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AEG

SVS POWER SUPPLY SYSTEMS

THYRO-S

THYRISTOR-SCHALTER THYRO-S 1S...H1

THYRISTOR SWITCH THYRO-S 1S...H1

Betriebsanleitung
Operating Instructions

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SAFETY INSTRUCTIONS

The following safety and operating instructions must be carefully read before assembly, installation and commissioning.

Obligation to give instructions

The following safety and operating instructions must be carefully read before initial assembly, installation and commissioning of Thyro-A by those persons working with or on Thyro-A.

These operating instructions are part of the Thyristor switch Thyro-S.

The operator of this device is obliged to provide, without restriction, these operating instructions to all persons transporting, commissioning, maintaining or performing other work on this device.

In accordance with the Product Liability Act, the manufacturer of a product has an obligation to provide explanations and warnings as follows:

- the use of the product other than for the intended use,
- the residual product risk as well as
- operating errors and their consequences.

The information given below must be understood in this respect. It is to warn the product user and protect him and his systems.

Proper use

- The Thyristor switch is a component which may only be used for control and regulation of electrical energy.

- The Thyristor switch may at most be operated using the maximum admissible connected load according to information on the type plate.

- The Thyristor switch may only be operated in connection with a suitable and series connected power supply disconnecting device.

- As a component, the Thyristor switch is unable to operate alone and must be projected for its intended use to minimize residual risks.

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The Thyristor switch may only be operated in the sense of its intended use, otherwise hazards to persons (e.g. electric shocks, burns) and systems (e.g. overload) may arise.

Residual hazards of the product

- Even in case of proper use, should a fault occur, it is possible that control of currents, voltages and power is no longer performed in the load circuit by the Thyristor switch.

In case of destruction of the power components (e.g break-down or high resistance), the following situations are possible: power interruption, half-wave operation, continuous power flow. If such a situation occurs, then load voltages and currents are produced from the physical dimensions of the overall power circuit. It must be ensured by system design that no uncontrolled large currents, voltages or power occur.

Maloperation and its results

- With maloperation it is possible that power, voltage or flow levels which are higher than planned reach the Thyristor switch or load. On principle, this can lead to the Thyristor switch or load being damagad.

Transport

- Thyristor switches are only to be transported in their original packaging (protection against damage e.g. due to jolting, knocking, soiling).

Installation

- If the Thyristor switch is brought into the operation room from a cold environment, moisture can occur. Prior to it being commissioned, the Thyristor switch must be absolutely dry. Therefore, wait for a minimum of two hours before commissioning.

Connection

- Prior to connection, it must be ensured that the voltage information on the type plate corresponds with the mains voltage.

- The electrical connection is carried out at the designated points with the required cross section and the appropriate screw cross sections.

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Operation

- The Thyristor switch may only be connected to the mains voltage if it has been ensured that any hazard to people and system, especially in the load section, has been eliminated.

- Protect the device from dust and moisture

- Do not block vents.

Maintenance, service, malfunctions



CAUTION
For maintenance and repair work the Thyristor switch must be disconnected from all external voltage sources and protected against restarting. The voltage-free state is to be determined by means of suitable measuring instruments. This work is only to be carried out by a skilled electrician. The electrical regulations which are locally valid are to be adhered to.



CAUTION
The Thyristor switch contains dangerous voltages. Repairs may only be carried out by qualified and trained maintenance personnel.



CAUTION
Danger of electric shock. Even after disconnection from the mains voltage, capacitators may still contain a dangerously high power level.



CAUTION
Danger of electric shocks. Even when the Thyristor switch is not triggered, the load circuit is not disconnected from the mains.



ATTENTION
Different components in the power section are screwed into place using exact torques. For safety reasons, power component repairs must be performed by AEG SVS Power Supply Systems GmbH.

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Safety regulations

Important instructions and explanations

The skilled personnel assembling and disassembling the devices, commissioning them and maintaining them must know and observe these safety regulations.



CAUTION
This instruction indicates work and operating procedures to be observed exactly to exclude hazards to persons.



ATTENTION
This instruction refers to work and operating procedures to be observed exactly to avoid damage or destruction of Thyro-S or parts thereof.



REMARK
This is where remarks on technical requirements and additional information is given which the user must observe.

Accident prevention rules

It is imperative that the accident prevention rules of the country of application and the generally applicable safety regulations are observed.



CAUTION
Before commencing any work on Thyro-S, the following safety regulations must be observed:

- switch voltage-free
- secure against switching on
- determine voltage-free state
- ground and short-circuit device
- cover or block neighbouring parts under voltage.

Qualified personnel

Thyro-S may only be transported, installed, connected, commissioned, maintained and operated by specialists in command of the respective applicable safety and installation regulations. All work must be monitored by the responsible specialist personnel.

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Intended use



CAUTION
The Thyristor switch may only be employed in the sense of its purpose of use (see the section of the chapter Safety instructions under the same name), otherwise hazards to persons (e.g. electric shocks, burns) and systems (e.g. overload) may occur.

Any unauthorized reconstruction and modification of Thyro-S, use of spare and exchange parts not approved by AEG SVS as well as any other use of Thyro-S is not permitted.

The person responsible for the system must ensure that
- safety and operating instructions are available and observed,
- operating conditions and specifications are observed,
- protective installations are used,
- maintenance personnel are immediately notified or Thyrs-S is immediately put out of commission if abnormal voltages or noises, higher temperatures, vibrations or similar occur, to determine the causes.

These operating instructions contain all information required by specialists for the use of Thyro-S. Additional information and notes for unqualified persons and for the use of Thyro-S outside of industrial installations are not contained in these operating instructions.

The warranty given by the manufacturer is only valid if these operating instructions are observed and adhered to.

Warranty

No liability is assumed for employing applications not provided for by the manufacturer. The responsibility for the necessary measures to avoid hazards to persons and property is borne by the operator or the user. In case of complaints, please notify us immediately stating:

Type name	Production number
Complaint	Ambient conditions
Operating mode	Duration of use

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Guidelines

The CE mark on the device confirms adherence to the general EC guidelines for 72/23 EEC – low voltage and for 89/339 EEC electromagnetic compatibility if the instructions on installation and commissioning described in the operating instructions are observed.

