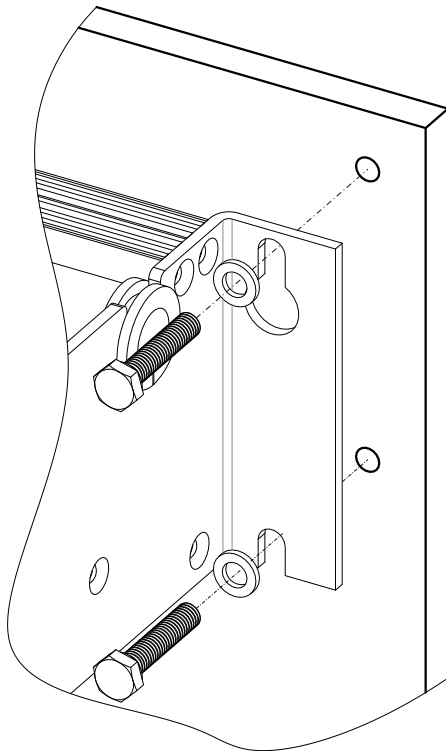


Figure 11: Attaching the System Fan

4.1.2 Mounting the 19-inch System Fans X-FAN 15 02 and X-FAN 15 04

The system fan is equipped with mounting flanges on the right and left sides so that it can be fastened to the 19-inch frame. Each of the mounting flanges is equipped with 2 oblong holes.

The following points describe the attachment of the 19-inch system fan. To this end, use the HIMA fastening parts kit (M 2212, part no. 99 0000115) composed of cage nuts, Phillips head screws M6 x 16 and washers. The fastening parts kit is not included within the scope of delivery of the system fan.

1. Fasten the system fan to the 19-inch frame.
2. Lock the system fan into place so that it fits correctly into the locking bolts on the base plate.
3. Fasten the system fan to all four oblong holes, see Figure 12 below.
4. Establish a conductive connection between system fan and ground.
5. Ensure that the mechanical connections are secure.

