Martens
Member of GHM GROUP

Operating Manual

EN

Limit switch
GS125L

Save for later reference!

Table of contents

1 Intended use (areas of application)

Refer to the chapter *2 Product description* for detailed specifications for the area of application. The operational safety of the device is only assured when used as intended in accordance with the specifications in the operating manual. Intervention beyond the actions described in the operating manual may only be carried out by personnel authorised by the manufacturer for safety and warranty reasons.
Conversions or modifications made on one's own authority are expressly prohibited.

Application-specific dangers can emanate from this device when used improperly or not as intended.
The device is **not intended** for use in explosion-prone areas.

General safety instructions, use
This operating manual must be kept in a location such that qualified personnel can refer to it at all times. Any processes described in this operating manual may only be carried out by trained, qualified personnel who are authorised by the owner and wearing protective clothing. All rights reserved.

1.1 Safety signs and symbols

Warning notices are identified in this document as described under *Table 1*:

Danger	Warning! This symbol warns of imminent danger which can result in death, severe bodily injury, or severe property damage in case of non-observance.
	Attention! This symbol warns of potential dangers or harmful situations which can cause damage to the device or to the environment in case of non-observance.
	Note! This symbol indicates processes which can have a direct influence on operation or can trigger an unforeseen reaction in case of non-observance.

Table 1 Safety sings and symbols

1.2 Safety instructions

Read the product description before commissioning the device. Ensure that there are no limitations for use of the product for the relevant applications. The owner is responsible for ensuring the fault-free operation of the device. The owner is obligated to ensure compliance and to observe the required work and safety measures of the current applicable regulations for the entire duration of use

1.3 Product liability and warranty

Exclusion of liability:

The contents of the operating manual have been checked to ensure conformity with the described device. However, deviations cannot be entirely ruled out. Therefore, we cannot assume any guarantee for complete conformity. The specifications in this document are checked regularly and any necessary corrections are incorporated into subsequent versions. This document is subject to technical changes. In addition, all claims are based on the valid 'Standard Terms for the Supply of Products and Services of the Electrical Industry'

GHM Messtechnik cannot inspect or repair any devices without the required form having been filled in completely (see *10 Returns*).

1.4 Standards and directives

Conformity with Directive	2014/30/EU
CE Conformity	EN 61326-1:2013.
Conformity with Directive	2014/35/EU
Insulation coordinates	EN 60664-1:2007
Functional safety	
Testing standard	EN 61508-1:2010

(Issue years for testing standards belong to german versions)

2 Product description

Limit switches of the series GS125 are used in switch cabinets for process monitoring or even for simple process regulation. Temperatures and derived signals such as voltage, current and resistance can be used as control signals. In the process, 1 or 2 limit values can be monitored. With the universal configurability of the measuring inputs, the need to stock multiple parts for various applications is reduced. The housing width of only 12.5mm allows space-saving installation in the switch cabinet. The limit value adjustment scales which are illuminated red or green depending on the switching status also enable operation in dark environments

2.1 Scope of Delivery

- GS125, according to order code
- 24 transparent labels with measuring units and scale assignment
- Power Rail DIN rail adapter (only with LP version)
- these operating instructions
- if necessary, further documents

2.2 Functional principle

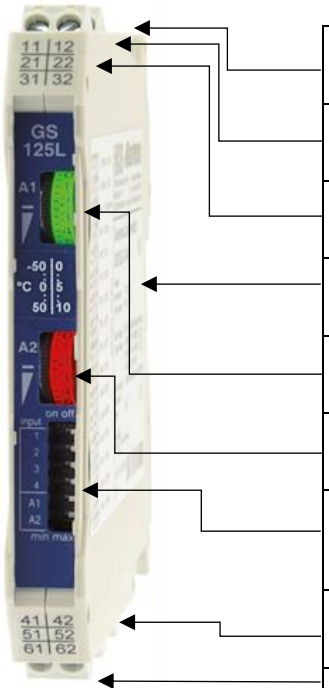
One or two relays may be switched depending on the measurement at the device input. Limit values can be adjusted with illuminated adjustment wheels. When the limit values are reached (depending on the input signal), relays are switched. The relay status is indicated by a colour change in the scales of the adjustment wheels. The switching behaviour of the relay can be specified as a minimum or maximum contact. Device configuration will be done via DIP switches. The relay is designed as a changeover contact for single-channel devices. Two-channel devices can be optionally supplied with a universal connection of the relay contacts or with two potential-free NO contacts. The universal connection enables use of the device with 2 independent NO contacts or in window range monitoring in which the two contact relays can be open or closed within the target range. The application is selected with the wiring of the outer connection terminals. A device version is available with analogue output that reproduces the respective input signal to 4-20mA. The analogue output is not galvanically isolated from the input signal! The device may be supplied in a wide range between 20..125V DC or 20..253V AC. A low cost version with 24V DC power supply is available. Another version allows a 24V power supply via a mounting rail bus (Power Rail) Twenty-four transparent adhesive labels are provided for assigning the unit of measure for the scale labelling. They can be affixed between the adjustment wheels on the front panel, depending on requirements.

