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Industrial
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Industrial Automation

Explosion Protection

Summary of Topics

The process of harmonisation of regulations in the field of explosion protection within the member states of the European Union was initiated in 1996. One of the main reasons for harmonisation is that the different regulations existing in the individual member states present a trade barrier. A transitionary period applied until the 30.06.2003 in which both the old and new regulations could be applied.
Since the 01.07.2003, the same common regulations apply for explosion protection in all EU states.

In the following please find a brief comparison between the new and the ”old” regulations. Our more detailed brochure **”Explosion Protection - A Practical Guide”** can be provided on request. Nevertheless, the user is obliged to know the presently applicable regulations and directives.

1 Directives and standards

History
Until the end of 1975, numerous national directives covering the field of explosion protection existed in the individual European states. On 18 December 1975, the first framework directive on explosion protection (mining excluded) came into effect, applying in the member states of the European Union: 76/117/EWG.

Until 1990 there were frequent amendments of this directive. This directive referred to the characteristics and structure of the equipment at issue and was directly related to standards. It applied exclusively to electrical equipment and explosion protection (except mining).

The fact that national directives were still in effect restricted free trade in this area.
In the beginning of 1994, the ”Framework Directive 94/9/EC of the European Parliament and Council of 23 March 1994 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres” was passed. This directive has regard to the ”European Treaty” of 1985, in particular article 100a (amendment of 2 February 1992), establishing the European Community.

To find a general abbreviation for this new directive it was agreed to use the name **ATEX 100a**. ATEX is an abbreviation of the French translation of ”explosive atmosphere” (**at**mosphère **ex**plosible) and 100a refers to the article 100a. Apart from the article 100a, there are further articles which have not yet been fully transposed into according directives. TURCK catalogues always use the term **ATEX** to relate to the new directives on explosion protection conforming to ATEX 100a.

Within the member states of the European Union the ATEX 100a was translated into national legislation, e.g. in the Federal Republic of Germany by the ”Gerätesicherheitsgesetz (§11 GSGV)” and the ”Explosionsschutzverordnung (EXVO)”.

The directives applying for explosion protection were valid until 30.06.2003. The ATEX 100a came into force on the 01.07.2003, which has been up-dated and re-named to ATEX 95a.

Installation and operation of electrical equipment in hazardous areas – standards and requirements

Involved with installation, acceptance and operation of electrical equipment are:

The Legislator having industrial supervision, trade organizations, TÜV and experts as supervisory authorities.

All **Plant Personnel** are required to observe strict guidelines such as health and safety and other work regulations that govern the maintenance and operation of electrical equipment located in the hazardous area.

The System Specifiers who must meet safety requirements according to IEC 31 (CO) 43, ATEX137, EN 60079-14.

The Manufacturers of Components bound by constructional requirements set forth by EN 50014...20, 28 and 39 and ATEX 100a.

EN 60079-14
Installation of intrinsically safe systems in explosion hazardous areas

This standard includes the safety requirements that must be observed (e. g. identification and classification of explosion hazardous locations, temperature classes, cabling and wiring, requirements for the installation of electrical devices in zones 0 and 1).
Contrary to the standards described, which are primarily for manufacturers, this standard applies to maintenance, operators and test personnel.

As EN 60079-14 this standard also complies with the requirements of ATEX. Please note that the former exemption clause for components is no longer included. Partly an approval for individual components is now required.

ElexV – Regulations on electrical equipment in explosion hazardous locations (old) /areas (new)

As a national directive, the ElexV is addressed to those responsible in Germany for the technological causes of the formation of explosive mixtures.

The former ElexV of 1980 related to European regulations on explosion protection of industrial electrical equipment. This ”old” version constituted the legal basis for almost the entire field of explosion protection of electrical equipment. By defining explosion hazardous areas and especially by dividing these into specific zones, ElexV gained major importance as a standard for explosion protection measures. Since the introduction of the ATEX directive in 1996 a lot has changed. Definitions relating to the non-electrical aspects of new electrical equipment are now covered by the new ”Explosion Protection Directive” (ExVO). The

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amended version of ElexV of 1996 refers only to those parts which have not yet been translated into national regulations.

ATEX 137 - Directive for system operators
The directive 1999/92/EC of the European Parliament and Council of 16 December concerning the essential health and safety requirements is intended to guard workers against the potential hazards of an explosive atmosphere. It is addressed to system operators and employers and contains binding regulations. Among other things, it requires to assess the risks resulting from a potentially explosive atmosphere, to classify areas exposed to potentially explosive atmospheres and to keep an explosion protection document.

The explosion protection directive – (ExVO)

The ExVO determines the placing on the market of devices, protective systems and components intended for use in potentially explosive atmospheres and is the German transposition of the directive 94/9/EC.
It describes the essential health and safety requirements and mandatory conformity assessment procedures. The ExVO is mainly aimed at manufacturers of devices, maintenance and test personnel.

In compliance with the directive 94/9/EC, ExVO excludes the following equipment from its scope (summarised): medical devices, explosive substances, or unstable chemicals, personnel protection equipment, seagoing vessels, offshore systems and products for military purposes.

EN 50014 – Electrical apparatus for use in potentially explosive atmospheres – General requirements

EN 50014 contains general requirements for the construction and testing of any electrical apparatus to be used in hazardous areas.
EN 50015...20, 28 and 39 describe the technical requirements of different methods of protection:
– oil immersion (EN 50015)
– pressurised apparatus (EN 50016)
– powder filling (EN 50017)
– flameproof enclosure (EN 50018)
– increased safety (EN 50019)
– intrinsic safety (EN 50020)
– encapsulation (EN 50028)
– intrinsically safe electrical systems (EN 50039)

EN 50020 – Protection type "Intrinsic Safety (i)"

All other methods of protection attempt to contain an explosion to the inside of the housing and to prevent penetration of an ignitable gaseous mixture.

The method of "intrinsic safety" is based on a different approach. It limits the electrical energy to such an extent, that elevated temperatures, sparcs or arcs are incapable of generating the energy needed to ignite an explosive atmosphere. Due to the limitation of electrical energy, these circuits are especially suited to application in the field of measuring, control and instrumentation. The method of "intrinsic safety" has some significant advantages over other protection methods, e.g. maintenance and wiring of live circuits. These systems are easy to handle and cost effective due to inexpensive intrinsically safe components.

2 Definitions of terms

Explosion

An explosion is an exothermic reaction of a material (such as gas, fumes, or dust) occurring at a high reaction speed.

The risk of an explosion exists wherever there is the probability of an explosive atmosphere containing flammable gases or vapours, flammable liquids, combustible dust, or ignitable flyings due to handling, processing, using and storing of these materials.

Such hazardous atmospheres can be present for instance in chemical industries, gas stations, refineries, power plants, paint shops, vehicles, sewage plants, grain mills, airports, grain silos and filling plants.

Explosion hazards

Explosion hazards exist in locations:

– in which ignitable concentrations of flammable gases or vapours can exist under normal operating conditions, or because of repair or of leakage, and when these conditions provide the probability that a dangerous fuel to air mixture will occur;
– where the explosive or ignitable mixtures can come in contact with a source of ignition and they continue to burn after ignition.

Explosive (flammable) mixtures (general term)

A combustible (flammable) mixture is an atmosphere containing substances that when mixed with air, gases or vapours, propel a reaction after ignition.

Explosive (flammable) atmospheres

An explosive atmosphere contains gases, vapours or dust mixed with air as well as the usual filler materials that can explode spontaneously under atmospheric conditions.

Dangerous explosive atmospheres

A dangerous explosive atmosphere is a mixture containing concentrations of flammable gases or vapours that, when ignited, can cause damage to persons directly or indirectly through an explosion.

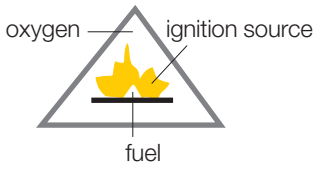
Explosion hazardous location

An explosion hazardous area is a location where potentially explosive atmospheres may exist due to local operating conditions.

Explosion Protection

Ignition triangle

In order to have an explosion, the following three components must be present simultaneously:



Possible sources of ignition:

- hot surfaces
- flammable or explosive gases
- mechanically generated sparks
- electrical installations
- transient currents
- static electricity
- lightning, ultrasonic energy...

Oxidizers:

- air (21 % Oxygen)
- pure Oxygen
- oxygen releasing compounds (i.e. potassium manganate)

Fuels (flammable substances):

Flammable concentrations of gases and powders from liquids or solids which have the potential for igniting an explosion.

Explosive limits

A mixture is only explosive when its concentration falls within certain material specific limits. These limits are called the upper and lower explosive limits and are listed in according tables.

Flash-point temperature

The flash-point is the lowest temperature at which a liquid releases sufficient vapours that are ignitable by an energy source and extinguish when the energy source is removed.

An explosive atmosphere cannot occur when the flash-point of a material is not exceeded during storage or handling. Flammable liquids, which do not dissolve in water, constitute a source of danger.

In Germany they are classified according to VbF (directive for the installation and operation of plants where flammable liquids are stored and handled). Further parameters to evaluate the danger are the glow temperature, the minimum ignition energy and the ignition temparature. These values are listed in according tables.

Primary and secondary methods of protection

Basically there are two methods used to prevent an explosion.

Primary method of protection

The primary method prevents formation of a dangerous atmosphere by one or more of the following measures:

- avoiding the use of flammable liquids
- increase of flash point
- limiting the concentration to safe levels
- through natural and technical ventilation
- monitoring the concentration

The primary method of protection is not described in this brochure. Please refer to the explosion protection regulations of the professional association of the chemical industry in Germany (Ex-RL) and EN 1127-1.

Secondary method of protection

The secondary method comprises measures to prevent ignition of an explosive mixture. Here, constructive or electrical techniques are used to

- segregate the electrical parts of the equipment, which could ignite a dangerous mixture, by keeping the explosive atmosphere away from the ignition source
- prevent an explosion by impeding the propagation to the surrounding explosive atmosphere.