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Remarks on the present operating instructions and Thyro-S

Validity

These operating instructions refer to the latest technical specification of Thyro-S at the time of publication. The contents are not subject matter of the contract, but serve only as information. Modification of information contained in these operating instructions, especially technical data, operation, dimensions and weights, remain reserved at any time. AEG SVS reserves the right to content modifications and technical changes within the present operating instructions without obligation to notification.
AEG SVS is not obliged to update these operating instructions constantly.

Loss of warranty

Our supplies and services are subject to the general terms and conditions of delivery of the electrical industry as well as our general sales conditions. Any complaints on goods delivered are to be submitted, together with the delivery note, within eight days of receipt.

All guarantees made by AEG SVS and its dealers will be cancelled without prior notice if other than original AEG SVS spare parts or spare parts purchased by AEG SVS are used for maintenance and repair.

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1. Introduction

Thyro-S meets the demands for simple assembly, speedy commissioning and safer operation.

For transport, assembly, installation, commissioning, operation and decommissioning, it is essential that the safety instructions included in these operating instructions are observed and made available to all persons handling this product.

In case of uncertainties or missing information, please contact your supplier.

1.1 General

Thyro-S is a Thyristor switch with the ability to communicate. It will also be referred to as Power Controller or simply controller. It can be used wherever voltages or currents need to be controlled in processing technology. With its good coupling ability to process and automation technology, high control precision and simple handling, Thyro-S is also future-orientated for new applications. The Thyro-S is suitable for a direct supply of ohmic loads.

1.2 Specific characteristics

Thyro-S has a wide range of distinguishing features, for instance
- easy handling
- type range 230-500 Volts, 8-280 A, single phase
- ohmic load
- operating modes 1:1, as well as 1:2, 1:3 and 1:5 (e.g. for commissioning)
- control with 24V signal (from 3V) via optional bus module
- series system interface
- electrical separation according to EN 50178 chapt. 3

Options:
- bus connections via bus module (bus adapter) coupling to different bus systems, e.g. Profibus DP, Modbus RTU, other bus systems on request.

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1.3 Type designation

The type designation of the Thyristor switch is derived from the construction of its power section:

Thyro-S 1S	Thyristor switch with single phase power section suited for single phase loads

Beispiel

...400-	with 400 Volt type voltage
...280	280 with 280 Amp type current
H	with integrated semi-conductor fuse
F	with ventilator (only 280 Amp types)
1	designation Thyro-S, 2002 series

The complete type range can be found in chapter 9, TYPE OVERVIEW.

2. Functions

2.1 Operating modes

Full wave switch

Depending on the digital set point signal the mains voltage is switched. In the operating mode 1:1 almost no harmonics are created in the mains frequency. Whole multiples of the mains periods are always switched.
For commissioning etc, a reduced supply can be switched with the S1 switch or via the optional bus module, the control system thereby either forces the switching of every 2. wave or an equal number of positive and negative half waves.

In all operation modes d.c. components are avoided:

Operating mode	Load voltage
1:1	every mains full wave (nom. oper. mode, default setting)
1:2	every 2. mains full wave
1:3	every 3. mains full wave (d.c. free)
1:5	every 5. mains full wave (d.c. free)

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2.1.1 Digital set point inputs

The Thyristor switch Thyro-S is equipped with two set point inputs which are electrically isolated from the mains for triggering signals:

• Set point input 1[1]	logic input 0-24V DC (R_i > 3.3 kΩ)	IN: U_{IN} > 3V
• Set point input 2	via bus module	

2.2 Indications

The LEDs on the front signal the following states:

• ON	GREEN	operating indication, power supply controller device

Blinking indications are described in chapter 3.2.

Monitoring of the mains voltage

The limiting values of the voltage are -57% for undervoltage monitoring and +10% for overvoltage monitoring. This produces the following absolute limiting values:

Type	Undervoltage	Overvoltage
230V	99V	253V
400V	172V	440V
500V	215V	550V

2.2.1 Equipment temperature monitoring

The control board is equipped with a temperature monitor.
If a fault occurs, the LED blinks.

2.2.2 Ventilator monitoring

The separately ventilated power controllers (F) are fitted with thermal monitoring. The temperature of the heat sink is measured. In case of a temperature overrange a fault indication (red LED) ensues.

1) see also chapter 4.4 Digital set point input

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3. Operation

3.1 Configuration switch S1

A 2-pole DIP switch is situated at the front behind the hood. The individual switches are marked from 1-2 starting from the bottom and must be set before operation. They are only read in once when switched on (mains recovery). For safety reasons further operation is carried out with the hood closed.

S1-	1	2	Operating mode
	0	0	1:1 operation, nom. Oper. mode (default setting)
	1	0	1:2 operation
	0	1	1:3 operation
	1	1	1:5 operation

For operations where initially no nominal load is possible (e.g.drying) reduced power can be controlled by Thyro-S independently.
With 1:2 operation each 2. cycle is switched, with 1:3 and 1:5 operation half cycles are switched with alternating polarity so that while switched on the load is supplied with d.c.-free energy.

3.2 Diagnosis / status indications

Faults can occur in the load circuit and in the controller itself or from the mains. Diagnosis of unexpected operating behaviour is performed by LEDs on the front panel of the control device.

Description	**Red LED**	**Description**
Frequency fault	LED blinks	outside 47Hz to 63Hz
SYNC fault	LED blinks	when switching on or zero crossing outside permissible tolerance range in operation
Temp. monitoring	LED blinks	Temp. monitoring responded (control board or contr. section)
Flash values invalid	LED blinks	Controller fault
Corr. values invalid	LED blinks	Parameter fault
Undercurrent	LED on	Mains fault

Tab. 1 Status indications

Further status indications can be called up via system interface.