Measuring ranges

Input type	Factory range
Standard signal Standard signal, live-zero	0…20 mA / 0…10 V 4…20 mA / 2…10 V
Potentiometer	1 kΩ…10 kΩ, nom
Pt100	-50 .. 50 °C 0 .. 50 °C 0 .. 100 °C 0 .. 150 °C 0 .. 200 °C 0 .. 300 °C 0 .. 500 °C
Thermocouple	Type J FeCuNi 0…250 °C Type J FeCuNi 0…500 °C Type K NiCrNi 0…500 °C Type K NiCrNi 0…750 °C Type K NiCrNi 0…1000 °C Type S PtRhPt 0…1500 °C

Table 2 Measuring ranges

2.3 Layout of the measuring system



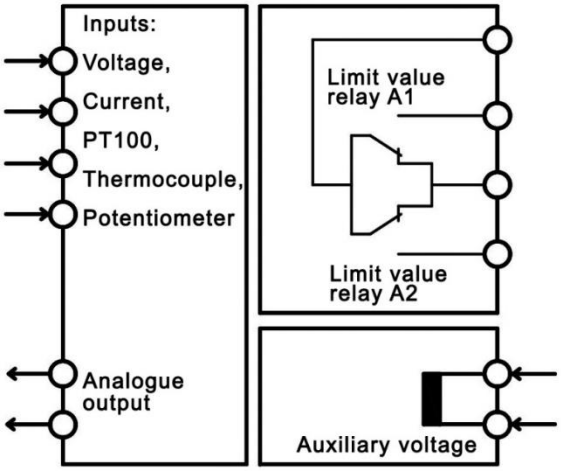
①	Terminals for auxiliary voltage
②	Terminals for relay
③	Terminals for relay
④	Type plate
⑤	Scale wheel, limit value A1
⑥	Scale wheel, limit value A2*
⑦	DIP-switches for configuration of the input and the limit functions A1, A2
⑧	Terminals for signal input
⑨	Terminals for analogue output

Figure 1 Limit switch GS125

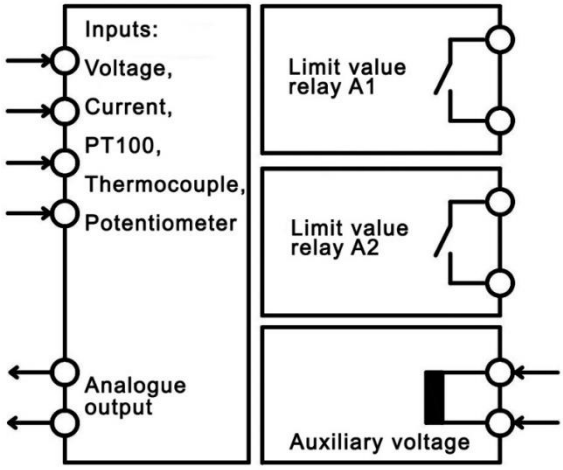
*available in device types with two limits, only.

2.4 Block circuit diagram

2 Relay contacts with universal



2 potential-free contacts, NO



Relay as a changeover contact

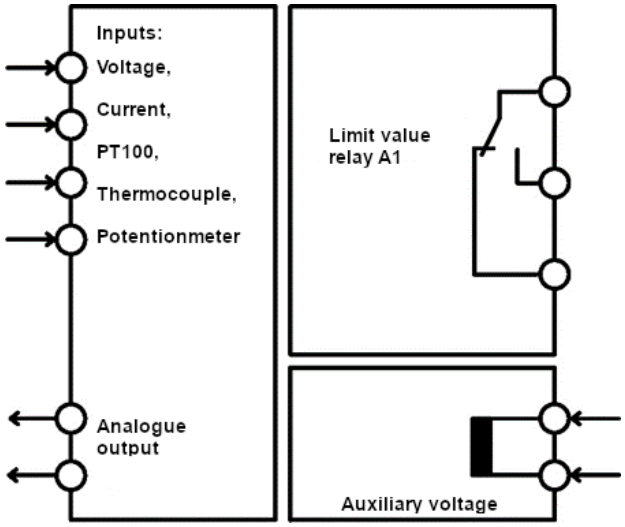


Figure 2 Block circuit diagrams

2.5 Type label

The type plate contains the most important identification data:

- Manufacturer
- Type and article description
- Technical specifications
- Serial number / barcode

Figure 3 Type Plate

2.6 Power Rail

The supply of multiple devices can be combined and simplified via a bus system in the carrier rail (TS35). A corresponding version is available for the entire LP series of GHM carrier rail devices in a housing with 12.5 mm width.
A bus adapter compatible with series connection is clamped on the carrier rail before installation of the device to be supplied with power.
An adapter is required for each device. The bus power supply is provided via a plug-type terminal strip.
The power supply terminals 11 and 12 on the upper device side are omitted in device version GS125LP designed for this purpose.

