English

Operating manual

Switch amplifier

TS125 / TS225

Companies / brands of GHM

TELEMETRIE & AUTOMATION
IMTRON
Martens
HONSBERG
GDFISINGFD

www.ghm-messtechnik.de

Save for later reference.

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1. Intended use (areas of application)

Refer to the chapter '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.

Only device versions TS125L-Ex,TS125LP-Ex TS125M-Ex and TS225M-Ex are permitted for use as accessory equipment for connection of intrinsically safe sensors installed in Zones 0 or 1 and/or 20 or 21.
In the process, the safety-related characteristic data must be observed.

The approval for all intrinsically safe equipment is voided if it has not first been connected to an intrinsically safe circuit, because compliance with the safety-related characteristic data must be 100% guaranteed.
Therefore, a safety test must be carried out by the manufacturer before later use as intrinsically safe equipment.

The devices TS125L-00, TS125LP-00 and all versions of the series TS*****-Ex may be installed in Explosion Zone 2 under the following conditions:

- Installation in a clean environment in a conductive, earthed housing (switch cabinet) with a minimum protection rating of IP54.
- Transient overvoltages (with open switch contact) may not be higher than 500V at the relay outputs.
- The connection terminals may only be disconnected in a de-energised state

Applicable standards: EN60079-0 and EN60079-15.

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.

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.

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 GmbH cannot inspect or repair any devices without the required form having been filled in completely (refer to page 16 'Returns').

1.4. Standards and directives

Low-voltage Directive 2014/35/EU
Testing standard 60664-1: 2007

EMC Directive 2014/30/EU
Testing standard EN 61326-1: 2013

RoHS Directive 2011/65/EU
Testing standard EN50581: 2012

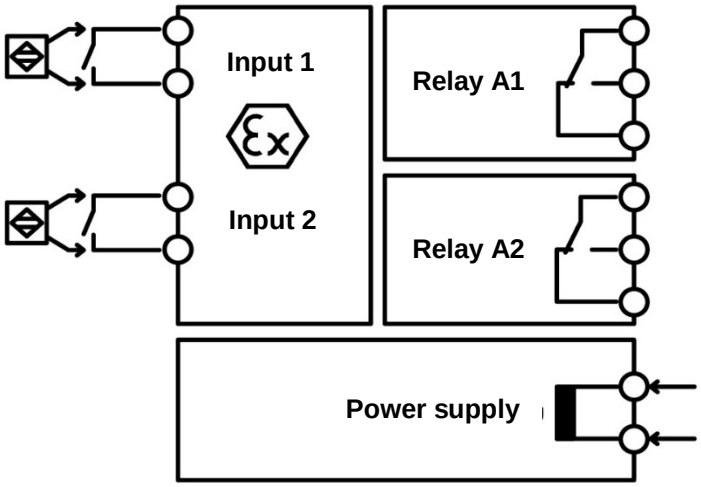
ATEX Directive 2014/34/EU
Testing standards EN60079-0: 2012, EN60079-11:2012, EN60079-15: 2010

Functional safety
Testing standards EN61508-1: 2010

(Issue years for testing standards belong to german versions)

2. Product description

Switch amplifiers of the series TS125 and TS255 are used in switch cabinets for the conversion and isolation of digital switching signals, optionally also in explosive areas.
The devices are available in one- or two-channel versions.
All passive sensors, such as switching contacts, Namur initiators according to DIN EN 60947-5-6, or passive electronic outputs of third-party devices, can be connected to the optional intrinsically safe inputs.
The TS125 series in 12.5mm wide carrier rail housing offers relay outputs with output make circuit.
The TS225 series in 22.5mm wide carrier rail housing offers relay outputs with changeover function.
The devices may also be used in explosion zone 2 if they are installed in a suitable housing.
Use in plants with functional safety SIL2 is also possible.



2.1. Scope of delivery

- TS125 or TS225
- this operating manual

2.2. Functional principle

The output relay and the diodes are controlled at the device front depending on the status of the measuring inputs.

A maximum voltage of 8V is applied at a connected Namur sensor via the input terminals. The sensor must limit the flowing current to two thresholds in accordance with the Namur specification. Current lower than 1.2mA is identified by the sensor as inactive; current higher than 2.1mA is identified by the sensor as active. The range between 1.2mA and 2.1mA applies as hysteresis.