The secondary protection method is frequently used, if primary protection does not provide adequate protection.

3 Electrical equipment featuring protection type "Intrinsic Safety"

The term "intrinsic safety" implies that the electrical energy of an intrinsically safe circuit is limited to such an extent that a thermal effect or spark is incapable of igniting an explosive atmosphere under specified conditions.

TURCK devices for use in explosion hazardous locations comply with protection type "intrinsic safety". The devices are divided into two different kinds of electrical equipment: intrinsically safe equipment and associated equipment. Marking of the devices enables clear distinction between the two types of apparatus (see point 5). Further there are devices defined as "simple equipment" which maintain an exceptional position within this field.

Intrinsically safe electrical apparatus
is any apparatus in which all circuits are intrinsically safe. Direct installation in hazardous locations is permitted, provided that all related requirements are met. An example is a NAMUR sensor approved according to EN 60947-5-6 or a transmitter.

Associated electrical apparatus
is any equipment which may incorporate both intrinsically safe and non-intrinsically safe circuits. Intrinsically safe devices may be connected to associated electrical equipment, provided that all essential conditions for this kind of interconnected assembly are fulfilled.

Associated electrical apparatus must generally be installed outside the hazardous areas. If installed within the hazardous location, additional types of protection must be provided.

All TURCK devices, type *multisafe*®, *multimodul*, *interfacemodul* and *multicart*® with intrinsically safe circuits, are classified as associated electrical apparatus.

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Simple electrical equipment

Simple components and simple equipment not generating or storing more than 1.5 V, 0.1 A and 25 mW, do not require approval. This kind of equipment includes thermo-elements, photocells, switches, resistors and simple printed circuits, which feature defined and known parameters and do not affect the intrinsically safe circuit.
A definition of simple electrical apparatus is contained in EN 50020 and EN 60079-14.

Categories

The intrinsically safe electrical apparatus conforming to EN 50020 is divided into two categories. This classification is determined by the failure probability and the ignition capability of the intrinsically safe circuitry.

Category "ia"

Category "ia" indicates that the electrical apparatus should not be able to ignite a dangerous mixture during normal operation and in the event of a single fault, nor in the event of any combination of two faults. Intrinsic safety must be maintained even when two independent faults occur at the same time.

Therefore, components of any apparatus of category "ia" that are susceptible to faults must be present in triplicate.

Category "ib"

An electrical apparatus in category "ib" should not be capable of causing ignition during normal operation and in the event of a single fault. Intrinsic safety must be maintained in the event of a single fault.

A fault could be the failure of a component that is susceptible to disturbances. Any apparatus in category "ib" must have all components in duplicate.

Groups and temperature classes

Electrical apparatus for use in the hazardous area is classified into groups and classes based on the likelihood of an explosion danger. This is of great importance from a **safety aspect** as well as an **economical aspect** because it determines the requirements that must be met by the electrical apparatus.

Definition of **Groups** is based on the location in which the apparatus is going to be used.

- Group I classified apparatus may be used in mines susceptible to firedamp and must conform to European standards EN 50014...50020 and 28.

- Group II classified apparatus may be used in all other potentially explosive atmospheres.

Group II classified apparatus is used in all hazardous (classified) areas except mining applications where methane may be present. Depending on the application, different flammable materials with different ignition energy ratings are needed. From a practical point of view, subdividing Group II is therefore necessary and makes sense, not only for economical reasons.
Subdivision of Group II equipment is determined by the different ignition energy of the flammable materials. The different groups are classified by capital letters in ascending alphabetical order according to the hazard risk of the associated material. Materials belonging to group C require less ignition energy than Group A materials (see table 1).

	T1	T2	T3	T4	T5	T6
I	Methane					
II A	Acetone	Ethyl alcohol	Gasolines	Acetadehyde		
	Ethane	i-Amylacetate	Diesel fuel	Ethyl ether		
	Ethyl acetate	n-Butane				
	Ammonium	n-Butyl alcohol	Aircraft fuel			
	Benzol (pure)					
	Acetic acid		Fuel oils			
	Carbon monoxide		n-Hexane			
	Methanol					
	Propane					
	Toluene					
II B	City gas	Athylene*)				
	(carbonated	hxdrogen)				
II C	Hydrogen	Acethylene*)				Ethylnitride*)

*) no authorised regulations

Tab. 1 Flammable materials - temperature classes and groups

Temperature class IEC/EN NEC 505-10	Maximum surface temperature of apparatus (°C)	Ignition temperatures of flammable materials (°C)	Temperature class NEC 500-3
T1	450	> 450	T1
T2	300	> 300 ≤ 450	T2
	280	> 280 ≤ 300	T2A
	260	> 260 ≤ 280	T2B
	230	> 230 ≤ 260	T2C
	215	> 215 ≤ 230	T2D
T3	200	> 200 ≤ 300	T3
	180	> 180 ≤ 200	T3A
	165	> 165 ≤ 180	T3B
	160	> 160 ≤ 165	T3C
T4	135	> 135 ≤ 200	T4
	120	> 120 ≤ 135	T4A
T5	100	> 100 ≤ 135	T5
T6	85	> 85 ≤ 100	T6

Tab. 2 Surface and ignition temperatures

Explosion Protection

Temperature class

The temperature class specifies the maximum allowable surface temperature of an apparatus. In this category, the explosion protected apparatus can be approved for different temperature classes - a decision which depends on technical and economical considerations.

In the majority of cases, explosion proof equipment for the lowest temperature can be very expensive to buy and install. By comparison, using products featuring protection type „intrinsic safety“ is more efficient and cheaper. Intrinsically safe equipment for direct installation in hazardous areas requires temperature classification. For associated apparatus temperature classification is not needed.

Ignition temperature

The ignition temperature (defined as the temperature at which a mixture self-ignites during testing) directly relates to the temperature class. The temperature class indicates the maximum surface temperature of an apparatus and must be lower than the minimum ignition temperature of the flammable material (see table 2 - page 0-7) to prevent an ignition.

Device Groups and Categories According to the ATEX Directive

The ATEX directive includes a new kind of device marking which describes the application and the constructional level of safety.

This new marking per ATEX does not replace standardised marking including temperature class, explosion group and protection type.

Marking according to ATEX contains information on the area of application and the safety level achieved by the device. Marking according to EN 50020 provides detailed information on how the protection measures were realised and which applications are permitted. EN 50020 and ATEX use similar terms but the information provided may be essentially different.

The first criterion is the **Equipment Group.** This classification accords to the groups described on page 11 and defines the location in which a device may be installed.

– Device Group I: for mining underground with a potential hazard due to firedamp and/or combustible dusts.
– Device Group II: for all other locations in which a potentially explosive atmosphere exisits

The second criterion is the **Equipment Category,** defining the level of safety:

1: very high level of safety: devices featuring two independent means of protection; even in the event of rare device disturbances, the device remains functional and maintains the requisite level of protection
2: high level of safety: devices featuring one means of protection. Even in the event of frequently occurring device disturbances or equipment faults which normally have to be taken into account the device provides the requisite level of safety
3: normal safety; the device ensures the requisite level of protection during normal operation.

Equipment classified as Group I (underground mining susceptible to firedamp) uses the prefix M, e. g. M1, in addition to the category classification.

The third and last criterion is the **Substance Group** which characterises the application of devices in particular atmospheres:

G: explosion protection in explosive atmospheres due to gases, vapours or mists (G: gas)
D: explosion protection in explosive atmospheres due to dusts (D: dust)

The equipment category also determines whether the device is an associated apparatus or an intrinsically safe apparatus. If it is an associated apparatus the equipment category is put into round brackets, e.g. II (1) G.

4 Zone classification

According to EN 60079-10 and EN 1127-1 explosion hazardous areas are divided into zones such as flammables gases, vapours, mists and combustible dust. The classification is based on the likelihood that a dangerous explosive atmosphere occurs. The ATEX directive has re-defined the zone division as follows:

– zone 0, 1 and 2 for gases and vapours
– former zones 10 and 11, now zones 20, 21 and 22 for dusts
– zones G and M for locations used for medical purposes

Zone classification	Likelihood of an explosive atmosphere	Compliance with safety requirements by	Requirements fulfilled by		
			equipment group	related equipment category	additional equipment category
Zone 0 (gas, ...) Zone 20 (dust)	continuously, for long periods or frequently	2 independent means of protection	II	1 G (for gas, ...) 1 D (for dust)	–
Zone 1 Zone 21	occasionally	1 independent means of protection	II	2 G 2 D	1
Zone 2 Zone 22	unlikely or infrequently - for a short period only	normal operation	II	3 G 3 D	1 or 2

Tab. 3 Zone classification – equipment category

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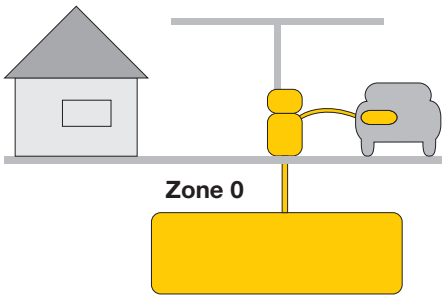
Gases and vapours

Zone 0

Zone 0 is a location in which ignitable concentrations of flammable gases or vapours are continuously present, or present for long periods. The example shows a gas station with zone 0 locations.



According to the previous national regulations any apparatus or parts thereof used in a zone 0 location had to be specially certified and approved for use in zone 0 locations. Further, the certificate of conformity had to mention explicitly that the equipment and parts thereof were permitted for use in zone 0. When using intrinsically safe and associated equipment as an interconnected assembly, both parts used to require a system approval.