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4. External connections

4.1 Power supply for Thyro-S

Connecting the power supply is carried out as shown in the figures and TECHNICAL DATA.

4.2 Power supply for the control device

The control device is supplied directly from the power section (terminals U1, X1:1.2). This voltage also serves as mains synchronization. The mains connection is equipped for input voltages of U_{nom} -57% to +10% and nominal frequencies of 47Hz to 63Hz. Both terminals (X1:1.2 1.5mm² grid 3.81) are internally bridged. If a phase is connected to X1, a fused connection is necessary (figs. 3,7).

4.3 Digital set point input

The set point input is a logic input. Between the terminals X22:1 and 2 it can be operated with a relay contact.
Between terminals X22:1 (signal), 3 (ground) it can be triggered with up to 24V d.c. With input voltages > 3 Volt it recognises the signal ON.
The signal terminals can be connected with up to 1.5mm², in grid 3.5.

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4.4 Block connection diagram

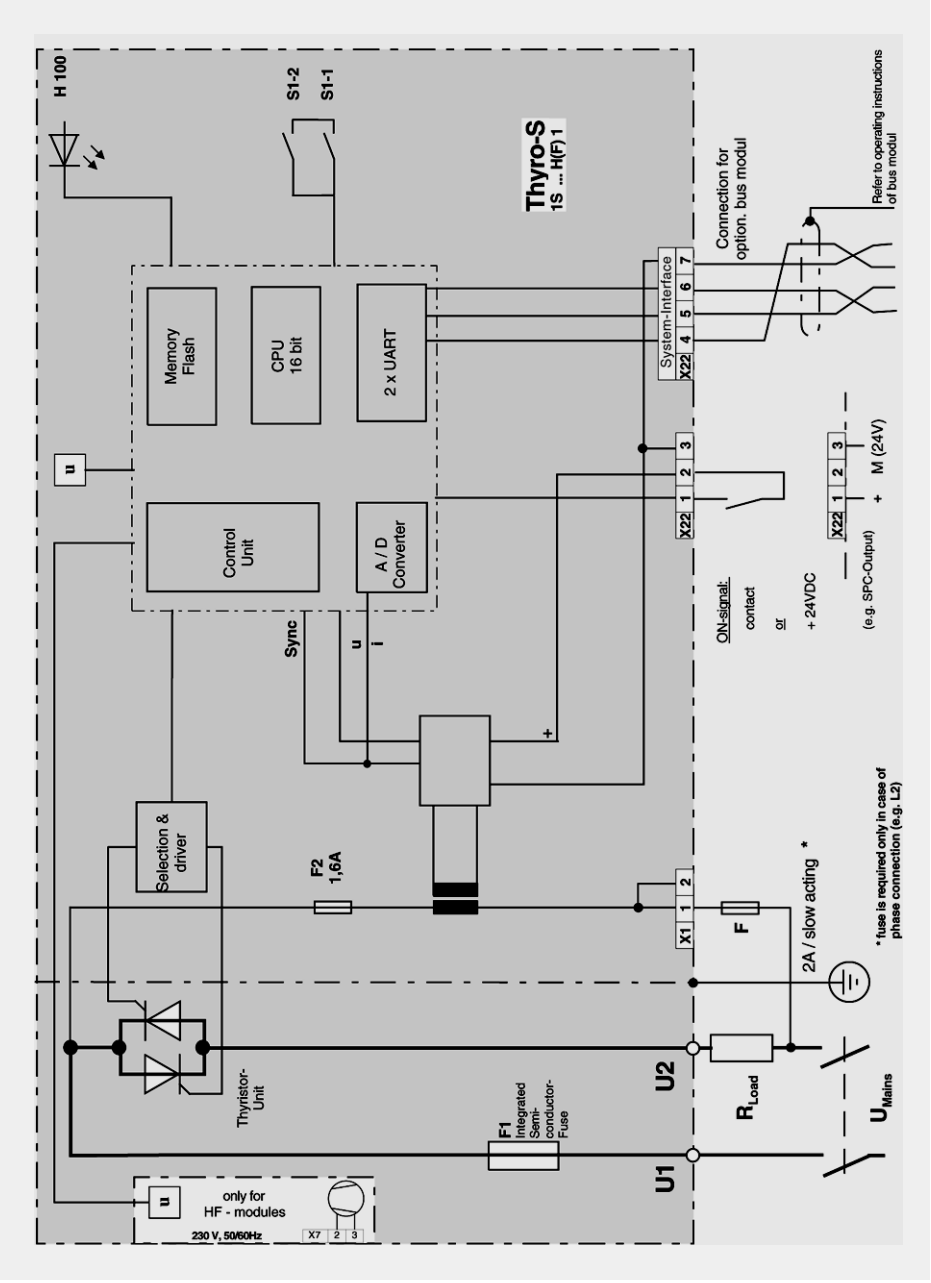


Fig. 1: Block connection diagram and connecting plan

The block connection diagram shows the functions of the H 1 design. Central control element is a μ-controller.

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4.5 Connections and terminal strips

This chapter describes all terminal strips and socket connectors.