Alternatively, a switch contact can be connected. Then no current flows in the open state and approx. 8mA flows in the closed state, wherein the previously mentioned requirements are also fulfilled.

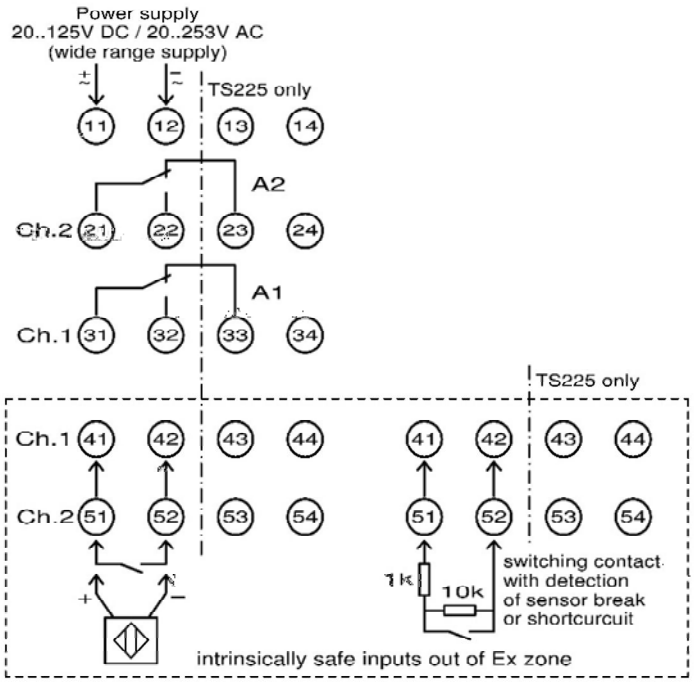
The front-side DIP switches can be used to select whether the input state is directly or inversely transferred to the corresponding output relay.

The devices also offer the possibility of monitoring the input lines for a short-circuit or wire break with the appropriate DIP switch settings.

In this connection, a current flow of less than 0.2mA applies as a wire break and a current flow higher than 7mA applies as a short-circuit. With activation of this monitoring function, the relays open in the event of a fault and the front-side LEDs blink red. With connection of a simple switch contact, the error monitoring must not be connected, because the error conditions are, in principle, always fulfilled.

In order to also monitor the connecting lines for a mechanical switch contact, resistors can be wired to the inputs according to the connection diagram below. In the process, it is assured that the error thresholds recognised by the device are only actually exceeded and/or undercut in the event of an error.