This restriction is not included to the ATEX directive. If both parts of equipment meet the regulations for installation in zone 0, it is permitted to use the equipment accordingly without an extra approval. When electrical equipment approved by both previous and new regulations is used as an interconnected assembly, it is required to meet all requirements set forth by both directives. Additionally a system approval is needed.

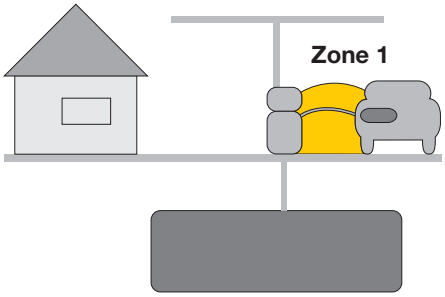
Intrinsically safe apparatus designed for use in zone 0 must meet category "ia" safety standards and must have no live contacts. Galvanic isolation between intrinsically safe and non-safe equipment is the method of choice. If earthing of the intrinsically safe circuit is required for functionality, this must be done outside zone 0, but as close as possible to zone 0.

Zone 1

Zone 1 are locations in which an explosive air/gas mixture is likely to occur under normal operation. Here ATEX does not incorporate any changes.The example identifies the area near the gas pump during refuelling as a zone 1 location.

Generally the following areas in industrial plants are considered to be zone 1 locations:

– in the vicinity of zone 0
– close to inspection openings
– near filling and draining devices
– inside of machinery

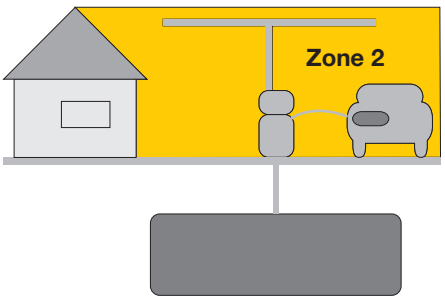


Any equipment certified for zone 1 must be Group IIA, IIB or IIC and at least category "ib".

Zone 2

Zone 2 comprises areas in which an explosive and dangerous atmosphere is unlikely to occur, but, if it does, only for a short period. The ATEX definition of zone 2 differs slightly: An explosive atmosphere should not occur, but, if it does, only infrequently and for a short period.

– any areas near zone 0 and 1
– areas near flange seals whenever standard flange joints are used
– areas near pipe lines in closed rooms



Unlike apparatus for zones 0 and 1, equipment for use in zone 2 does not require a test certificate by an authorised body. Devices for zone 2 must conform to category 3 and must meet the following criteria (EN 60079-15):

- **restricted breathing enclosures** (10 K overtemperature only)
- **sealed enclosures** (various test methods/requirements)
- **simple pressurized enclosure** (like „p" without purging)
- **limited energy** (intrinsic safety without safety factor)
- **encapsulated switching devices** (simple „pressurized enclosure")
- **lower requirements for equipment in zone 1, e.g.**
  – clearances and creepages
  – housing impact test
  – plastic materials
  – construction of lampholders and starters

Installation of devices in Zone 0 to 2

For installation in zones 0 to 2 (gas, vapour) it is required that intrinsically safe and associated equipment must meet at least those requirements applying to the zone in which the intrinsically safe apparatus is to be installed. If the equipment meets higher requirements, operation is obviously permitted. The national regulations apply to interconnected assembly and installation of devices. Please refer to point 7 for further information.

Explosion Protection

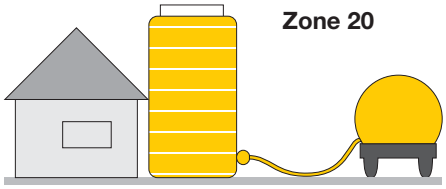
Combustible dusts

Explosion protection regulations applying to combustible dusts differ from those relating to gases and vapours due to the different hazard points. Here, ATEX also determines new regulations. Transposition into new directives and standards has not yet been completed, so that it is likely that there will be various amendments and complications.

The previous zone classification and the new division into zones according to ATEX differ in many respects. Following please find a comparison.

Previous zones 10 and 11 will be replaced by the zones 20, 21 and 22. Here the zone classification is similar to that of gases and vapours.

Previous Zone 10, new Zone 20



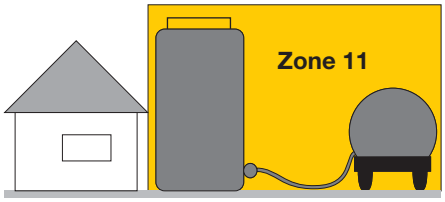
According to the previous regulations, zone 10 comprises areas in which a dangerous explosive atmosphere is constantly present or prevails for a long period.

According to ATEX, zone 20 is classified as an area in which a dangerous explosive atmosphere in form of a dust cloud is continuously present, or occurs frequently, or for a long period. The possibility of a dust deposit with a known or excessive thickness is given. The presence of dust deposits as a single event does not constitute a zone 0 classification.

As a rule, these conditions can only prevail inside an enclosure, pipes and instruments.

Areas, in which dust deposits occur, but where clouds of dust are not present constantly, frequently, or for a long term, do not belong to this zone.

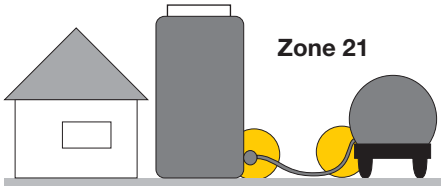
Previous Zone 11, new Zone 21 and Zone 22



Zone 11 comprises areas in which it is likely that a dangerous explosive atmosphere occurs occasionally due to whirling up of dust. According to ATEX, zone 11 is subdivided into two zones, i.e. zones 21 and 22.

Zone 21

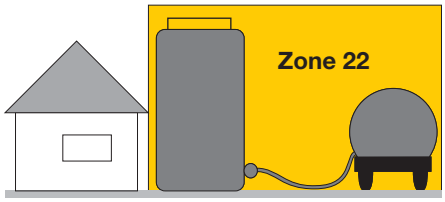
Areas in which, during normal operation, a potentially explosive atmosphere in form of a dust cloud can occur occasionally. Dust deposits or layers of combustible dust will usually be present.



These can be areas in the close vicinity of filling or dust extraction stations, where dust deposits are present and explosive concentrations of flammable dust mixed with air may occur during normal operation.

Zone 22

An area in which it is unlikely that a potentially explosive atmosphere in form of a dust cloud occurs during normal operation. If such an atmosphere occurs, then only for a short period, or in the event of dust accumulation, or in layers of combustible dust.



An example: areas in the vicinity of equipment containing dust which can escape due to leakages und where dust deposits can build up (e.g. mills from which dust is released and accumulates) could be classified as zone 22 environments.

Devices for use in Zone 20 to 22

Installation and operation of devices in zone 20 to 22 are subject to the national regulations (EN 50281-1-2). Thus, intrinsically safe equipment used within zones 20 to 22 must feature the corresponding approvals. Associated equipment does not require an approval for flammable dusts, an approval for gases and vapour is sufficient. It must be ensured that the limit values of intrinsic safety of the EC type examination certificate are met in case of an interconnected assembly. Then it is permitted to mark the intrinsically safe equipment, for instance as II 1 D and the associated apparatus as II (1) G. However, the marking II (1) GD is generally used in order to avoid confusion.
During installation it is required to observe the special conditions of dust protection. E.g. simple apparatus for use in zone 20 to 22 must have an approval, whereas this is not necessary for simple equipment in zones 0 to 2.

Medical environments

According to the previous regulations, medical environments, e.g. all equipment used for anesthesia or for articificial respiration, were subdivided into zones M and G. ATEX no longer includes medical equipment in the scope of its explosion protection regulations. The applicable legislation covering the protective aspects associated with medical products do not relate to explosion protection so that there is a juridical insecurity in this field.

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5 Marking of devices

Equipment for explosion protected areas must be clearly marked. There are two different types of marking. According to CENELEC marking of an apparatus conforming to EN 50014/20 must provide the following information:

- manufacturer's name or trademark
- part number
- EEx-symbol
- ignition category (e. g. „ia")
- designated group together with the respective subdivision (e. g. IIC)
- temperature class or maximum surface temperature (for group II devices only)
- serial number (may be omitted if space is restricted)
- test authority, date and file number
- "x" after the test certificate number indicates that special conditions must be met (see certificate for special conditions)

An intrinsically safe apparatus could have the following marking:

EEx ia IIC T6

- T6 — temperature class
- IIC — explosion group
- ia — type of protection
- EEx — conform to European standard

An associated apparatus could have the following marking:

[EEx ia] IIC

- IIC — explosion group
- ia — type of protection
- EEx — acc. to European standard
- [ ] — associated apparatus

To date, the test certificate number of the test authority used to contain the generation number of the applicable standard to indicate the amendment status, e.g.:

PTB Nr. Ex-85.B.2128X

PTB Nr.	authorised body
Ex-	explosion protected apparatus
85.	year of issue
B.	generation indicator
2128	serial certificate number
X	special conditions

According to ATEX marking must be as follows:

PTB 97 ATEX 2128X

PTB	authorised body
97	year of issue
ATEX	accord. to 94/9/EC
2128	serial certificate number
X	special conditions

Within the European Union the devices must meet the respective requirements. If the manufacturer fulfills these, he is permitted to affix the CE sign.
The ATEX directive extends marking. The identification number of the notified body, which carried out the quality assurance system approval, is added to the CE sign (see point 6).

CE 0102

For example, the test body of the TÜV Hannover uses the identification code 0032 and the PTB in Braunschweig has the code number 0102. Additionally the year of production and the constructional level of safety must be contained in the device's marking. In case of intrinsically safe apparatus marking according to ATEX would be:

II 1 G

- II — explosion protected against gas, vapour and mist
- 1 — very high safety level suited for zone 0
- G — all areas except mining

Associated equipment is identifiable by round brackets enclosing the device category:

II (1) G

- ( ) — may not be installed in hazardous areas

6 Manufacturer obligations

Certificates of conformity and EC type test certficates

An authorised body is entitled to test and certify that devices are suited for use in explosion hazardous areas and comply with the relevant regulations and standards.