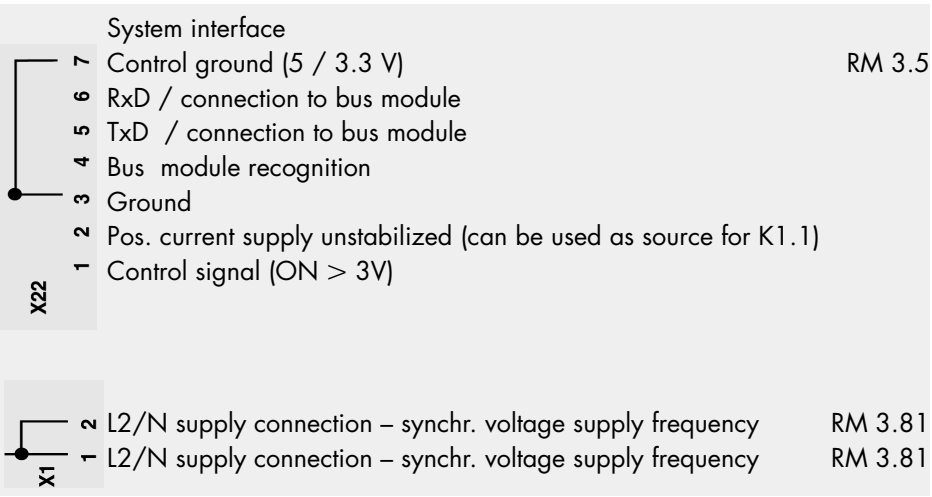


Fig. 2 Terminal plan

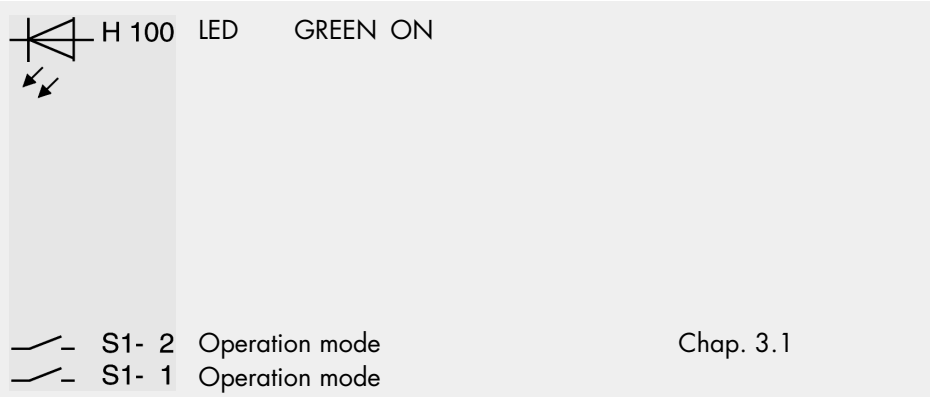


Fig. 3 Operation

5. Interfaces

With its system interface the Thyristor switch Thyro-S can be connected via an optional bus module to, for example, Profibus DP or Modbus RTU (other bus modules available on request). Description and connections can be taken from the instructions of the respective components.

REMARK

The access to set value, actual values and parameters made possible through bus provides further useful functions for application.

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6. Mains load optimization

Thyro-S is not suitable for mains load optimization in multiple controller applications. If mains load optimization is necessary, Thyristor controllers of type Thyro-A or Thyro-P must be used.

7. Connecting diagrams

Thyro-S can be employed in single phase switch and in three phase switches which can be transposed to single phase switches, e.g. star connections with MP conductor or N conductor and in open delta connection.
It is possible to apply 2 identical Thyro-S as a three phase saver circuit (with delta load or star without N), if the triggering signal for both controllers is set up at the same time. See Fig. 5.

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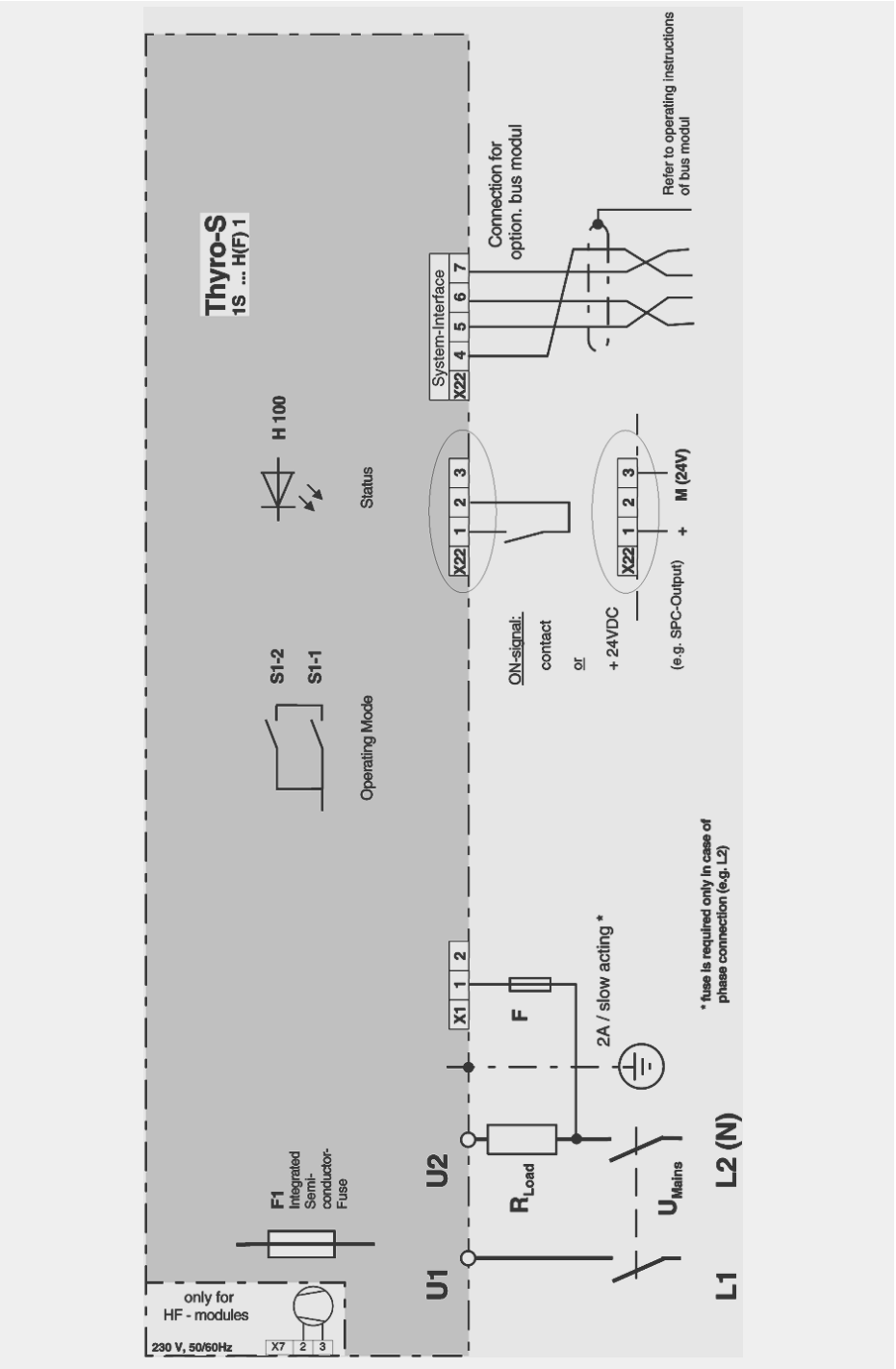