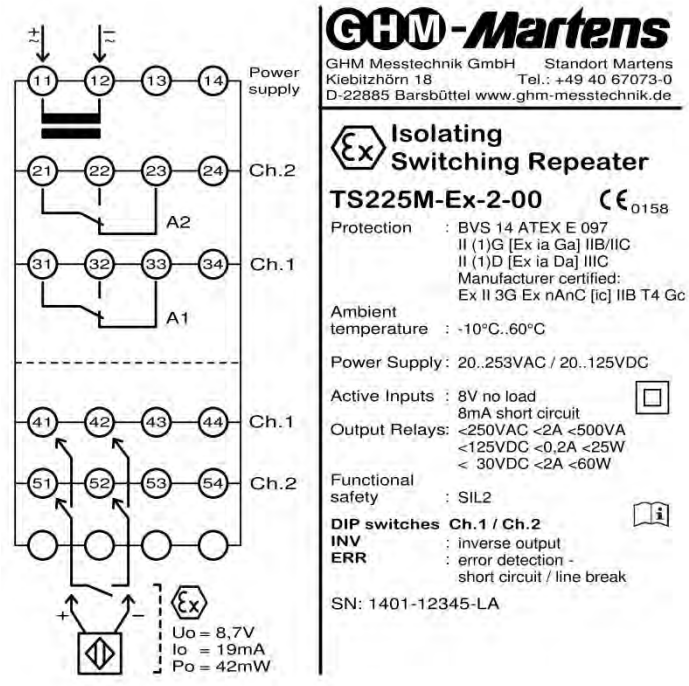
2.3. Connection diagram



2.4. Type plate

The type plate includes the most important identification data

- Type and article name
- Technical data
- Serial number / bar code



2.5. Carrier rail bus - PowerRail

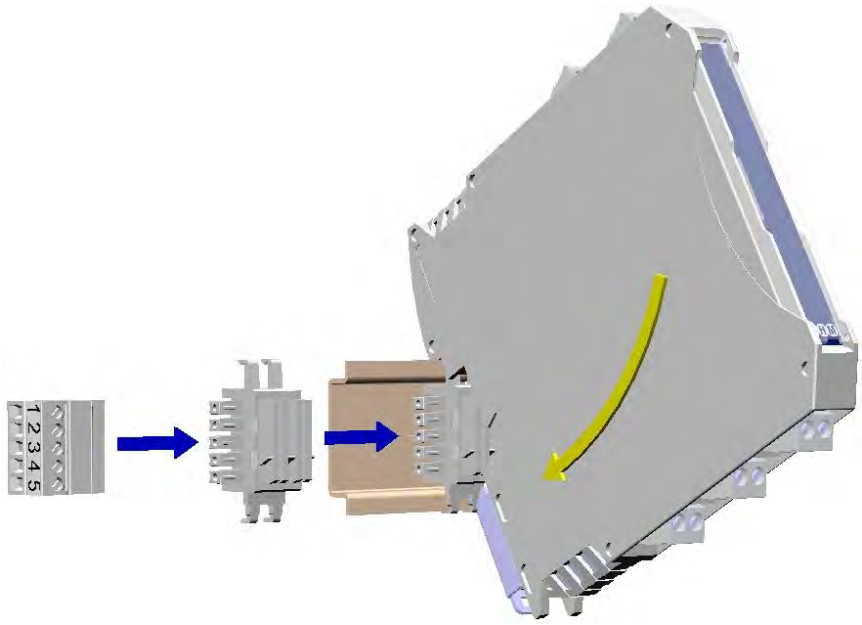
The power supply voltage supply of multiple devices can be concentrated in the mounting carrier rail (TS35) of a bus system.

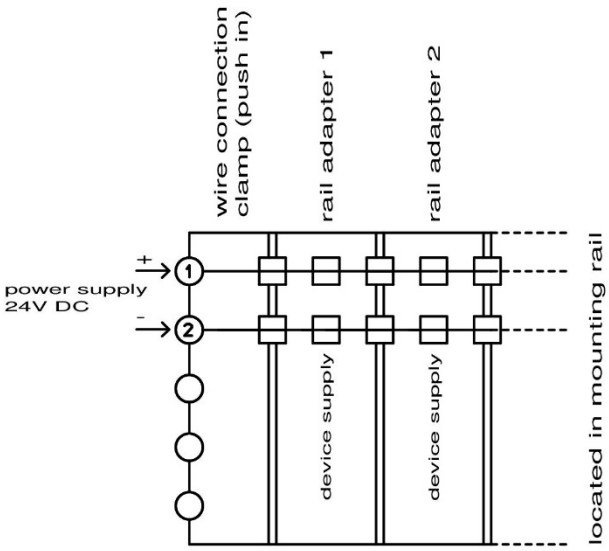
An equivalent version is available for the entire LP series of GHM carrier rail devices in 12.5mm wide housing.

Before mounting the device to be supplied, a series-compatible bus adapter must be connected on the carrier rail.

For this purpose, an adapter piece is required for each device. The supply of the bus then takes place via a plug-in terminal strip.

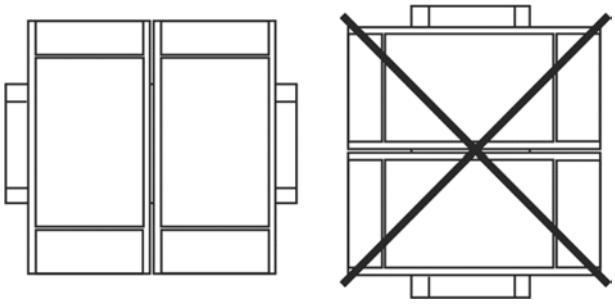
In the device version TS125LP provided for this purpose, the supply terminals 11 and 12 on the upper side of the device are omitted.





3. Assembly and installation

3.1. Mechanical assembly



Carrier rail mounting TS35, DIN EN 60715

The mounting of multiple devices without spaces is only permitted on horizontally mounted carrier rails.

The devices may be installed in Ex Zone 2 within an earthed, conductive housing (switch cabinet) with protection rating IP54.

3.2. Electrical installation

The device may only be installed by an electrician. The national and international regulations for connection of electrical systems in the respective user country apply.

Voltage supply in accordance with DIN EN 60664-1, SELV, PELV.