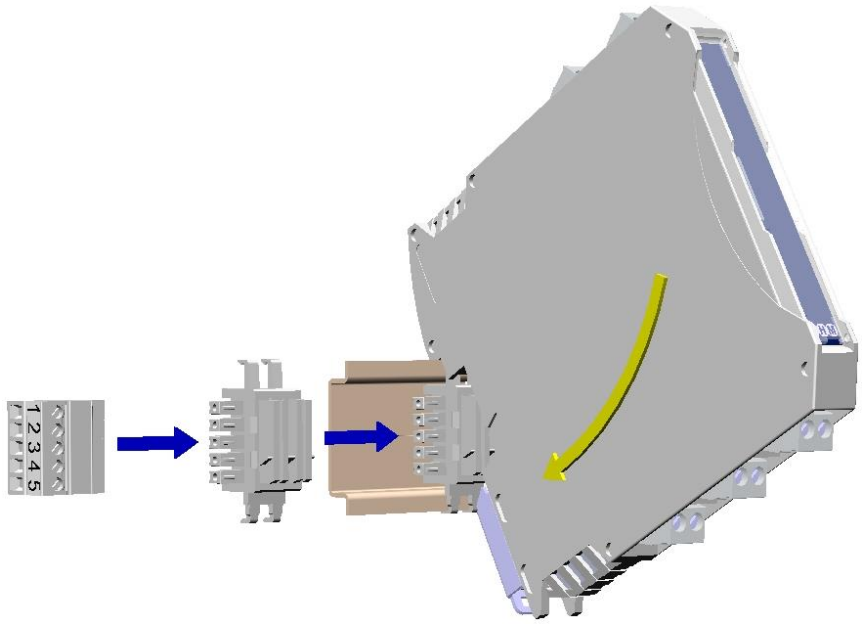


Figure 4 Example: GS125LP with DIN rail connector and supply terminal PRVK (optional accessories)

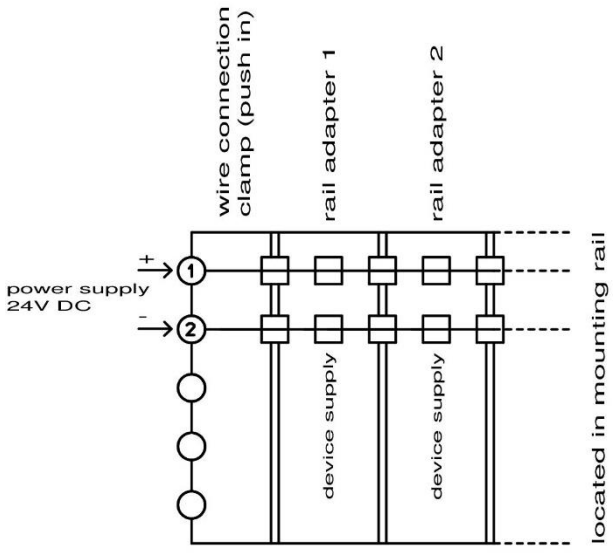


Figure 5 Terminal Assignment PRVK

3 Assembly and installation

3.1 Mechanical assembly

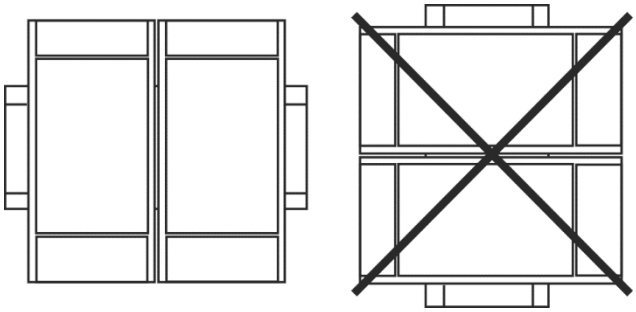


Figure 6 rail mounting TS35, DIN EN 60715

The installation of multiple devices without spacing is only permitted with a horizontally mounted DIN rail.

3.2 Electrical Installation

The device may only be installed by a qualified electrician. The national and international regulations for the installation of electrical systems of the respective operator country apply.

Power supply according to DIN EN 60664-1. SELV, PELV

For the installation of the inputs and outputs, refer to the connection diagram.
The auxiliary voltage is connected to connections 11 and 12 of the pluggable terminal block.
Terminals 41, 42, 51, 52 are used for sensor connection
Terminals 21, 22, 31, 32 are used for relay output. Circuit depends on device type.
Terminals 61, 62 are used for the analogue output

Elektrische Anschlüsse

Terminals	**Assignment**			
11	Power supply ~/+			
12	Power supply ~/-			
Switching outputs*		GS125x-1	GS12x-2	GS125x-3
21	Relay contact	A1	A1, A2	COM A2
22	Relay contact	-	A2	A2
31	Relay contact	COM A1, A2	COM A1, A2	COM A1
32	Relay contact	A1	A1	A1
Signal inputs	**PT100 / Poti**	**Thermocouple J /K /S**	**Current**	**Voltage**
41	Red** /S	+ black/green/orange***		+
42	Red** /		+	
51	White** /A			
52	/E	- white / white / white**	-	-
61	Analogue output + 4…20 mA			
62	Analogue output – 4…20 mA			

Table 3 Electrical connections

* Take care of actual limit function (Min/Max)! Please also see *3.4 Limit contacts*
** Description acc. to IEC 60751, different colour coding possible
*** Description acc. to IEC 584, different colour coding possible