Previous regulations required the manufacturer to submit a test sample to the test body and to ensure compliance with existing regulations. The authorised test body then issued the certificate of conformity and passed it on to the manufacturer. The certificate of conformity contains all relevant data associated with explosion protection.

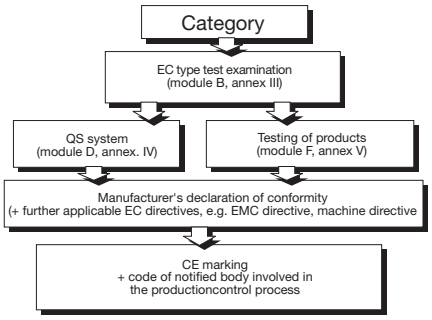
Here, the ATEX directive also implements a change. The manufacturer is requested to supply a type test sample to an authorised inspection body, which draws up a test report to be submitted to the notified body entitled to issue the EC type examination certificate after verifying conformity. Notified bodies and external inspection bodies are registered centrally. The EC type examination certificate contains all data relevant for explosion protection.

The obligation to keep a copy of this certificate is the responsibility of the manufacturer of the device. Along with the certificate, the manufacturer provides an instruction manual with all relevant Ex data. In addition, the manufacturer issues a declaration of conformity, stating that all applicable standards and directives are met. The user needs these documents to document compliance of the system installation correctly.

Explosion Protection

CE marking of equipment

Devices for use in explosion hazardous area are equipped with the CE marking and the identification code of the testing authority. The assessment procedure for CE marking is clearly defined and depends on the device category. The example shown relates to device category 1, featuring the highest safety level. The applicable annexes of the directive 94/9/EC are also shown.



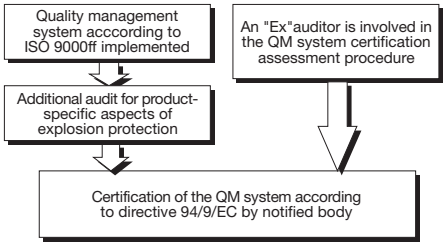
Different annexes apply to the various device categories.

Assessment of the quality assurance system

The manufacturer of intrinsically safe devices, categories 1 and 2, must have an approved quality management system. This approval is needed to ensure that the manufacturer produces the devices according to the test type sample and that conformity to relevant protection regulations is given. Assessment of the quality assurance system is carried out by a notified body. Assessment can be achieved in two different ways:

Assessment and certification can be done directly within the frame of certification according to ISO 9000ff. Approval of those fields associated with explosion protection is accomplished in cooperation with an expert of the notified body. If the ISO certificate has already been granted, it is possible to certify those parts relating to explosion protection subsequently within the frame of an additional audit.

The following illustration shows both possibilities:



TURCK's manufacturing sites for explosion protected devices are certifed according to ISO 9001 and have a quality system approval.

7 Guidelines for use of devices with intrinsically safe circuits

The national regulations and standards are the basis for use of devices with intrinsically safe circuits. These must be strictly observed and followed. The user is obliged to inform himself on all revisions.
The following guidelines relate to the ATEX (94/9/EG) directive of the member states of the European Union, especially to the field of explosion protection in areas exposed to hazards by gas.

If the device is classified as an associated apparatus equipped with intrinsically safe and non-intrinsically safe circuits it may not be installed in explosion hazardous areas. It is permitted to connect intrinsically safe devices located in the hazardous area to the intrinsically safe connections of this device. With the TURCK devices, series *interfacemodul, multimodul, multisafe®*, and *multicart®*, these connections are marked in blue.
When interconnecting devices within such an assembly it is mandatory to provide a proof of intrinsic safety (EN 60079-14:2004, section 12.2.5).
It is required to verify that all data related associated to explosion protection of the devices allow mutual operation. Verification must include the internal capacitances and inductances of the cables used. Please refer to section 8.1 on page 0-15 for further information.

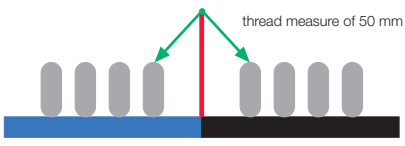
Intrinsically safe circuits should never be interconnected with non-safe circuits. Even if only interconnected once, it is possible that essential protective elements are damaged without the user being aware of this fact. A simple function test is not suited to verify a damage of this kind. Once intrinsically safe circuits have been connected to the non-intrinsically safe circuit, it is not permitted to use the device subsequently as intrinsically safe equipment.

The governing regulations cover installation of intrinsically safe circuits, mounting to external connections, cable characteristics and cable installation. Cables and terminals with intrinsically safe circuits must be marked and separated from non-intrinsically safe circuits or feature appropriate isolation (> 1.500 VAC) Following an excerpt from the requirements according to EN 60079-14:

- protection against external electrical or magnetic fields (e.g. power current cables)
- prevent conductor splicing of fine wires through wire sleeves
- min. cross section of 0.1 mm (also single wires of a conductor)
- protection against damaging (mechanical, chemical, thermic...)
- armouring, metal cladding, shielding of cables and lines
- common use of single-core non-sheathed cables of intrinsically and non-safe circuits in one line is not permitted
- separate error assessment when using multi-conductor cables and lines
- when marking cables by colour, light-blue must be used.

Due to the open construction and the special wiring of *Eurocard* style devices, the following regulations must be followed when installing *multicart*® switching amplifiers:

- According to IEC publication 60529, *multicart*® style devices require a protection of at least IP20. Generally, this is achieved by installing special partiton barriers or special enclosures in the mounting rack.
- connections for intrinsically safe and non-intrinsically safe circuits must either be separated by a physical barrier so that they are at least 50 mm (thread measure) apart from each other, or each connection must be provided with cable sleeves which cannot slip off and ensure covering of all bare parts. These safety measures are not necessary if crimp snap-in type edge connectors are used.
- all edge connectors on the *multicart*® devices must be coded by a pin/plug coding to avoid insertion of the wrong module. The coding is prepared by the manufacturer by means of coding pins and holes on the contact strips according to a coding plan.
- within the mounting rack, the safety distances must also be observed.



A thread measure is defined as the distance between circuits separated by an partition barrier. The reason for this regulation is that it possible to work with live intrinsically safe circuits; thus it must avoided that these come into contact incidentally with any non-safe connection components.

This distance is only required for external connections which can be accessed by the user. The minimum distance between two intrinsically safe circuits must be 6 mm and separation from other (earthed) metal parts must be 3 mm.

The approval expires, if the device is repaired, altered or opened by a person other than the manufacturer or an expert unless the device-specific instruction manual explicitly permits such interventions. Only an expert disposes of the information on protection measures needed to assure that the device is still in accordance with the applicable regulations after such an intervention. Visible damages of the device's housing (e. g. black or brown discolouration due to heat accumulation, perforation or deformation) indicate a serious error and the device must be turned off immediately. It is required to check the connected equipment too.

Inspection of a device with regard to all relevant aspects of explosion protection may only be carried out by an expert or the manufacturer. Operation of the device is only permitted within the specified limits, e.g. the supply voltage may never exceed the maximum rating and the temperature range during operation must be strictly observed.

Intrinsically safe circuits with galvanic isolation - as is the case with TURCK devices - should not be earthed, unless not absolutely necessary from a functional point of view.

Circuits without galvanic isolation, e.g. Zener barriers, always require earthing. EN 60079-14 includes the relevant earthing regulations. Within zone 0 earthing of a circuit is not necessary. If earthing is necessary for functional reasons, then it must be carried out in close vicinity of zone 0.

Prior to every initial set-up or after any change of the device interconnection within the assembly, it must be ensured that all applicable regulations, directives and framework directives are met, that all safety regulations are fulfilled and that the device is functioning properly. Only then operation is permitted.

Mounting and connection of the device should only be carried out by qualified and trained staff familiar with the relevant national and international regulations of explosion protection to ensure correct operation.

The system operator must ensure that the system is always in the required safe condition. The system must be inspected continuously and necessary maintenance work must be carried out immediately while observing the safety regulations. The system must be tested in case of need, latest every three years.

Accidents

The operator must report any explosion which could have been caused by the electrical equipment to the supervisory body. The supervisory body is entitled to order an investigation by an expert.

Explosion Protection

Safety barriers

Safety barriers are considered protection devices and their function is to avoid possible errors and faults by preventing the transfer of unsafe levels of energy to the hazardous area. Possible faults are:

- excessive voltage in the hazardous area
- high current levels in the hazardous area (short-circuit)

Because barriers have no galvanic isolation, they require connection to the equipotential connection (PA) leading into the hazardous area to prevent potential variances between conducting constructional parts and the intrinsically safe circuit.

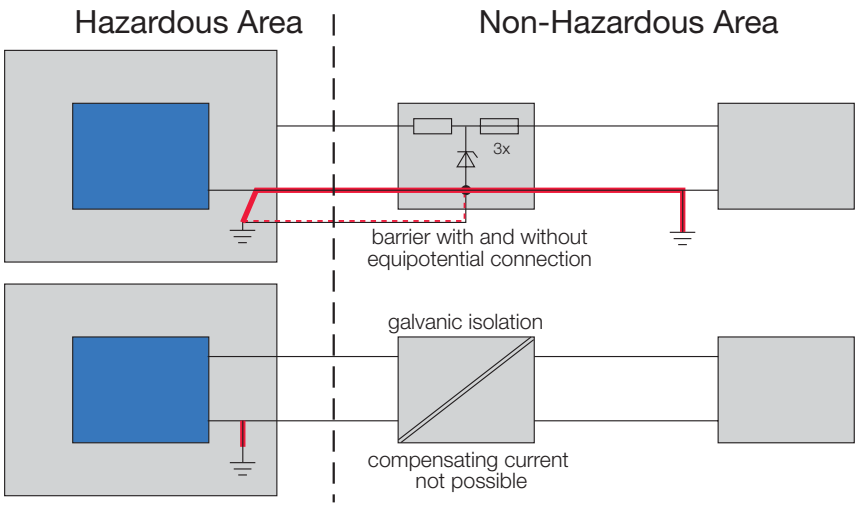
The following parameters must be observed when using safety barriers:

- Zener voltage U_Z
- short-circuit current I_k
- maximum current I_m

In cause of fault, these maximum energy values could reach the hazardous area.