The power supply is connected at Connections 11 and 12 of the plug-in terminal strip.

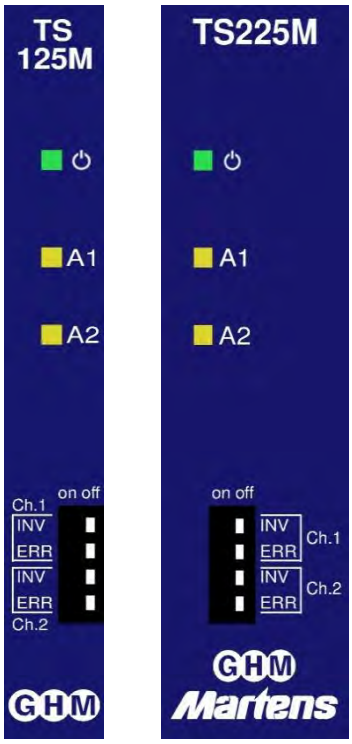
Terminals 41, 42 (Channel 1) and 51, 52 (Channel 2) are intended for the sensors and/or input switches.

With TS125 the normally open relay outputs are at Terminals 31, 32

(Channel 1) and/or 21, 22 (Channel 2)

With TS225 the changeover relay outputs are at Terminals 31-33 (Channel 1) and/or 21-23 (Channel 2).

4. Controls and functional description



4.1. TS125...-1, TS125...-2, TS225...-1 TS225...-2:

1 or 2 channel switch amplifier

- Green operating display

Operating elements per channel Ch.1 / Ch.2

- LEDs A1/A2 : yellow ○ with active relay
  blinks ● red
  (wire break or short-circuit)
- Switch INV : <u>off</u>: active input switches the assigned relay on
  on: active input switches the assigned relay off
- Switch ERR : <u>off</u>: error recognition inactive
  on: error recognition of wire break or short-circuit at the input
  Switches the assigned relay off with error status
  (condition as delivered underlined)

Applications with functional safety (SIL2)
require switch **INV = off** and **ERR = on!**

Ch.1 and Ch.2 switching behaviour

Input	Switch INV	Switch ERR	Relay
open (<0.2mA)	off	off	open
	on	off	closed
	on or off	on	open
inactive (0.4…1.2mA)	off	on or off	open
	on	on or off	closed
active (2.1…6mA)	off	on or off	closed
	on	on or off	open
short-circuit (>7mA)	off	off	closed
	on	off	open
	on or off	on	open

TS125...-F, TS225...-F

1-channel isolating amplifier with additional error relay or parallel relay. Also enables simulation of a changeover contact in the narrow housing.

Operating elements

- Green operating display

- LED A1 : yellow ○ with active Relay A1
  blinks ● red with error status
  (wire break or short circuit)
- LED A2 : yellow ○ with active Relay A2
  (if switch ERR-Ch.2 = off)
  blinks ◍ red/yellow with active Relay A2 with
  error status (if switch ERR-Ch.2 = on)
  blinks ● red with inactive Relay A2 with
  error status (if switch ERR-Ch.2 = on)

- Switch INV-Ch.1 : off: active input Ch.1 switches Relay A1 on
  on: active input Ch.1 switches Relay A1 off
- Switch ERR-Ch.1 : off: error recognition with Relay A1 inactive
  on: error recognition of wire break or short-circuit at input Ch.1
  Switches Relay A1 off with error status
- Switch INV-Ch.2 : off: active input Ch.1 or alternatively on error status*) switch Relay A2 on
  on: active input Ch.1 or alternatively on error status*) switch Relay A2 off
- Switch ERR-Ch.2 : off: error recognition with Relay A2 inactive (Relay A2 switches parallel to Relay A1)
  *) on: error recognition with Relay A2 active (see Switch INV-Ch.2)

(condition as delivered underlined)

Applications with functional safety (SIL2)
requires switch **ERR-Ch.2 = on** and **INV-Ch.2 = on!**

INV-Ch.1 = off, INV-Ch.2=on, ERR-Ch.2 simulates a changeover contact. with Relay A1, A2.
(It must be ensured that **both contacts are open** with the device switched off)

Switching behaviour TS125...-F, TS225...-F (with error relay)