3.3 Connection Diagram

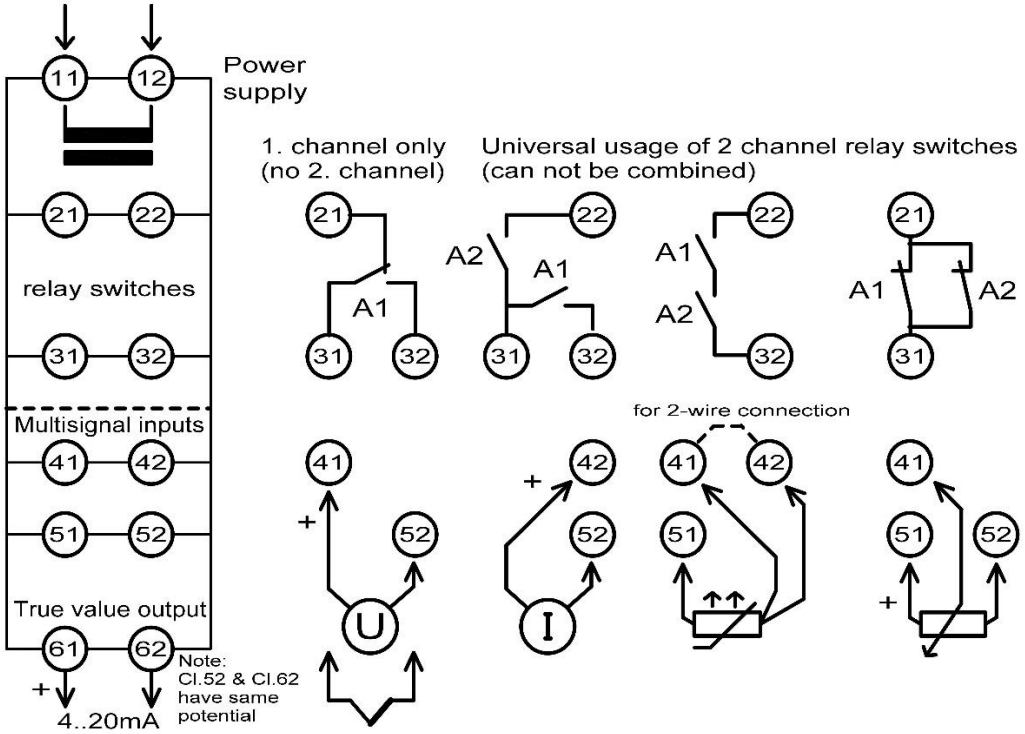


Figure 7 Connection diagram GS125x-1, GS125x-2

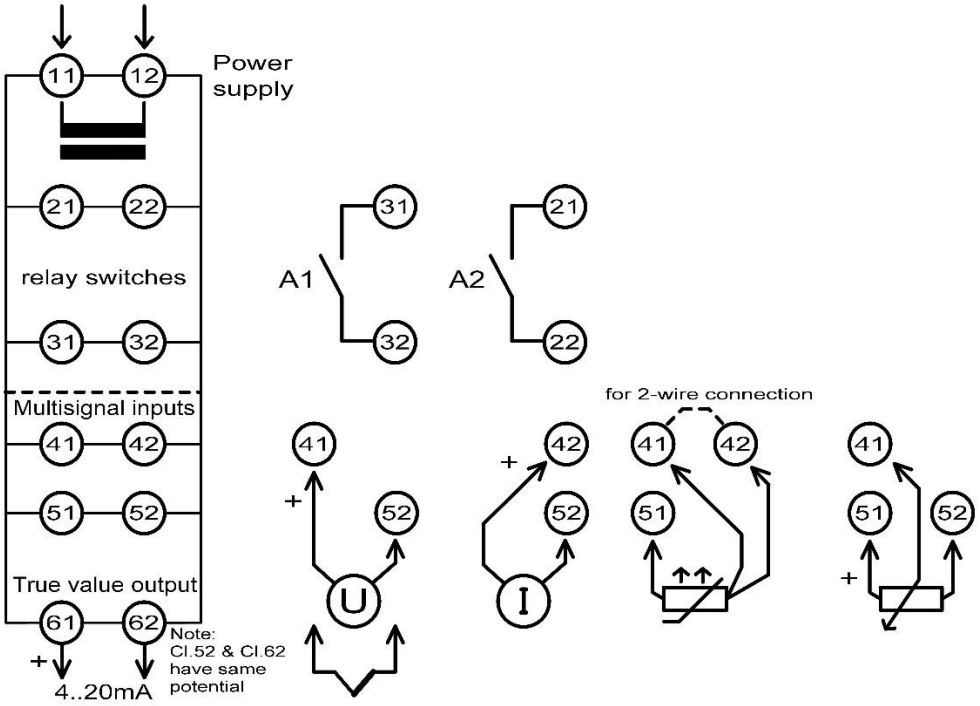


Figure 8 Connection diagram GS125x-3

The input signal should be connected via separate, two- or three-wire lines.

Grounded cables can cause interference at the non-galvanically isolated, analogue actual value output.

3.4 Limit contacts

Depending on the device design, the 3 basic circuits described below can be operated.
Circuits 2a, b, c are application examples of the universal basic circuit 2.