Fig. 4 Connecting diagram Thyro-S 1S...H1

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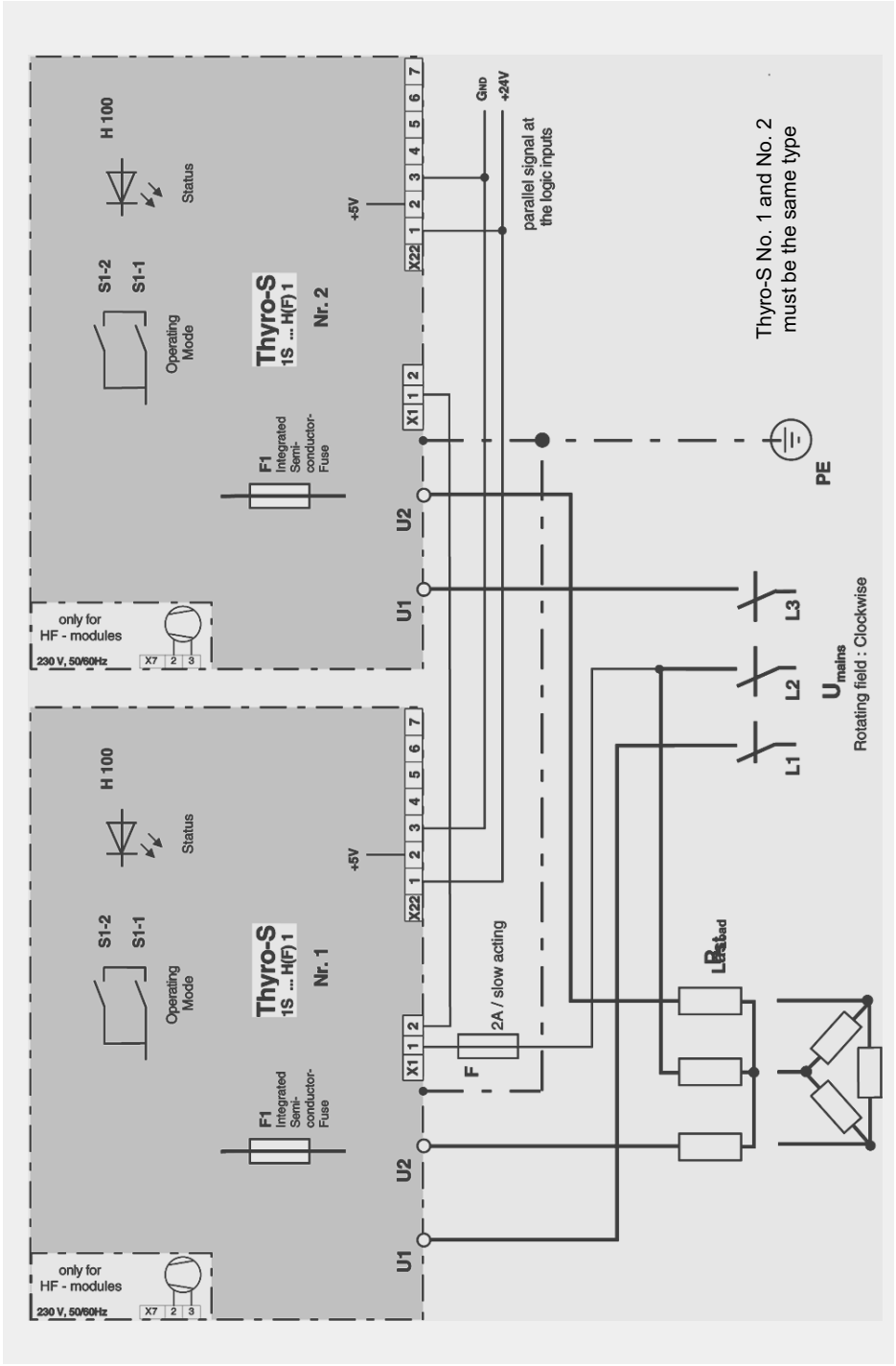


Fig. 5 Connecting diagram 2x Thyro-S 1S...H1

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8. Special remarks

8.1 Installation

Thyro-S requires a vertical fitting position. With cabinet mounting sufficient ventilation of the cabinet must be ensured. The distance between the Power Controller and the cabinet ceiling or other mountings should be at least 150mm. The distance below the Power Controller should be at least 100mm. Heating up of the device by heat sources must be avoided. The dissipation of the Power Controller is stated in the Type overview table.



ATTENTION
Grounding must be carried out according to local electricity board regulations! (grounding screw for protective conductor connection on fastening adapter is provided).
The grounding also serves EMV devices (Y capacitor 4.7 nF).

For Thyro-S with type currents 8A, 16A or 30A an adapter can be delivered for the 35mm top-hat rail assembly.

8.2 Commissioning

The device must be connected to the mains and the associated load according to the corresponding connecting plans.
On delivery the device is parameterized and adjusted to the respective power section. If a different operating mode is desired, then it must be set with DIP fix 1 and 2 by the user (commissioning phase).



ATTENTION
Heat sinks and neighbouring plastic parts can become hot during operation (> 70°C)! Provided sign should be fixed nearby Thyro-S.