Input Ch.1 switches Relay A1 and A2

Standard relay A1

Input	Switch INV-Ch.1	Switch ERR-Ch.1	Relay A1
open (<0.2mA)	off	off	open
	on	off	closed
	on or off	on	open
inactive (0.4…1.2mA)	off	on or off	open
	on	on or off	closed
active (2.1…6mA)	off	on or off	closed
	on	on or off	open
short-circuit (>7mA)	off	off	closed
	on	off	open
	on or off	on	open

Error relay A2

Input (at Ch.1)	Switch INV-Ch.2	Switch ERR-Ch.2	Relay A2
open (<0.2mA)	off	off	open
	on	off	closed
	off	on	closed
	on	on	open
inactive (0.4…1.2mA)	off	on or off	open
	on	on or off	closed
active (2.1…6mA)	off	off	closed
	on	off	open
	off	on	open
	on	on	closed
short-circuit (>7mA)	off	on or off	closed
	on	on or off	open

5. Commissioning, maintenance and service

5.1. Commissioning

1. Ensure that the connection assignment takes place according to the connection diagram and matches the power supply.
2. With connection of equipment for explosion-prone areas, ensure that the device version has the appropriate approval.
3. With installation of the isolating amplifier in Zone 2, the device must be installed in a switch cabinet with protection rating IP54.
4. Ensure that the terminals are firmly screwed in.
5. After switching on the power, check for the correct switching function.

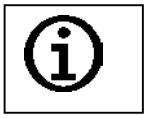
Note:
After the supply voltage is applied, a check of the device function takes place according to the requirements for functional safety.
The device is ready for operation after approximately 3 seconds.
The functional test also includes a load test of the supply voltage. The device draws as much power as a maximum load for 2 seconds, which means 2 short-circuited inputs and 2 energised relays. The load is only simulated, which means the relays do not switch during this phase.

5.2. Maintenance

Housing:

No cleaning or maintenance is required when operated as intended.

5.3. Service



Service of the device is only possible at the factory.