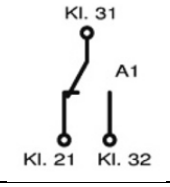
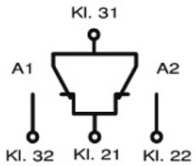
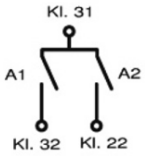
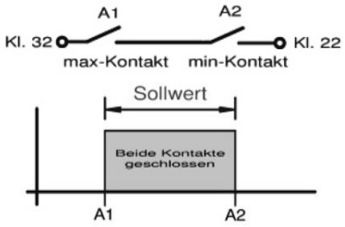
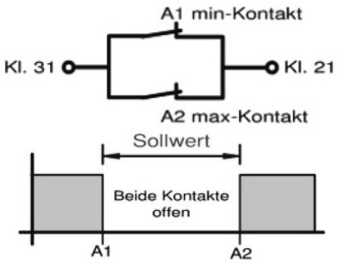
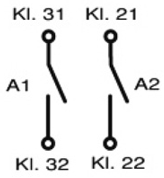
No.	Circuit diagram	Connection variant	Description
GS125x-**1**-x-xx type with 1 change over contact (SPDT)			
1		normally open / n.o.: Kl.31 / 32 normally closed / n.c.: Kl. 31 / 21	Changeover contact with 1 limit function AL1
GS125x-**2**-x-xx type with 2 change over contacts (universal wiring)			
2		A1 normally open / n.o.: Kl.31 / 32 A2 normally open / n.o.: Kl.31 / 22 A1/A2 normally closed / n.c.: Kl. 31 / 21	
2a			Two independent limits with with shared COM.
2b			Window monitoring function - normally open / n.o
2c			Window monitoring function - normally closed / n.c.
GS125x-3-x-xx: type with 2 contacts (SPST)			
3		A1 normally open / n.o.: Kl.31 / 32 A2 normally open / n.o.: Kl.31 / 22	Two independent limits with separated COM.

Table 4 Limit contacts

3.5 Positioning of individual scale marking

For the assignment of the measuring unit to the scale marking, 24 transparent adhesive labels are supplied, which can be placed to the front panel between the control wheels according to the requirements.
In the case of two-part stickers, the scale unit is located on the left, the assignment to the scale wheel division on the right (0...10).

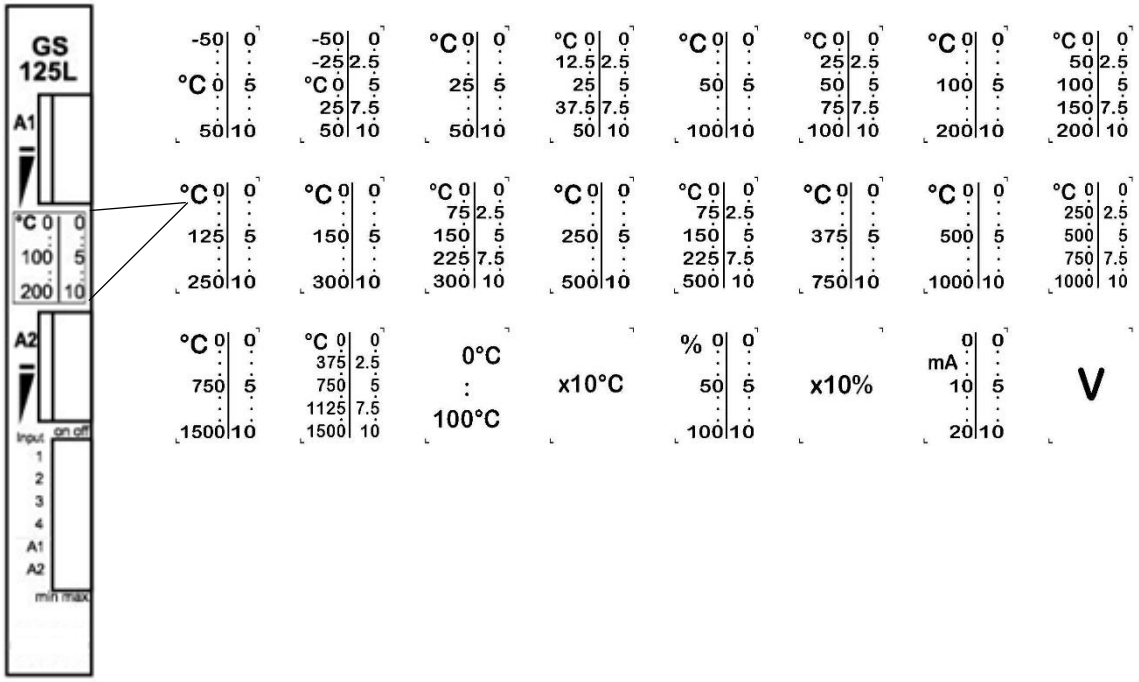


Figure 9 Scale marking

4 Operating steps, functional description, output

4.1 Control elements, functional description

Input configuration
With **DIP-switches 1...4** the selection of the measuring range is done:
- Current, Voltage, Potentiometer, Pt100 or thermocouple

With simultaneous use of voltage and current input, the measuring values will summarized.

Limit function
The limit values can be set via the A1 and A2 control wheels. The illuminated scales also serve as an operating indicator.
If the limit value relay is not active, the control wheel scale lights up **green**.
When the limit value relay is active, the control wheel scale lights up **red**.

The switching behaviour of the relays can be determined via **DIP switches 5** and **6**:

- max (switch position at the top): The relay becomes active when the limit value is exceeded
- min (switch position below): The relay becomes active when the limit value is not reached

The **black boxes** symbolize the position of the DIP switch.