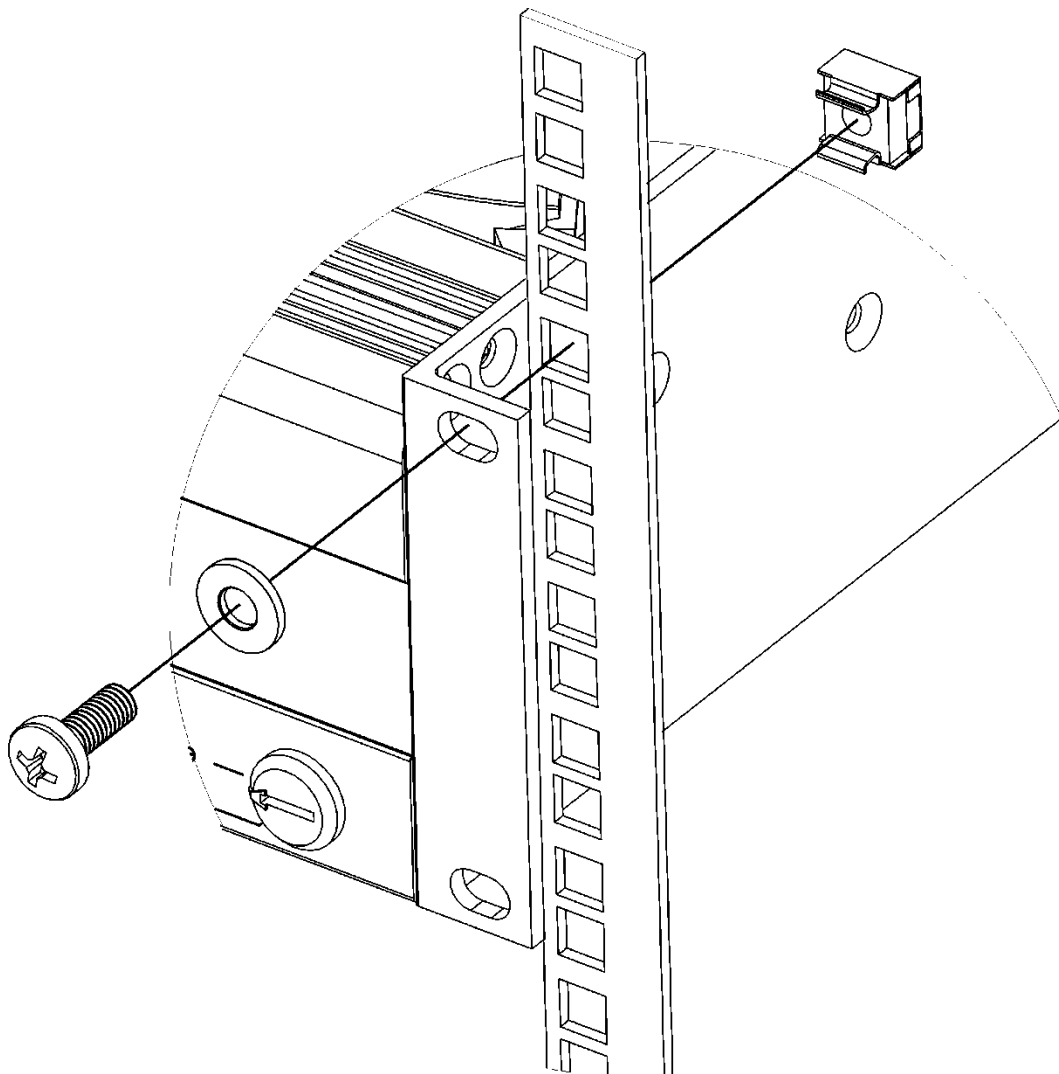


Figure 12: Attaching the 19-inch System Fan

4.1.3 Connecting the Power Supply

Use the following wires to connect the connector plugs:

Wire	Cross-section	Tightening torque
Single-wire	max. 1.5 mm ²	0.2...0.25 Nm
Multiple-wire	max. 1.5 mm ²	0.2...0.25 Nm
Finely stranded	max. 1.5 mm ²	0.2...0.25 Nm
Finely stranded with wire end ferrule	max. 1.5 mm ²	0.2...0.25 Nm

Table 6: Terminal Cross-Sections

Tools and utilities:

- Screwdriver, slotted 0.4 x 2.5 mm
- Wire stripper

1. Strip the insulation from the ends of the connector cables to a length of 6 mm.
2. Plug the stripped connector cable ends into terminals 1 to 4 of the connector plug in accordance with Table 3.
3. Use the screwdriver to tighten the terminals.

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If only one power supply is used, connected it to terminals 1 and 2. In addition, a jumper must be connected between terminals 5 and 3 so that the fan monitoring does not diagnose a voltage loss on L2.

5 Operation

Handling of the system fan during operation is not required.

5.1 Diagnosis

LEDs on the front side indicate the state of the system fan, see Chapter 3.4.4.

The state of the system fan can be evaluated in the controller or the control system via the fault relay.

6 Maintenance

Defective system fans must be replaced with faultless system fans of the same type or with an approved replacement model.

Only the manufacturer is authorized to repair the system fans.

When replacing system fans, observe the instructions specified in the system manual (HI 801 001 E) and safety manual (HI 801 003 E).

Only personnel with knowledge of ESD protective measures may modify or extend the HIMax system.

CAUTION



Electrostatic discharge can damage the electronic components within the systems!

6.1 Maintenance Measures

The lifetime of the system fans depends on the operating temperature.

6.1.1 Replacing System Fans

HIMA recommends observing the instructions for replacing the system fans:

- Every 6 years, at normal operating temperature (< 40 °C).
- Every 3 years, at higher operating temperature (> 40 °C).

7 Decommissioning

Remove the power supply to decommission the system fan.

8 Transport

To avoid mechanical damage, the components must be transported in packaging.

Always store the components in their original product packaging. This packaging also provides protection against electrostatic discharge (ESD). Notice that the product packaging alone is not suitable for transport.

9 Disposal

Industrial customers are responsible for correctly disposing of decommissioned hardware. Upon request, a disposal agreement can be arranged with HIMA.

All materials must be disposed of in an ecologically sound manner.



Appendix

Glossary

Term	Description
AI	Analog input
AO	Analog output
ARP	Address resolution protocol, network protocol for assigning the network addresses to hardware addresses
COM	Communication module
CRC	Cyclic redundancy check
DI	Digital input
DO	Digital output
EMC	Electromagnetic compatibility
EN	European norm
ESD	Electrostatic discharge
FB	Fieldbus
FBD	Function block diagrams
HW	Hardware
ICMP	Internet control message protocol, network protocol for status or error messages
IEC	International electrotechnical commission
Interference-free	Inputs are designed for interference-free operation and can be used in circuits with safety functions
MAC	Media access control address, hardware address of one network connection
PADT	Programming and debugging tool (in accordance with IEC 61131-3), PC with SILworX
PE	Protective earth
PELV	Protective extra low voltage
PES	Programmable electronic system
R	Read, the variable is read out
R/W	Read/Write, column title for system variable type
Rack ID	Base plate identification (number)
r_P	Peak value of a total AC component
SB	System bus (module)
SC/OC	Short-circuit/open-circuit
SELV	Safety extra low voltage
SFF	Safe failure fraction, portion of faults that can be safely controlled
SIL	Safety integrity level (in accordance with IEC 61508)
SILworX	Programming tool
SNTP	Simple network time protocol (RFC 1769)
SRS	System.Rack.Slot, addressing of a module
SW	Software
TMO	Timeout
W	Write, the variable receives a value, e.g., from the user program
WD	Watchdog, device for monitoring the system's correct operation Signal for fault-free process
WDT	Watchdog time

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HIMax and SILworX are registered trademark of:

HIMA Paul Hildebrandt GmbH

Albert-Bassermann-Str. 28

68782 Brühl, Germany

Phone: +49 6202 709-0

Fax: +49 6202 709-107

HIMax-info@hima.com

www.hima.com



SAFETY
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