The safety parameters of the barrier are:

- the supply voltage of the barrier should always be lower than the maximum input voltage indicated on the barrier, otherwise any leakage currents occurring during normal operation could flow through the Zener diodes
- total series resistance R of the barrier
- maximum voltage U_M on the hazardous side
- maximum allowable external inductances L_a and capacitances C_a.



Section 12.2.4 of EN 60079-14 generally requires intrinsically safe circuits to be earth-free, but for safety and functional reasons earthing is permitted.
Due to an earth fault between two different potentials of remote system components, compensation currents may flow in the intrinsically safe circuit. These currents can counteract intrinsic safety, e.g. by causing excessive heat within a cable which originally was rated correctly for the intrinsically safe circuit.

The safest method is an isolated (earth-free) design of intrinsically safe circuits. As a rule, earthing is usually not necessary for functional reasons. Earthing of an intrinsically safe apparatus at one point is permitted and in many cases needed to prevent disturbances. Metal housings of intrinsically safe equipement do not require earthing. Further details on Zener barriers are included in the data sheets available from the respective manufacturers.

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8 Proof of intrinsic safety

According to EN 60079-14 a proof of intrinsic safety must be provided to confirm that equipment interconnected within an assembly accords to the requirement of intrinsic safety. In this context there is a clear distinction between two basically different circuits:

1. simple intrinsically safe circuit with a single associated apparatus and at least one intrinsically safe apparatus without additional supply
2. more than one associated apparatus which is capable of supplying electrical energy to the intrinsically safe circuit not only during normal operation but also in a fault condition.

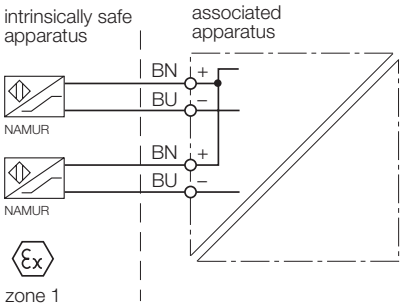
8.1 Simple circuits

The first definition of a simple intrinsically safe circuit requires to observe all electrical limit values stated in the EC type examination certificate and the power characteristics. If these conditions are met, the user is entitled to keep a proof of intrinsic safety. Inductances and capacitances of the installed cables must be taken into account.
Intrinsic safety of a simple circuit is given, if the limit values are maintained according to the following conditions:

associated equipment	condition	intrinsically safe apparatus + cable
U_0	≤	U_i
I_0	≤	I_i
P_0	≤	P_i
L_0	≥	$L_i + L_C$
C_0	≥	$C_i + C_C$

The cable characteristics provided by the manufacturer should be used. Should these not be available, it is recommended to use the following typical values (BASEEFA newsletter no. 3, October 1980):
L_C = 1 mH/km / C_C = 110 nF/km

The connection of proximity switches to isolating switching amplifiers, or 2-wire transmitters to isolating transducers, or solenoid valves to a valve control module can be considered as simple circuits.



The limit value indexes of the old certificate of conformity and the new EC type examination certificate differ.
In this overview the indexes according to EN 60079-14 are used. Index „0“ stands for maximum output values and „i“ for maximum input values.

The proof of intrinsic safety should be laid down in a standardised document to facilitate clear documentation.

The document should contain the date, the name of the manufacturer, the circuit type and the type code. A possible form of documentation is shown below.

Associated equipment										
Type	Type name	Manufacturer	Approval Number	Expl. Group	Device Category	U_0 [V]	I_0 [mA]	P_0 [mW]	L_0 [mH]	C_0 [nF]
Isolat. switching amplifier	MC13-36AEx0-R	TURCK	TÜV 03 ATEX 2378	[EEx ia] IIC		9.6	11.0	26.0	0.9	1100

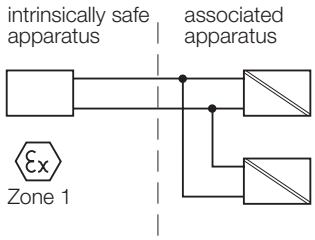
Intrinsically safe electrical equipment											
No.	Type	Type name	Manufacturer	Approval Number	Expl. Group	Device Category	U_i [V]	I_i [mA]	P_i [mW]	L_i [mH]	C_i [nF]
1	Proximity switch	BIM-INT-Y1X	TURCK	KEMA 01 ATEX 1264 X	EEx ib IIC T6		15.0	60.0	100.0	50.0	30.0
2											
	Cable inductances and capacitances: (Manufacturer data or L_C = 1 mH/km, C_C = 110 nF/km) Total cable length: 130 m									0.13	14.3
	Total inductances and capacitances: (ΣL_i and ΣC_i)									50.13	44.3
Intrinsic safety is given if the following conditions are fulfilled: $U_0 \le U_i$ $I_0 \le I_i$ $P_0 \le P_i$ $L_0 \ge \Sigma L_i$ $C_0 \ge \Sigma C_i$											

Example of a "Proof of intrinsic safety"

Explosion Protection

8.2 Interconnection/Assembly of several devices

The second case considers interconnection of several active associated devices. It differs essentially from the first case. Here it is not permitted to apply the electric limit values of the EC type examination certificate for the proof of intrinsic safety.



Different limit values apply to an assembly of the individual associated apparatus. Such an assembly will always be classified as equipment according to category „ib“, even if the single apparatus accords to category „ia“. An assembly may therefore not be installed in zone 0. A detailed description of interconnection and assembly is beyond the scope of this catalogue. The related calculation methods and an example are contained in annexes A and B of EN 60079-14. Additionally, the ignition curves of IEC 60079-11 are needed. EN 50020 also contains the ignition curves.

8.3 Non-linear characteristics

When interconnecting associated apparatus whose typical curves are not entirely linear, a special procedure must be applied. This procedure is explained precisely in report number PTB-THEx-10 of the German PTB in Braunschweig (ISBN 3-89701-440-8).

9 Approvals outside the EU

Equipment certified according to the ATEX directive may be placed on the market, installed and put into service within the member states of the European Union. Even though Switzerland does not belong to the EU, approvals according to ATEX are accepted. An approval by SEV is not required, if the customer provides the mandatory documentation, i.e. the instruction manual, the EC type examination certificate, the CE declaration and the certificate of the quality management audit relating to explosion protection.

Many states outside the European Union explicitly request an own national approval. Therefore TURCK devices feature approvals for many different countries. Own approvals are required e.g. in the USA, Canada, China, Japan, Australia, CIS states, Hungary or in the Czech Republic, whereas other states accept approvals issued by other states. For this reason it is indispensable to be familiar with the national requirements.

In many states approvals are granted for a certain period only. Therefore it is recommended to check if the approval has expired or has been prolonged accordingly. If an approval expires after installation, many countries accept further operation.

Approvals according to ATEX and approvals in the USA and Canada are not subject to a time limit.

Apart from the national approvals there are also specific installation and operation requlations. These are supplied together with devices featuring approvals for the USA and Canada. The TURCK brochure „**Understanding Hazardous Area Sensing**“ (in English) gives insight into explosion protection in the United States and can be provided on request.

10 Approvals and certifikates of conformity via Internet

TURCK offers their customers to view all valid approvals and to download these as PDF files (Acrobat Reader, from version 5.0 onwards):
www.turck.com
⇒ Headquarters
⇒ Download
⇒ Approvals

General Technical Data and Guidelines

Summary of Topics

1 Notes for mounting and installation

Mounting and installation have to be performed conform to the valid regulations and the operator is obliged to ensure that they are observed. On devices with intrinsically safe connections, special knowledge in the field of explosion protection is required.

Under certain conditions, the devices must be protected against dust, dirt, humidity and other environmental influences, as well as against mechanical damage, unintentional touching and alteration of parameters. It must be ensured that heat is conducted away from the devices.

2 Environmental conditions

The devices listed in this catalogue are designed for normal industrial use under normal atmospheric conditions. This does not exclude non-condensing humidity. The operational temperature range is stated for every device. Sources of intensive solar radiation or other heat sources should be avoided.
Use in environments with high-energy radiation should be avoided due to the use of semi-conductor components in the devices. Usage may still be possible after a thorough examination of the application and further clarification by TURCK.
The devices have been designed and developed to the current state-of-the-art in the field or electromagnetic compatibility. Conformity to the respective guidelines is confirmed by the use of the CE mark. However, the operator is urged to ensure that his installation is designed for EMC compatibility.

3 Relay outputs

The use of relay couplers is limited by their relatively low switching frequencies and limited contact life. TURCK uses high quality relays with a mechanical life of at least 20 mio. switching operations.
The electrical life depends strongly on the connected load type and can drop to approx. 1 mio. switching operations, when the relay contacts are subject to maximum load. All switching capacity and switching current indications refer to resistive loads. Lower values apply to inductive or capacitive loads, such as solenoid valves or motors. For inductive loads it is required to observe the relay-specific load limits, which can be provided by TURCK on request. If the relay coupler is directly connected to a contactor, the contactor must be equipped with a protective circuitry at the coil connection. Relays are designed to switch large voltage and current ranges. Once that a high current has been switched, low currents or voltages cannot be switched subsequently.