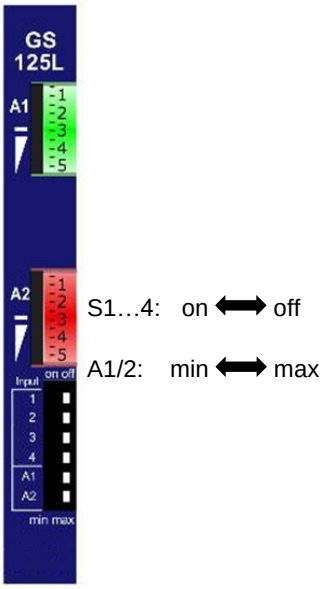


Figure 3 Front plate

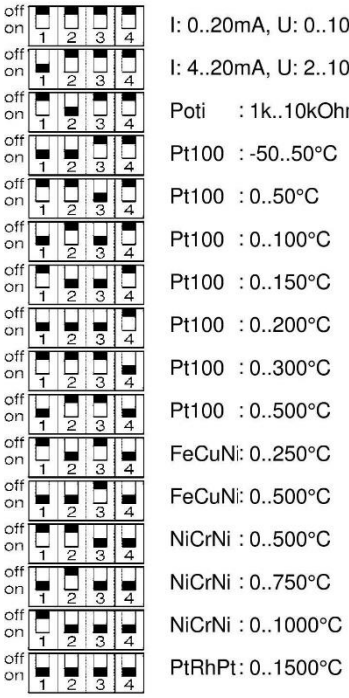


Figure 1 Input configuration

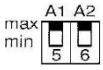


Figure 2 Configuration of limit function

Sensor breakage and short circuit
In the measuring ranges for Pt100 sensors, monitoring for sensor breakage and short circuit as well as the measuring range is also carried out.

In this case, the relays become inactive and the scale illumination flashes red.
The analogue output drops to about 0mA.

For **functional safety (SIL2) applications**, the device must be configured in a way that the relays become inactive in the event of a fault!
When using the analogue output for **SIL2,** the evaluation device must be configured to detect values >21mA and values <1mA as errors.

5 Commissioning, Maintenance and Service

5.1 Commissioning

1. Configure the device using the front DIP switches S1... S4 for the desired input measuring range and the output range.
2. Configure the device for the desired limit value functions using the front DIP switches A1 and A2
3. Configure the device for the desired limit value using the front scale wheels for A1 and A2.
4. Make sure that the port assignment has been carried out according to the connection plan and that the auxiliary voltage is the same.
5. Make sure that the terminals are firmly screwed and the terminal blocks are plugged in until the end impact.
6. After turning on the auxiliary power, check the correct function.

5.2 Maintenance

Housing

When used as intended, no cleaning or maintenance is required.

5.3 Service

Service of the device is only possible in the factory.

5.4 Error and System Messages

Error	**Cause**	**Remedy**
Scale wheel not illuminated	Power supply not connected or supply voltage to small or device faulty	Check connection or Return device to factory for service
Scale wheel red or green illuminated	Device is ready for use	
Scale wheel flashes red	Break of sensor or short circuit	Check connections and sensor wiring
Current output does not work correctly	- wrong measuring range selected - Connections incorrect - connected burden too high - Device faulty	- Check configured measuring range - Compare terminals with the port connection diagram. e.g. with Pt100 / - 2-wire measurement, a bridge between terminals 41 and 42 is mandatory. - Return device to factory for service

Table 5 Error and System Messages

6 Technical Data

Power Supply		
Supply Voltage GS125M GS125L/LP	 20…125 V DC and 20…250 V AC (47…63Hz) 24 V DC	
Power consumption	< 1,5 VA	
Conformity	CE, Guideline 2014/30/EU	
EMC	EN 61326-1:2013	
Standards	EN 60664-1:2007	
Rated voltage	253 V AC acc. to EN 60664-1 Overvoltage category 2 und pollution degree 2.	
Test voltage	3 kV AC (Input / Relay output / supply voltage)	
Ambient conditions		
Working temperature	-10…60 °C	
Storage temperature	-20…80 °C	
Air humidity	< 10…90 %	
Condensation	Not allowed	
Maximum operating height above sea level	≤ 2000 m	
Measuring inputs		
Voltage input	0…10V or 2…10 V.	Ri approx. 20 kΩ.
Current input	0…20 mA or 4…20 mA.	Ri approx. 60 Ω
Pt100	linearized, measuring current approx. 1.6 mA Relays fall back in case of sensor breakage or short circuit	
Thermocouple	linearized with cold junction compensation (optional without internal compensation)	
Resistive	Potentiometer (3-wire), Nominal value 500 Ω.. 20 kΩ, internal Reference voltage approx. 1.5 V	
Accuracy analogue output value		
Input signal	Basic accuracy [%]	Temperature drift [%/K]*
Standard signals		
0/2..10V	0,2	0,004
0/4..20mA	0,2	0,004
Potentiometer	1	0,007
Resistive thermometer Pt100		
Pt100 -50... 50°C	0,5	0,03
Pt100 0... 50°C	0,9	0,04
Pt100 0...100°C	0,5	0,03
Pt100 0...150°C	0,2	0,02
Pt100 0…200°C	0,4	0,02
Pt100 0...300°C	0,3	0,01
Pt100 0...500°C	0,2	0,007
Thermocouple		
Type J, FeCuNi 0...250°C	1,0	0,4
Type J, FeCuNi 0...500°C	0,5	0,3
Type K, NiCrNi 0...500°C	0,5	0,04
Type K, NiCrNi 0...750°C	0,4	0,03
Type K, NiCrNi 0...1000°C	0,3	0,02
Type S, PtRhPt 0…1500°C	1,0	0,04