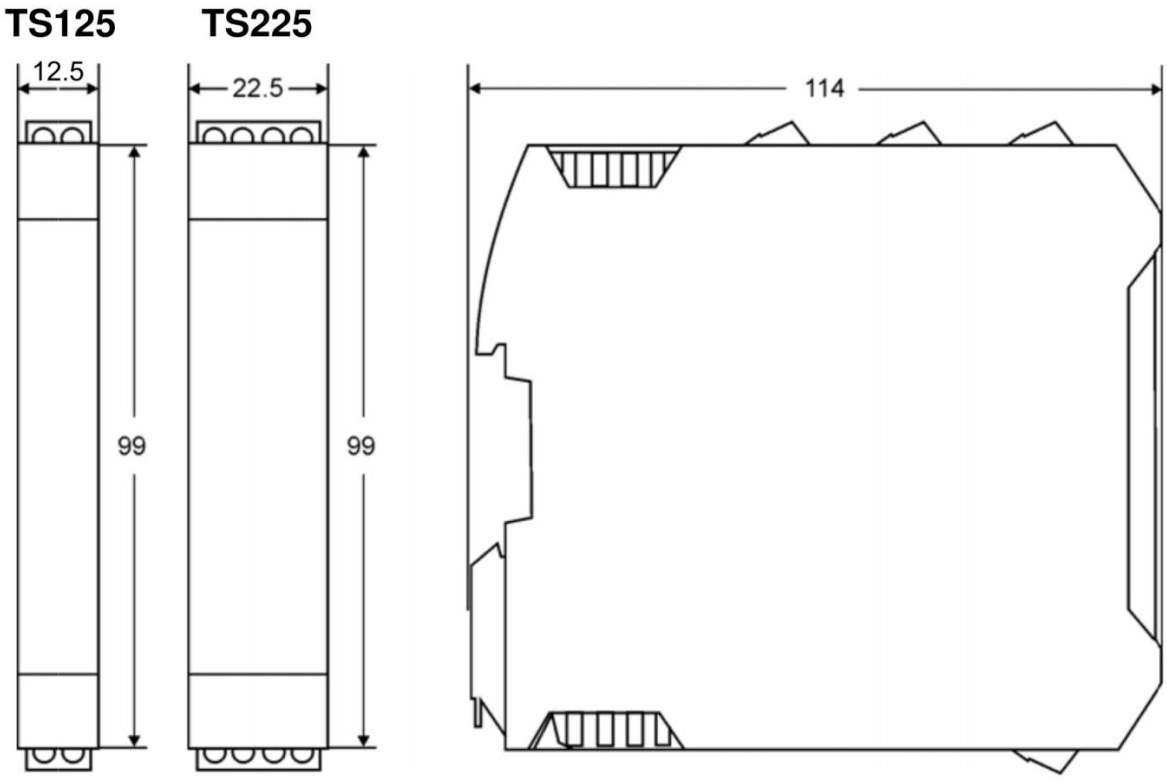
6. Technical data

Explosion protection Device versions with intrinsicallsafe inputs for Zone 0/1 (TS125L-Ex.., TS125LP-Ex.., TS125M-Ex.., TS225M-Ex..)				
Gas Dust	Ⓔx II (1) G [Ex ia Ga] IIC/IIB[1)] Ⓔx II (1) D [Ex ia Da] IIIC[1)] 1) BVS 14 ATEX E079 certificate			
Installation in Zone 2 (only TS125L)	Ⓔx II 3 G Ex nA nC [ic] IIB T4 Gc [2)] 2) Manufacturer's certificate, conditions of use on page 3			
Device version TS125L without intrinsically safe inputs				
Installation in Zone 2 (ATEX ignition protect. class 'n')	Ⓔx II 3 G Ex nA nC IIB T4 Gc [*)] *) Manufacturer's certificate, conditions of use on page 3			
Wide-range power supply				
Supply voltage	20..125VDC and 20..253VAC (47..63Hz), max.1.5W			
ATEX limits for intrinsically safe inputs:	U_o = 8.7V; I_o = 19mA; P_o = 42mW L_i = 20µH; C_i =10nF			
	Gr. IIB/IIIC	L_o 100µH	1mH	100mH
		C_o 12.9µF	7.3µF	2.8µ
	Gr. IIC	L_o 100µH	1mH	100mH
		C_o 2.2µF	1.2µF	0.4µF
24V power supply				
Supply voltage	24V DC +/-15%, max. 1.5W			
ATEX limits for intrinsically safe inputs:	U_o= 8.7V; I_o= 17mA; P_o= 37mW L_i = 20µH; C_i =10nF			
	Gr. IIB/IIIC	L_o 100µH	1mH	100mH
		C_o 13.9µF	7.3µF	2.9µF
	Gr. IIC	L_o 100µH	1mH	100mH
		C_o 2.2µF	1.3µF	0.4µF
Additional data for all device types				
Rated voltage (non Ex-devices)	253V AC (acc. to EN60664-1; pollution degree 2, overvoltage category II)			
Rated voltage Um (according to ATEX)	253V AC / 125V DC (acc. to EN6079-11)			
Test voltage	3kV AC between supply/input/relay switches voltage			
Working temperature	-10..60°C			
Storage temperature	-20..80°C			
Air humidity	10..90% (no condensation)			
EMC	acc. to EN61326-1			

Measuring inputs (in accordance with EN60947-5-6 Namur)	
Open circuit voltage	approx. 8V
Short circuit current	approx. 8mA
Switching points	inactive <= 1.2mA, active >= 2.1mA, hysteresis > 0.5mA
Error recognition	
- Wire break	<0.2mA
- Short circuit	>7mA
Relay outputs	
Switching voltage	<250V AC <2A <500VA <125V DC <0.2A <25W < 30V DC <2A <60W
Switching frequency	max. 5Hz
-delay	max. 30ms
Casing	
Dimensions (WxDxH)	TS125: 12.5 x 114 x 108mm
	TS225: 22.5 x 114 x 108mm
Material	PA6.6, light grey
Weight	TS125: 120g TS225: 140g
Protection type	IP20
Screw terminals	0.2..2.5 mm², AWG 24..14, removable, coded
Push-in terminals (spring-type terminals)	0.5..1.5 mm², AWG 25..16, double connection (12A between the connections), removable, coded
Power rail	8A over the entire bus system (Supply via removable terminals 0.2..2.5 mm², AWG 24..14)