8.3 Service

The devices delivered have been produced under quality standard ISO 9001.
Should nevertheless faults or problems occur, our
24-hour service hotline: Tel: 02902 / 763-100.
is at your service.

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8.4 Checklist

- **LED ON greenn lights up** -> mains voltage available

- **LED ON green does not light up**
  Check fuse control 500V 1.6 A, if defective, check external wiring, also applies to faults of external fusing, check Power Controller fusing. If fuse is defect then check load and wiring to load. Synchronization voltage is supplied to X1.1. Check 5 Volt to X22.2. If this voltage is absent or too low, there is a defective component.

- **Supply available but no load current**
  Check connection signal (digital set point) is present
  Check for interruption in load circuit
  Check blinking LED signals (chapt. 3.2)

- **Load current does not have expected value**
  Check connection signal (digital set point) for continuous signal ON
  With optional bus module
  Check bus connection signal (bus set point) for continuous signal ON
  Check all parallel load resistances for current conduction

- **Load current flows uncontrolled**
  Check connections in the controller (with initial commissioning)
  In rare cases a Thyristor short-circuit can occur

9. Type overview

Thyristor switches with integrated semiconductor and system bus interface.

		Type capacity [kW]				Dimens. in mm / kg						
Type 1S	Current	230V	400V	500V	Dissi-pation [W]	W	H	D	Weight	Dim. draw.	Current transf.	Fuse F1
H 1	8	1.8	3.2			40	121	127	0.6	850		12
H 1	16	3.7	6.4	8	30	45	121	127	0.7	851	40	20
H 1	30	6.9	12	15	47	45	121	127	0.7	851	40	40
H 1	45	10	18	22.5	48	52	190	182	1.7	853	100	63
H 1	60	14	24	30	80	52	190	182	1.7	853	100	100
H 1	100	23	40	50	105	75	190	190	1.9	854	100	180
H 1	130	30	52	65	150	125	320	237	4	856	150	200
H 1	170	39	68	85	210	125	320	237	4	856	200	315
HF 1	280	64	112	140	330	125	370	237	5	858	300	350

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10. Technical data

Type voltage
230 Volt -57% +10%
400 Volt -57% +10%
500 Volt -57% +10%

Mains frequency
all models 47Hz bis 63Hz; Δf=6Hz;
max. frequency change 5% per half wave

Load description
ohmic load

Operating modes

Name	Load signal, with digital set point = ON
1:1	all full wave (default setting)
1:2	every 2. mains full wave
1:3	every 3. mains half wave (d.c. free)
1:5	every 5. mains halve wave (d.c. free)

Digital set point inputs (connection signals)
The Thyro-S has 2 set point inputs. The set point inputs are safely disconnected from the mains (SELV, PELV).

Set point 1:	Logic input 0-24V	$R_i > 3{,}3k\Omega$	ON > 3V
Set point 2:	System interface, connection from superset automation system via optional bus module.		

Ambient temperature
35°C external cooling (F model with integrated ventilator)
45°C self air cooling
At higher temperatures it is possible to operate with reduced type current:
Temperature range up to 55°C: type current –2% / °C

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Power connections

Type current	Connector U1, U2,	Earthing screw	Conductor cross sect.
8 A	Screw plug-in terminal	Bracket / M4	4 mm^2, max.
16 A	Bracket / M4	Bracket / M4	6 mm^2, max.
30 A	Bracket / M4	Bracket / M4	6 mm^2, max.
45 A	M 6	M 6	50 mm^2, max.
60 A	M 6	M 6	50 mm^2, max.
100 A	M 6	M 6	50 mm^2, max.
130 A	M 8	M 10	95 / 120 mm^2
170 A	M 8	M 10	95 / 120 mm^2
280 A	M 10	M 10	150 / 185 mm^2

With UL applications use only 60°/75° copper conductors!

Torques for connection screws [Nm]

Screw	Min value	Nom. value	Max value
M 2	0,22	0,25	0,28 (Phönix terminals)
M 4	0,85	1,3	1,7
M 6	2,95	4,4	5,9
M 8	11,5	17	22,5
M10	22	33	44

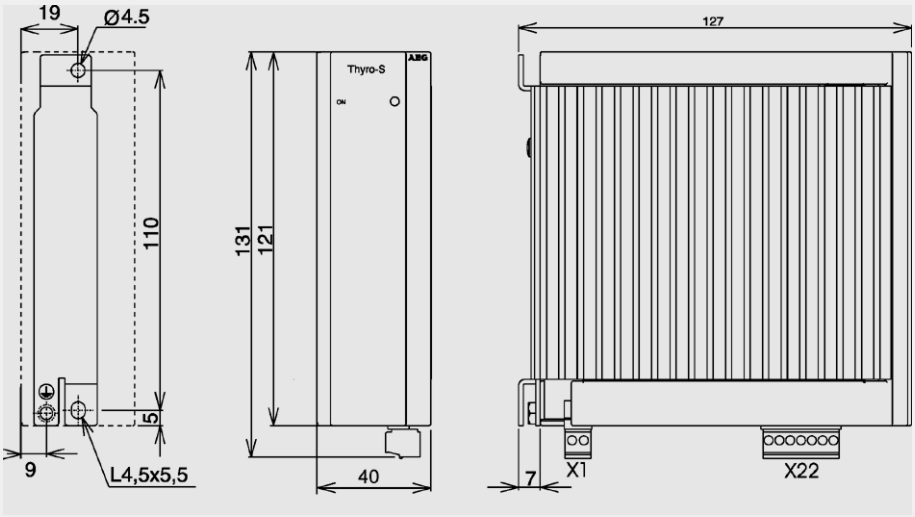
Ventilation 230V, 50-60Hz

Thyro-S	Type current 50 Hz	Type current 60 Hz	Air volume
1S 280 HF	0,13 A	0,13 A	120 m^3/h

The ventilators must run with Thyro-S switched on, connection to X7.