Output	
Relay output Switching voltage: Switching frequency: Switching hysteresis:	 <250 V AC <2 A <500 VA <125 V DC <0,2 A <25 W; < 30 V DC <2 A <60 W 5 Hz, max Approx. 1%
Limit value adjustment	Scale prescision: 2%
Analogue output	4…20 mA Burden < 120 Ω, max. (Burden error @ 120 Ω, 0,1% max.) No galvanic isolation to input signal
Casing	
Material	PA6.6, flammability class UL94V-0
Color	light grey
Width	12,5 mm
Dimensions (HxD)	108 x 114 mm
Weight	120 g
Protection class	Casing IP 30, terminals IP 20 BGV A3
Terminals Screw terminals Push-In-terminals (spring loaded) Power Rail	 0,2...2,5 mm², AWG 24..14, removable, coded 0,5..1,5 mm², AWG 25..16, double connection (12A between connections), removable, coded 8A over the entire bus system (Supply via removable terminals 0,2..2,5 mm², AWG 24..14)
Mounting	DIN Rail mounted, TS35 DIN EN 60715
Functional safety SIL2 (parameters acc. to EN61508 and SN29500)	
Device type	B
HFT	0 (1oo1)
Response time	
Standard mode→Error	500ms with temperature measurement 100ms with voltage, current, poti measurement
Error→Standard mode	approx. 2s (self resetting)
Evaluation criteria for supply voltage drops to 0% over 20ms	
GS125L, GS125M Relays Analogue output	 FS B

Table 6 Technical Data

6.1 Safety-related key values

MTBF-calculation acc. to SN29500

Device without analogue value output (GS125x-x-**0**-xx)				
	GS125M 1-channel-Version	GS125M 2-channal-version	GS125L/GS125LP 1-channel-version	GS125L/GS125LP 2-channel-version
λSD [FIT]	191	225	175	209
λSU [FIT]	106	119	107	120
λDD [FIT]	106	111	106	111
λDU [FIT]	38	46	34	41
SFF [%]	91,3	90,9	92,0	91,5
DC [%]	73,4	70,7	75,9	73,0
PFH [1/h]	3,82E-08	4,58E-08	3,36E-08	4,12E-08
PFDavg				
1 year	1,67E-04	2,01E-04	1,47E-04	1,80E-04
2 years	3,35E-04	4,01E-04	2,94E-04	3,61E-04
5 years	8,37E-04	1,00E-03	7,36E-04	9,02E-04
Device with analogue value output (GS125x-x-**1**-xx)				
	GS125M 1-channel-version	GS125M 2-channel-version	GS125L/GS125LP 1-channel-version	GS125L/GS125LP 2-channel-version
λSD [FIT]	203	237	187	221
λSU [FIT]	124	137	125	138
λDD [FIT]	124	130	125	130
λDU [FIT]	44	52	40	47
SFF [%]	91,1	90,7	91,7	91,2
DC [%]	73,8	71,4	75,9	73,4
PFH [1/h]	4,43E-08	5,18E-08	3,96E-08	4,72E-08
PFDavg				
1 year	1,94E-04	2,27E-04	1,74E-04	2,07E-04
2 years	3,88E-04	4,54E-04	3,47E-04	4,13E-04
5 years	9,69E-04	1,13E-03	8,68E-04	1,03E-03