4 Electronic outputs

Electronic outputs are typically bounce-free and fast switching devices.
Compared to relay contacts, the current and voltage ranges of an electronic output are clearly defined depending on the kind of output used. Transistor outputs are only suited to low currents and DC voltages, e.g. a PCL input. Switching frequencies are above 1 kHz. In order to protect transistors against overload, they are equipped with a short-circuit protection. Due to the resulting voltage drop it is not possible to switch the low level of TTL inputs. Mosfets are a particular kind of transistor. Based on their special design and circuitry, they can be used to switch AC and DC currents of up to 250 V. Their switching frequency is lower than that of transistors, but the switching current may be higher. Thyristor and Triac outputs are used in high current and AC voltage applications.

5 Analogue outputs

In addition to switching outputs, analogue voltage and current outputs are also available. A voltage output is a kind of internally regulated voltage source. The output provides a measurable voltage. The minimum load resistance specified in the data sheet must be observed.

When using current outputs, active and passive outputs must be distinguished. Active outputs are an internally regulated current source and provide measurable current signals. The load ratings of the data sheet may not be exceeded. Passive current outputs are internally controlled current sink mode devices. The current sink mode output requires voltage supply to control the current flow. Passive current outputs are normally used in conjunction with remote processors featuring input circuits for connection of 2-wire isolating transducers or transmitters.

General Technical Data and Guidelines

6 Time and date processing

With the exception of the PACT*ware*™ compatible devices, **no** processing of the time and date information is undertaken.

7 Installation of cables

Electrical cables are the connection between field and interface devices and are important functional components of an automation system. Therefore it is advisable to observe some frame conditions when installing cables. Cables must be protected against negative environmental influences.
Chemical resistance, temperature rating, resistance against ultraviolet radiation and applicable operation standards are just some of the parameters which should be taken into account.
By choosing an appropriate installation method it is possible to prevent damages, e.g. through vehicles. When connected to field devices, the cable should be routed in a conduit. If connected to vibrating machines or moving parts, some extra cable should be added as a reserve.
The minimum bending radius must also be observed. Cable manufacturers provide information on cable installation and valuable installation hints. Data integrity and reliability depend strongly on the cable types and installation methods.

Sensor cables should always be installed separately from the power cables. Electromagnetic interferences must also be avoided. Cable connections to motors which are controlled via frequency converters should be protected according to the manufacturer's safety specifications. If long cables are needed, it is recommended to use shielded and earthed cables. The line resistance of sensors may not exceed 50 Ω (EN 60947-5-6); the maximum cable length is determined by the cable's cross-section:

$$l = \frac{R \times S}{\delta}$$

R = line resistance [Ω]
S = cable cross-section [mm²]
δ = resistivity [Ω x mm²/m]
l = cable length [m]

8 Configuration and parameterisation via PACT*ware*™

PACT*ware*™ stands for "Process Automation Configuration Tool" and is an open-source configuration software via which the manufacturers can integrate the operation of their field devices. The optimisation of the device operation is the key objective with the PACT*ware*™ concept.

Contrary to the concept of writing to devices via a text file (Device Description = DD), PACT*ware*™ uses a universal interface (Field Device Tool = FDT) between the frame program and the individual software modules for device operation. Modern and user-friendly operating concepts can be implemented as a result.

FDT specifies an interface in order to use the software modules for field devices (Device Type Manager = DTM) in various applications from different manufacturers. Some of the TURCK field devices can be configured via PACT*ware*™. The DTMs required are contained in a free of charge basic version which is not equipped with all functional features, as well as in a Professional version.

More information about this topic can be found under **www.pactware.de**.
The PACT*ware*™ software and the DTM can be downloaded free from the TURCK homepage **www.turck.com**.

9 General data

multicart® modules offer multiple programming possibilities and are thus suited to a wide variety of applications.

There are two ways of altering factory settings:

– a set of toggle switches on the front panel (menu driven)
– or via personal computer (PC)

The attributes of each model are easy to change. Enclosed with each card is a diagram with the programming sequence showing all possible settings for each parameter in several languages.

10 Front label

All settings necessary for operation of the card are displayed on the front label. The label indications depend on the type of device and can differ from those shown on the right.

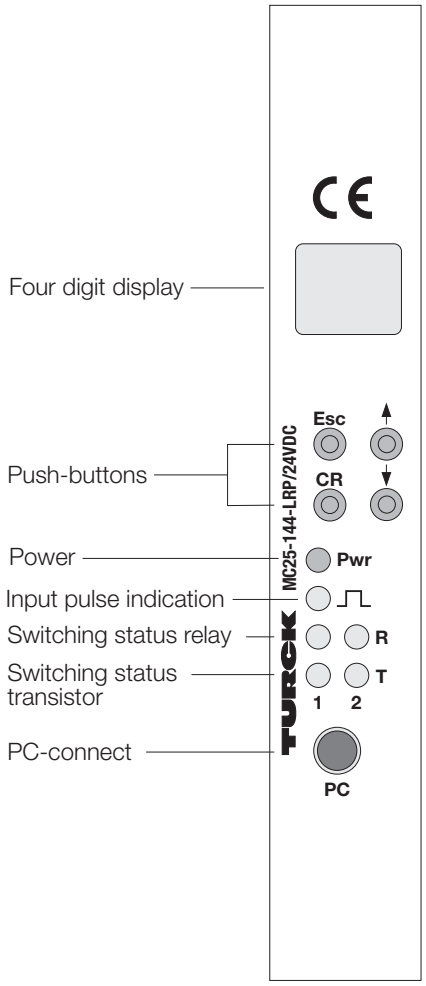
During operation or active mode, the green „Power" LED is lit and the display shows the actual value. If a card has setpoint outputs, yellow LEDs indicate if the limit value of the respective output is below the setpoint. The respective setpoint relay and the transistor output de-energise and the LED stays off when the setpoint is reached.

If the card is provided with built-in input alarms for wire-break or short-circuit conditions, the alarm outputs activate during a malfunction, an „ERR" (Error) message appears on the display and the green „Power" LED changes to red.
If a card has setpoint outputs for status indications, the outputs de-activate (relay de-energised, transistor not conducting), unless no other parameters have been programmed.

11 Parameter programming with buttons

Menu-assisted adjustments are carried out with the two buttons on the front of the card. ESC up (left top button on the front panel) interrupts the monitoring operation and the „Power" LED turns off. The programming LED „Progr." illuminates and „PARA" appears in the display to indicate that the first parameter can be set.

Each of the parameters of the main menu can be selected with the right button. The selected parameter is verified by parameter value appearing in the display, or a message prompt referring to a submenu.



On each card, the first card parameter indicating „PARA" in the display is a submenu used to access and program all specific parameters.

The selected parameter is verified by activating ENTER (left button in down position). When a submenu has been selected, the parameter value is adjusted using the right toggle switch. Activating ENTER a second time saves the adjusted parameter.

The right hand buttons are used to change the parameters. If the desired value has been set, activating the ENTER key saves the parameter. „SAVE" will briefly appear in the display to indicate that the parameter has been saved. Switching to ESC terminates adjustment of the selected parameter without saving.

ESC is used to switch between the submenu and the main menu. A second activation of the ESC switch initiates display of the actual measurement value and the "Power" LED illuminates.

General Technical Data and Guidelines

12 Adjustment of the card via PC under usage of PACT*ware*™

For card programming via PC the adapter IM-Prog is needed. The card is connected to the RS232 interface of the PC via the adapter.

The frame application PACT*ware*™ and the basic DTMs can be downloaded free of charge via the Internet under www.turck.com. The required DTMs are available in a basic version (with limited functions) as well as in a professional version. The professional version with special functions can be activated via a billable license key.

The special functions are:

• Monitor function:
The measuring value and the status of the inputs and outputs can be displayed in a monitor window. The cyclic update function can be de-activated.

• Print-out function:
The parameters can be printed in three different categories:
- Off-line parameterisation (all parameters)
- Measuring value (frequency, rotational speed, output current, measuring span of output current in %), output voltage, measuring span of output voltage in %),
- Diagnostics (all diagnostic bits)

• Trend viewer:
A selection of measuring values can be recorded cyclically. Thus the modification of values can be monitored in the on-line mode. Recorded value curves can be stored in a specially formatted text file.

• Memory function:
With this function the parameters are stored.

13 Scanning of parameters

Each parameter can be scanned while the system is operating. To do this, activate the right top button (up) until the desired parameter is displayed.

Using ESC (the left top button switch on the front panel) returns the card to the measuring mode and display of actual data. This can also be done when the ESC key is disabled. If no button is activated for 10 seconds, the display automatically resets to the actual value.

14 Saving of parameters

All card parameters are saved in case of power failure in an EEPROM memory.

15 ESC lockout

Unauthorised front panel changes can be prevented by lockout of the ESC toggle switch. This is done as follows:

– plug the connector (included with the card) into the V.24/RS232 interface of the card
– de-activate the ESC key via the PC program (see above).

The parameter scan during system operation is not affected by the lockout of the ESC key.