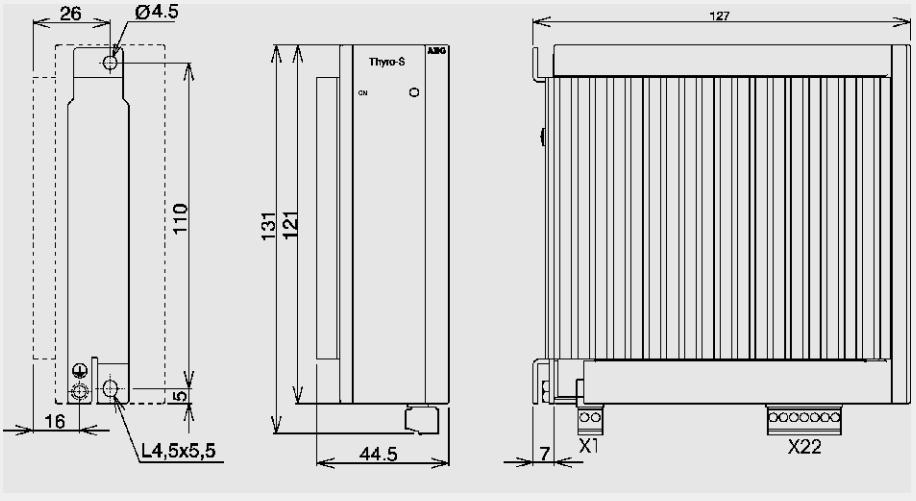
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11. Dimensional drawings



Thyro-S 1S (8H)

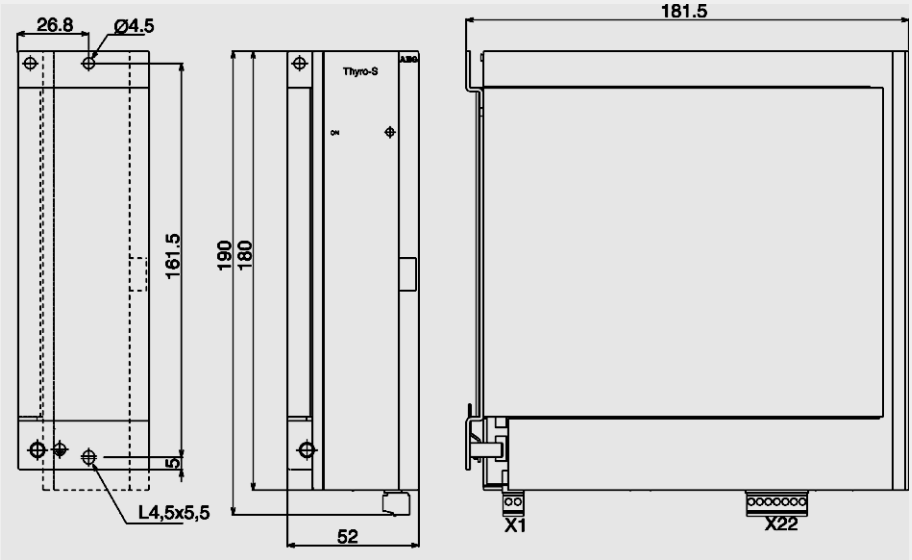
Dimensional drawing 850



Thyro-S 1S (16H, 30H)

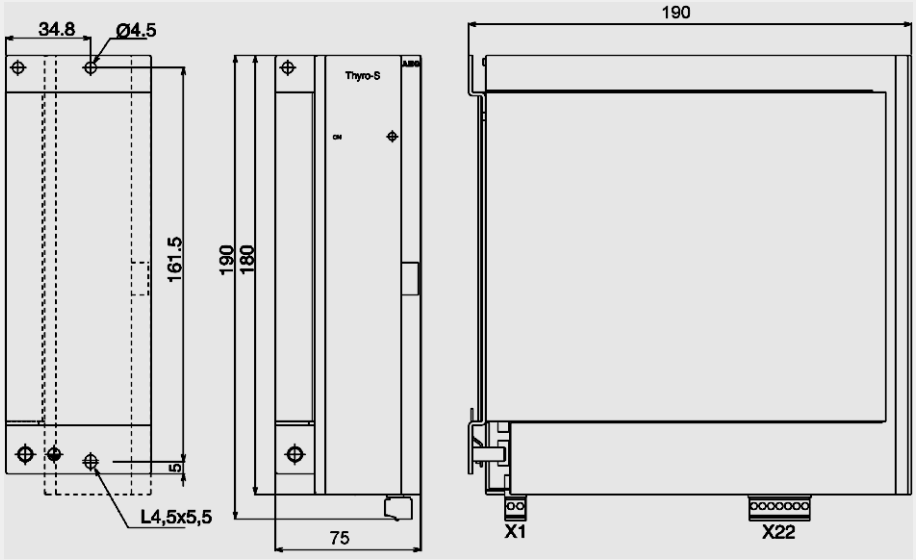
Dimensional drawing 851

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Thyro-S 1S (45H, 60H)

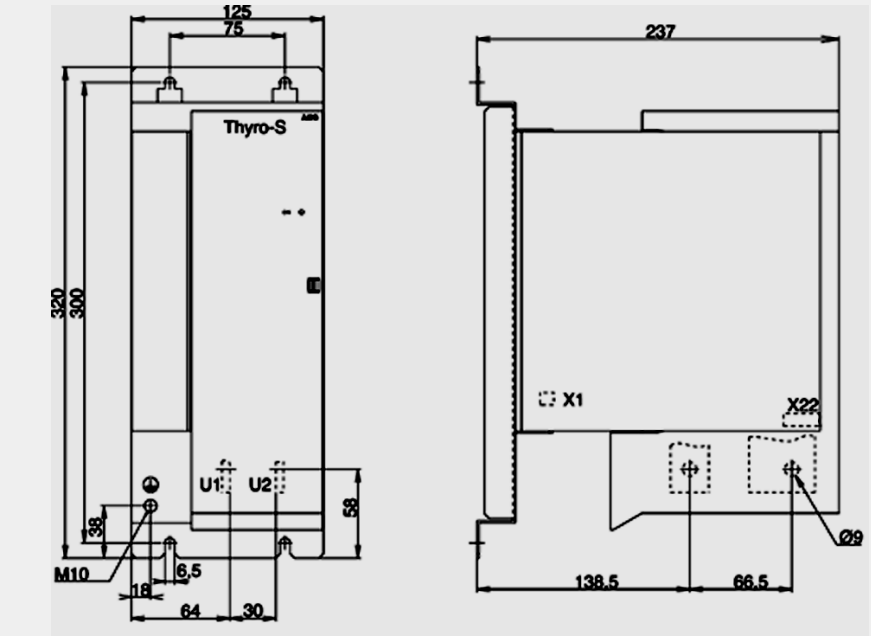
Dimensional drawing 853



Thyro-S 1S (100H)