Table 7 MTBF key values

6.2 Mechanical design / dimensions

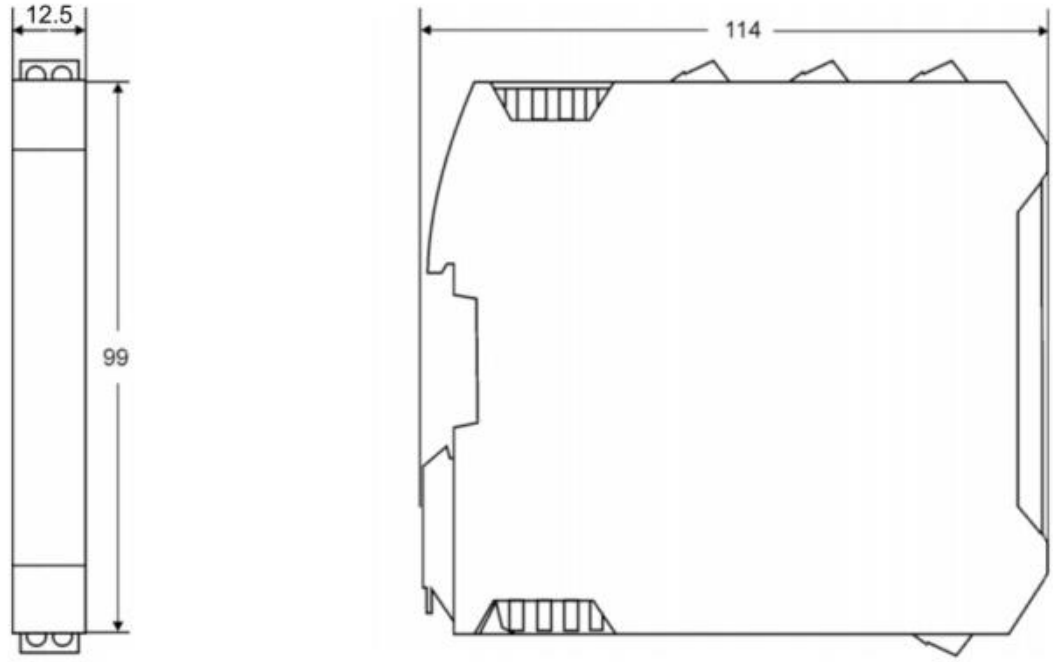


Figure 103 Dimensions

7 Accessories and replacement

Ordering code	Description
PRVK	Power Rail, power connecting terminal Side of installation: left

8 Order Code

1. - 2. - 3. - 4.

1.	**Device version**	
	GS125L	Supply voltage 24VDC +/- 15%
	GS125LP	Supply voltage 24VDC +/- 15% with mounting rail bus connection
	GS125M	Wide-range power supply 20..125V DC / 20..253V AC
2.	**Limit value contacts**	
	1	1 relay (changeover contact)
	2	2 relays (universal circuit)
	3	2 relays (potential-free NO contacts)
3.	**Actual value output**	
	0	Not available
	1	Output 4…20 mA
4.	**Options**	
	00	Without options
	01	Push-in terminals (plug-in)

9 Device transport and storage

Gentle and tension-free packaging of the housing must be ensured for transport (no machine wrapping of the package). The device must be stored in the environmental conditions specified in the technical data

10 Returns

The legal regulations for environmental protection and our personnel require that devices which are sent back which have come into contact with liquid are handled without risk to people or the environment.

If you send a device back to us for inspection or repair, we must request that you strictly observe the following requirements:

On the GHM homepage under 'info desk/forms' a return shipment form can be downloaded.

The repair can be performed quickly and without call-back questions if:

1. a filled-in form is provided for each device,
2. the device has been cleaned and packaging which prevents damage to the device is used, and
3. a safety data sheet for the measuring medium is affixed to the outside of the package, if the device has come into contact with a critical substance.

11 Disposal

Separation by material and recycling of device components and packaging must take place when the device is disposed of. The valid legal regulations and directives applicable at the time must be observed.

The device may not be disposed of with household waste. If the device should be disposed of, return it to us with the return shipment form filled in under section 8. We will then arrange for the proper disposal.

12 Service

12.1 Manufacturer

If you have any questions, please do not hesitate to contact us:

Contact

GHM Messtechnik GmbH
GHM GROUP - Martens
Kiebitzhörn 18
22885 Barsbüttel | GERMANY
Tel: +49 40 67073-0

12.2 Repairs processing

Defective products are repaired professionally and quickly in our service centre.

Open hours and contact

Monday to Thursday from 8:00 to 16:00
Friday from 8:00 to 13:00

GHM Messtechnik GmbH
GHM GROUP - Martens
Kibitzhörn 18
Service Centre
22885 Barsbüttel | GERMANY
Tel: +49 40 67073-143
service.martens@ghm-messtechnik.de

Fill in the return form available from the information base online at www.ghm-group.de and sent it in with the product.

13 Certificate of Conformity

Martens
Member of GHM GROUP

CE

EU-KONFORMITÄTSERKLÄRUNG
EU-DECLARATION OF CONFORMITY

GHM GROUP - Martens | GHM Messtechnik GmbH | Kiebitzhörn 18 | 22885 Barsbüttel | GERMANY

Dokument-Nr. / Monat.Jahr:
Document-No. / Month.Year: **3045 / 01.2022**

Wir erklären hiermit als Hersteller in alleiniger Verantwortung, dass die folgenden Produkte konform sind mit den Schutzzielen der Richtlinie des Europäischen Parlaments:
We declare as manufacturer herewith under our sole responsibility that the following products are in compliance with the protection requirements defined in the European Council directives:

Produktbezeichnung:
Product identifier: **GS125L / GS125LP / GS125M**

Produktbeschreibung:
Product description: **Grenzwertschalter**
Limit switch

Die Produkte entsprechen den folgenden Europäischen Richtlinien:
The products conforms to following European Directives:

Richtlinien / *Directives*		Angewandte harmonisierte Normen oder angeführte technische Normen *Applied harmonized standards or mentioned technical specifications*
2014/30/EU	EMV Richtlinie / *EMC Directive*	EN 61326-1:2013
2014/35/EU	Niederspannungsrichtlinie / *Low Voltage Directive*	EN 60664-1:2007
2011/65/EU	RoHS / *RoHS*	EN IEC 63000:2018

Diese Erklärung wird verantwortlich für den Hersteller abgegeben durch:
The manufacturer is responsible for the declaration released by:

Dr. Axel Lamprecht
Geschäftsführer
CEO

Barsbüttel, 07. Januar 2022

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Harmonisierungsrechtsvorschriften, beinhaltet jedoch keine Zusicherung von Eigenschaften.
This declaration certifies the agreement with the harmonization legislation mentioned, contained however no warranty of characteristics.

Members of GHM GROUP: GREISINGER | HONSBERG | Martens | Xeltacom | VAL.CO

Notes

Notes