Functional safety	**SIL2 (parameters in accordance with EN61508 and SN29500)**			
Device type	B			
HFT	0			
Response time				
Standard Mode -> Error Mode	30ms			
Error Mode -> Standard Mode	ca. 2s (self reseting)			
Wide-range supply				
- 1-channel version	SFF 95.9%; DC 84.0%; PFH 1.91E-08 /h;			
	PFDavg	1 year	2 years	5 years
		8.38E-05	1.68E-04	4.19E-04
- 2-channel version	SFF 94.6%; DC 79.3%; PFH 2.88E-08 /h;			
	PFDavg	1 year	2 years	5 years
		1.26E-04	2.53E-04	6.31E-04
24V supply				
- 1-channel version	SFF 95.6%; DC 82.6%; PFH 1.85E-08 /h;			
	PFDavg	1 year	2 years	5 years
		8.10E-05	1.62E-04	4.05E-04
- 2-channel version	SFF 94.3%; DC 77.6%; PFH 2.82E-08 /h;			
	PFDavg	1 year	2 years	5 years
		1.23E-04	2.47E-04	6.17E-04

6.1. Mechanical design / dimensions



7. Order code

1. 2. 3. 4.

TS ☐ - ☐ - ☐ - ☐

1.	**Device version**	
	125L	Housing width 12.5 mm, normally open relay contacts, Supply voltage 24V DC +/- 15%
	125LP	Housing width 12.5 mm, normally open relay contacts, Supply voltage 24V DC +/-15% with carrier bus rail connection *)
	125M	Housing width 12.5 mm, normally open relay contacts, Wide-range supply 20..125 V DC, 20..250 V AC
	225M	Housing width 22.5mm, changeover relay contacts, Wide-range supply 20..125 V DC, 20..250 V AC
2.	**Explosion protection**	
	00	No inherently safe inputs Installation of devices TS125L and TS125LP in Zone 2 permitted, in accordance with ATEX protection category 'n'
	Ex	**With installation of the devices outside the Ex area:** Inputs intrinsically safe in accordance with ATEX ignition protection rating 'ia' for Zones 0 and 20 **Devices TS125L and TS125LP** may only be installed in Zone 2 in accordance with ATEX protection category 'ic'
3.	**Number of channels**	
	1	Single channel
	2	Dual channel
	F	Single channel with additional error relay or parallel relay
4.	**Options**	
	00	No options

*) see separate Power-Rail information sheet

8. 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.

9. 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 'Downloads/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.

10. 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.

11. Imprint

GHM Messtechnik GmbH
Standort Martens, Kiebitzhörn 18, 22885 Barsbüttel
Managing Director: Günther Oehler
Registered office: Schloßstr. 6, 88453 Erolzheim / Germany

Ulm District Court, Commercial Register Section B 730462

12. EU Declaration 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: **3044 / 06.2017**

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:
TS125L / TS125LP / TS125M
TS225L / TS225LP / TS225M

Produktbeschreibung:
Product description:
Trennschaltverstärker
Isolating switching repeater

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

Richtlinien / *Directives*	
2014/30/EU	EMV Richtlinie / *EMC Directive*
2014/35/EU	Niederspannungsrichtlinie / *Low Voltage Directive*
2011/65/EU	RoHS / *RoHS*

Angewandte harmonisierte Normen oder angeführte technische Normen:
Applied harmonized standards or mentioned technical specifications:

Harmonisierte Normen / *harmonized standards*	
EN 61326-1:2013	Allgemeine EMV-Anforderungen / *General EMC requirements*
EN 60664-1:2007	Allgemeine Isolationsanforderungen / *General isolating requirements*
EN 50581:2012	Beschränkung der gefährlichen Stoffe / *Restriction of hazardous substances*

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

Michael Wulf

Standortleiter
Site director

Barsbüttel, 20. Juni 2017

i.V.

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Harmonisierungs-rechtsvorschriften, 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 | IMTRON | DeltaOHM

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EU-KONFORMITÄTSERKLÄRUNG
EU-DECLARATION OF CONFORMITY

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Dokument-Nr. / Monat.Jahr:
Document-No. / Month.Year: **3046 / 06.2017**

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:
TS125L-Ex / TS125LP-Ex / TS125M-Ex
TS225L-Ex / TS225LP-Ex / TS225M-Ex

Produktbeschreibung:
Product description:
Trennschaltverstärker
Isolating switching repeater

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 61010-1:2010
2011/65/EU	RoHS / *RoHS*	EN 50581:2012
2014/34/EU	ATEX-Richtlinie / *ATEX Directive*	EN 60079-0:2012 + A11:2013 EN 60079-11:2012 EN 60079-15:2010

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

Michael Wulf

Standortleiter
Site director

Barsbüttel, 20. Juni 2017

i.V.

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

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