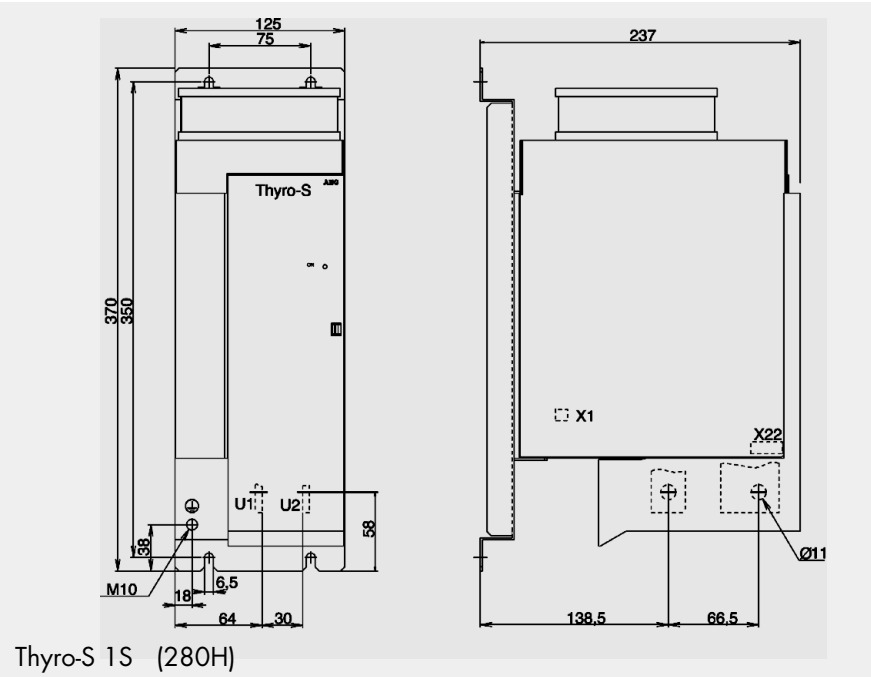
Dimensional drawing 854

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Thyro-S 1S (130H, 170H)

Dimensional drawing 856



Thyro-S 1S (280H)

Dimensional drawing 858

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12. Accessories and options

Order No. 8000 006 757	Support for 35 mm snap-on assembly for devices with type current 8A, 16A and 30A
Order No. 2000 000 841	Bus module Profibus DP
Order No. 2000 000 842	Bus module Profibus RTU

13. Approvals and conformities

No product norm exists for Thyristor switches so that a useful norm structure can be built up based on the corresponding basic norms ensuring reliable application and comparison potential.



CAUTION
Thyristor switches are not devices for disconnection in the sense of DIN VDE 0105 T1 and may therefore be operated only in connection with a suitable mains isolating device (e.g. switch, isolating link).

Approvals and conformities for Thyro-S are available

- Quality standard according to DIN EN ISO 9001
- UL registration, file no. E 135074, under preparation, with consideration to Canadian National Standard, project no. 02ME08043
- CE conformity
- Low voltage directive 73/23 EEC
- EMV directive 89/336 EEC; 92/31 EEC

In detail

Conditions for usen	
Built-in unit (VDE 0160)	DIN EN 50 178
General requirements	DIN EN 60146-1-1:12.97
Design, vertical installation	
Operating conditions	DIN EN 60 146-1-1; K. 2.5
Operating location, industry sector	CISPR 6
Temperature behaviour	DIN EN 60 146-1-1; K 2.2
Storage temperature	-25°C - +55°C
Transport temperature	-25°C - +70°C
Operating temperature	-10°C - +35°C with external cooling (280A) -10°C - +45°C with self air cooling -10°C - +55°C with reduced type current -2%/°C

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Load class	1	DIN EN 60 146-1-1 T.2
Humidity class	F	DIN EN 50 178 Tab. 7
Overvoltage category	ÜIII	DIN EN 50 178 Tab. 3
Degree of pollution	2	DIN EN 50 178 Tab. 2
Air pressure		900 mbar * 1000m above NN
Safe isolation up to 500 V mains voltage:		DIN EN 50 178 Chap. 3
Air and creeping distances		casing / mains potential ≥ 5.5 mm
		casing / control potential ≥ 2.5 mm
		mains voltage /contr. potent. ≥ 8 mm
		interface /contr. Potent. -/-
		mains voltages interact 2.5 mm
Test voltage		DIN EN 50 178 Tab 18
Tests according to		DIN EN 60 146-1-1 4.
EMV noise emission		EN 61000-6-4
Noise suppr. control device	Class A	DIN EN 55011:3.91 CISPR 11
EMV noise resistance		EN 61000-6-2
Compatibility level	Class 3	EN 61000-2-4:7.95
ESD	8 kV (A)	EN 61000-4-2:3.96
Electromagnetic fields	10 V/m	EN 61000-4-3:3.95
Burst mains lines	2 kV (A	EN 61000-4-4:.95
control lines	2 kV (A)	
Surge mains lines	2 kV unsym.	EN 61000-4-5:.95
	1 kV sym.	EN 61000-4-5:.95
control lines	0.5 kV	
Line-conducted		EN 61000-4-6

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