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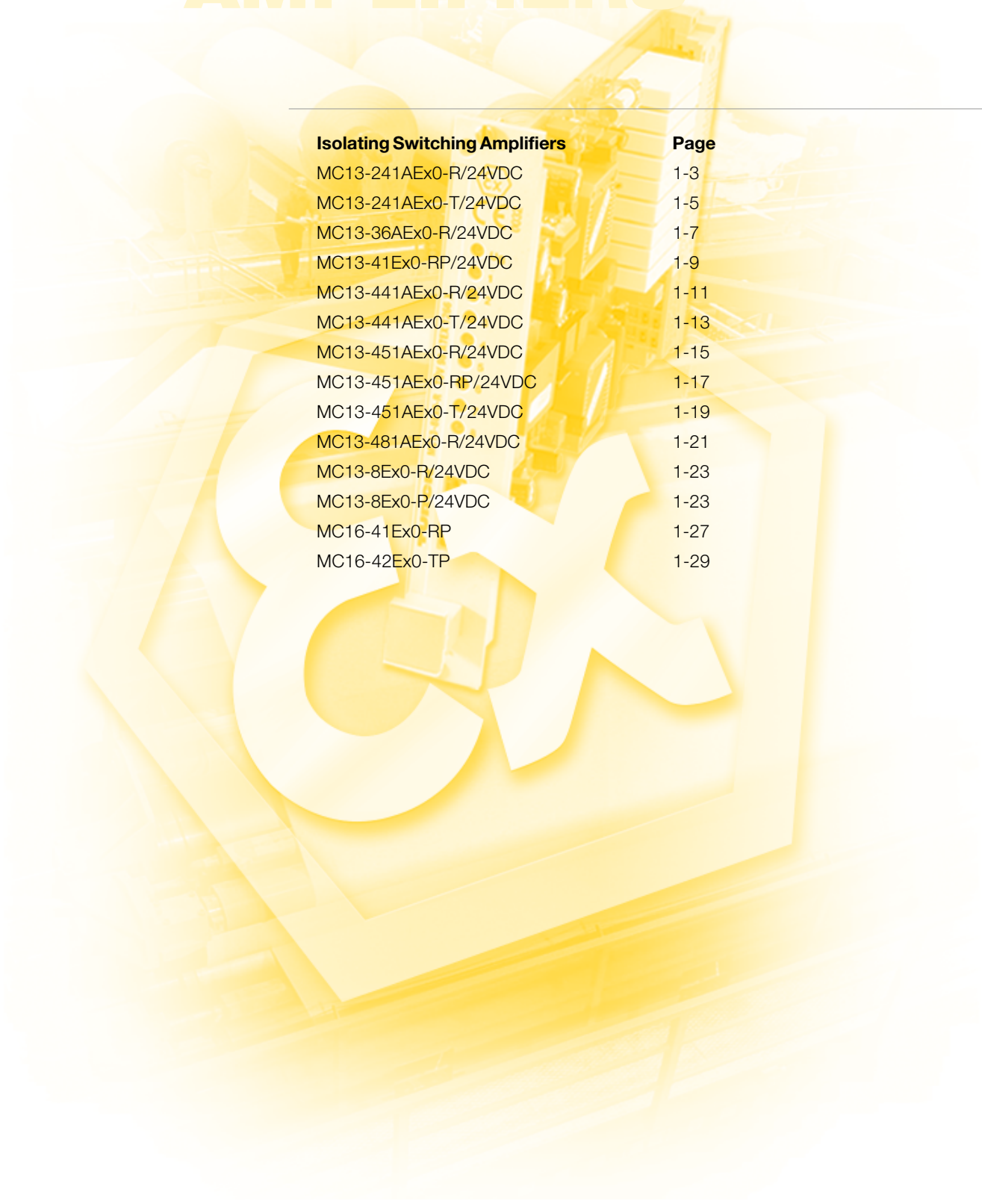
TURCK

Industrial Automation

ISOLATING SWITCHING AMPLIFIERS

1



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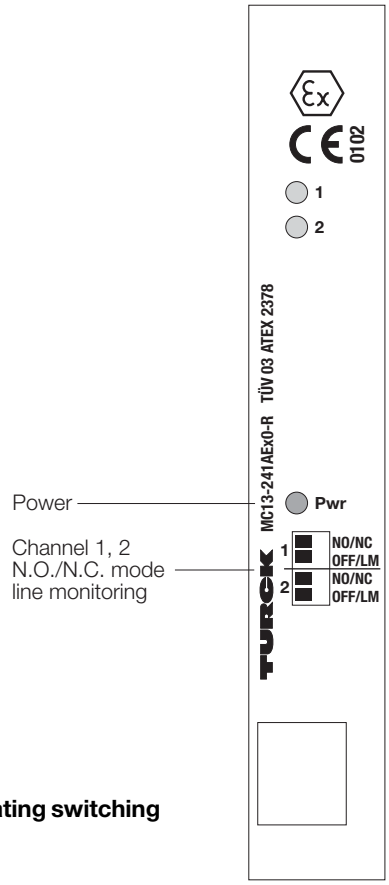
Isolating Switching Amplifier MC13-241AEx0-R/ 24VDC two channels



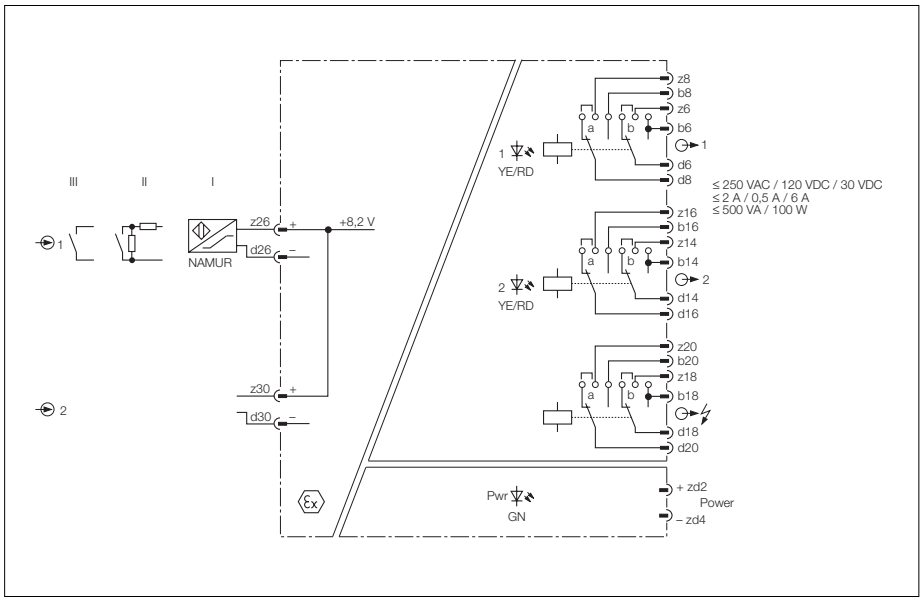
- **Two-channel isolating switching amplifier**
- **Intrinsically safe input circuits EEx ia**
- **Area of application according to ATEX: II (1) GD**
- **Galvanic isolation between input, output and supply circuit**
- **Input circuit monitoring for wire-break and short-circuit conditions (can be disabled)**
- **Two relay outputs with two change-over contacts each**
- **Additional common alarm output**
- **Surge suppressor circuit**
- **32- and 48-pole multi-point connectors may be used**
- **Outputs with progammable N.O. or N.C. mode per channel**

The isolating switching amplifiers MC13-241AEx0-R/... feature two channels and intrinsically-safe input circuits. Sensors according to EN 60947-5-6 (NAMUR) (I) or mechanical contacts (II +III) may be connected.

Each channel is equipped with top-grade gold-plated dublet change-over contacts. These are suited for reliable switching of circuits with min. currents of 50 µA and max. currents up to 2 A.

The green LED on the front cover indicates that the device is powered. The two dual colour LEDs indicate the switching status (yellow) as well as fault conditions (red). When the input circuit monitoring feature is activated, red illuminates to indicate a fault in the input circuit and the respective output relay is de-energised.

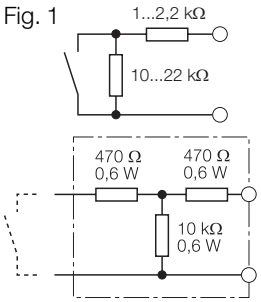
There is an additional common alarm output for indication of errors in the input circuits of the two channels. The input circuits can be monitored for wire-break and short-circuit conditions. The input circuit monitoring function as well as the output mode can be adjusted via the front panel DIP switches.



Isolating Switching Amplifier MC13-241AEx0-R/24VDC

In case of an error in one of the input circuits, the common alarm output is switched off (relay de-energised); if the device is powered and the inputs are error-free, the alarm circuit is switched (relay energised).
If mechanical contacts are used, the wire-break and short-circuit monitoring function must be disabled or the contact must be wired to a resistor circuitry (see Fig. 1).

Fig. 1

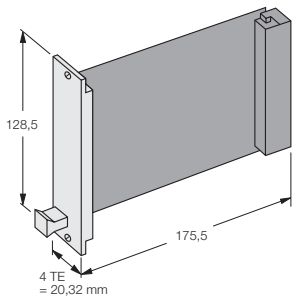


Ready-made resistor module WM1
Ident-no. 0912101

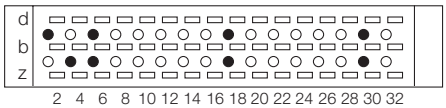
Function programming via front panel DIP switches

The functions are programmed via front panel DIP switches on the card separately for each channel.

NO normally open mode
NC normally closed mode
LM wire-break and short-circuit monitoring enabled
OFF wire-break and short-circuit monitoring disabled



Type	MC13-241AEx0-R/24VDC
Ident-no.	9024701
Supply voltage U_B	20.4...27.6 VDC
Ripple W_{pp}	≤ 10 %
Overvoltage threshold	33 V ± 1.5 V
Protection against faulty connection	≤ 250 V
Current consumption	≤ 100 mA
Galvanic isolation	between input circuit and output circuit and supply voltage for 250 V_{rms} test voltage 2.5 kV_{rms}
Input circuits	according to EN 60947-5-6 (NAMUR), intrinsically safe according to EN 50020
Operating characteristics	
– Voltage	8.2 V
– Current	8.2 mA
Switching threshold	1.55 mA
Hysteresis	0.2 mA
Wire-break threshold	≤ 0.1 mA
Short-circuit threshold	≥ 6 mA
Output circuits	two relay outputs
Contact configuration	two change-over contacts, twin contact, Ag alloy + 3 µm Au
Switching voltage	≤ 250 VAC/120VDC/30VDC
Switching current	≤ 2 A/0.5 A/6 A
Switching capacity	≤ 500 VA/100 W
Switching frequency	≤ 10 Hz
I.S. approval acc. to certificate of conformity	TÜV 03 ATEX 2378
Maximum nominal values	
– No load voltage U_0	9.6 V
– Short-circuit current I_0	11 mA
– Power P_0	26 mW
Internal Inductances/Capacitances L_i/C_i	0.1 mH/negligible
External Inductances/Capacitances L_0/C_0	
– [EEx ia] IIC	0.9 mH/1.1 µF
– [EEx ia] IIB	4.9 mH/4.1 µF
Marking of device	⟨Ex⟩ II (1) GD [EEx ia] IIC
LED indications	
– Power	green
– Switching status/Fault indication (2-colour-LED)	2 x yellow/red
Eurocard	100 x 160 mm (DIN 41494)
Base material	Epoxy-resin, glass-fibre reinforced, quality class FR4
Front plate	plastic, 4TE = 20.32 mm for individual interlocking
Connection	connectors according DIN 41612, style F, 32 poles (series z+d)
Operating temperature range	-25…+70 °C
Coding (no. 19)	



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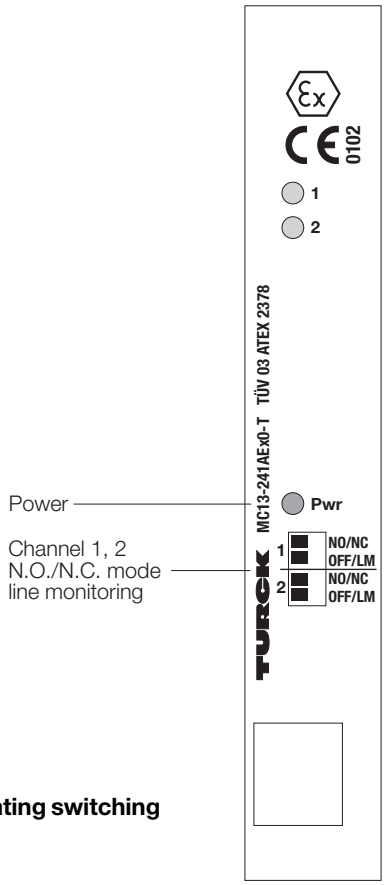
Isolating Switching Amplifier MC13-241AEx0-T/ 24VDC two channels



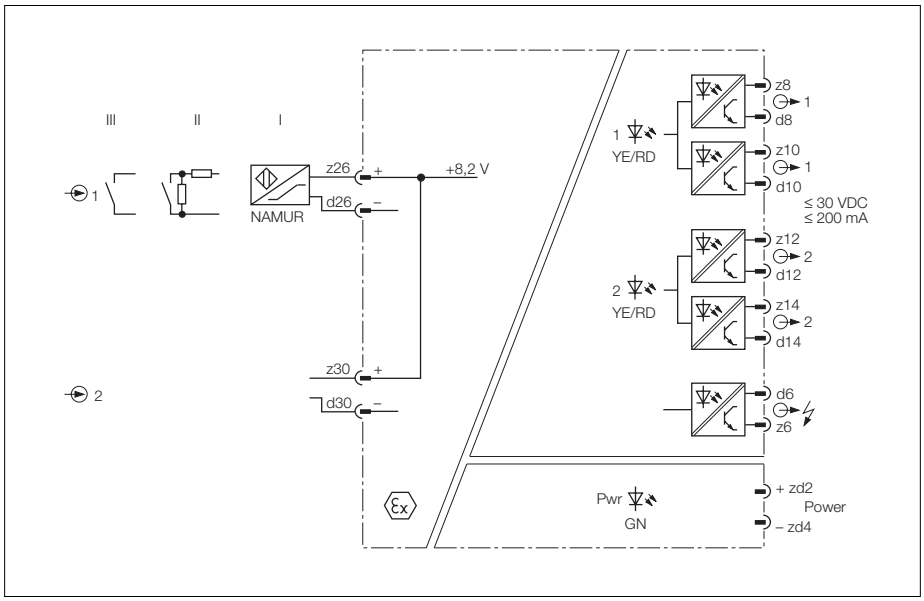
- **Two-channel isolating switching amplifier**
- **Intrinsically safe input circuits EEx ia**
- **Area of application according to ATEX: II (1) GD**
- **Galvanic isolation between input, output and supply circuit**
- **Input circuit monitoring for wire-break and short-circuit conditions (can be disabled)**
- **Two potential-free transistor outputs per channel, short-circuit protected**
- **Additional common alarm output**
- **Surge suppressor circuit**
- **Outputs with progammable N.O. or N.C. mode per channel**

The isolating switching amplifiers MC13-241AEx0-T/... feature two channels and intrinsically-safe input circuits. Sensors according to EN 60947-5-6 (NAMUR) (I) or mechanical contacts (II +III) may be connected.

Each channel is equipped with potential-free short-circuit protected transistor outputs. The short-circuit protection is thermal (non-cyclic).

The green LED on the front cover indicates that the device is powered. The two dual colour LEDs indicate the switching status (yellow) as well as fault conditions (red). When the input circuit monitoring feature is activated, red illuminates to indicate a fault in the input circuit and the respective output transistor is disabled.

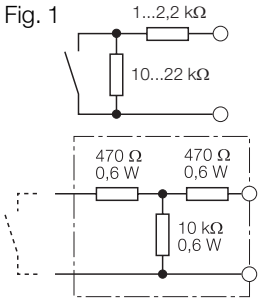
There is an additional common alarm output for indication of errors in the input circuits of the two channels. The input circuits can be monitored for wire-break and short-circuit conditions. The input circuit monitoring function as well as the output mode can be adjusted via the front panel DIP switches.



Isolating Switching Amplifier MC13-241AEx0-T/24VDC

In case of an error in one of the input circuits, the common alarm output is switched off (transistor inhibited); if the device is powered and the inputs are error-free, the alarm circuit is switched (transistor conductive).
If mechanical contacts are used, the wire-break and short-circuit monitoring function must be disabled or the contact must be wired to a resistor circuitry (see Fig. 1).

Fig. 1

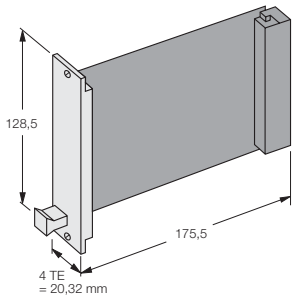


Ready-made resistor module WM1
Ident-no. 0912101

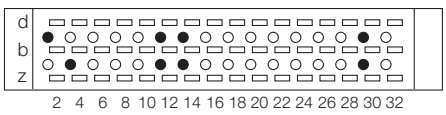
Function programming via front panel DIP switches

The functions are programmed via front panel DIP switches on the card separately for each channel.

NO normally open mode
NC normally closed mode
LM wire-break and short-circuit monitoring enabled
OFF wire-break and short-circuit monitoring disabled



Type	MC13-241AEx0-T/24VDC
Ident-no.	9024604
Supply voltage U_B	20.4...27.6 VDC
Ripple W_{pp}	≤ 10 %
Overvoltage threshold	33 V ± 1.5 V
Protection against faulty connection	≤ 250 V
Current consumption	≤ 80 mA
Galvanic isolation	between input circuit and output circuit and supply voltage for 250 V_{rms} test voltage 2.5 kV_{rms}
Input circuits	according to EN 60947-5-6 (NAMUR), intrinsically safe according to EN 50020
Operating characteristics	
– Voltage	8.2 V
– Current	8.2 mA
Switching threshold	1.55 mA
Hysteresis	0.2 mA
Wire-break threshold	≤ 0.1 mA
Short-circuit threshold	≥ 6 mA
Output circuits	transistor outputs, potential-free, short-circuit protected
Switching voltage	≤ 30 VDC
Switching current	≤ 200 mA
Voltage drop	appr. 4 V/200 mA and appr. 2.7 V/50 mA
Switching frequency	≤ 1 kHz
I.S. approval acc. to certificate of conformity	TÜV 03 ATEX 2378
Maximum nominal values	
– No load voltage U_0	9.6 V
– Short-circuit current I_0	11 mA
– Power P_0	26 mW
Internal Inductances/Capacitances L_i/C_i	0.1 mH/negligible
External Inductances/Capacitances L_0/C_0	
– [EEx ia] IIC	0.9 mH/1.1 µF
– [EEx ia] IIB	4.9 mH/4.1 µF
Marking of device	⟨Ex⟩ II (1) GD [EEx ia] IIC
LED indications	
– Power	green
– Switching status/Fault indication (2-colour-LED)	2 x yellow/red
Eurocard	100 x 160 mm (DIN 41494)
Base material	Epoxy-resin, glass-fibre reinforced, quality class FR4
Front plate	plastic, 4TE = 20,32 mm for individual interlocking
Connection	connectors according DIN 41612, style F, 32 poles (series z+d)
Operating temperature range	-25…+70 °C
Coding (no. 17)	



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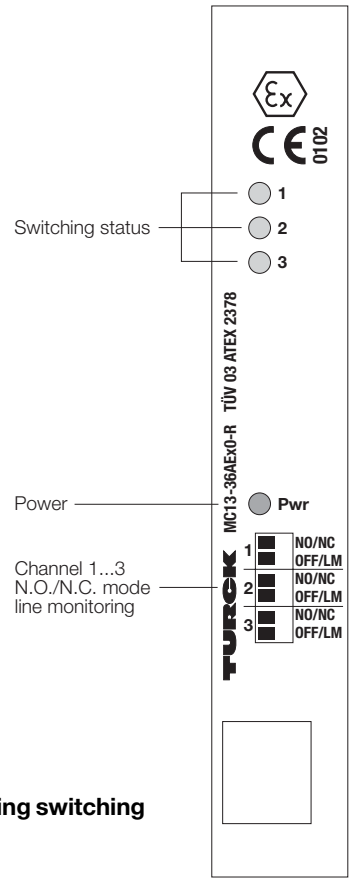
Isolating Switching Amplifier MC13-36AEx0-R/ 24VDC three channels



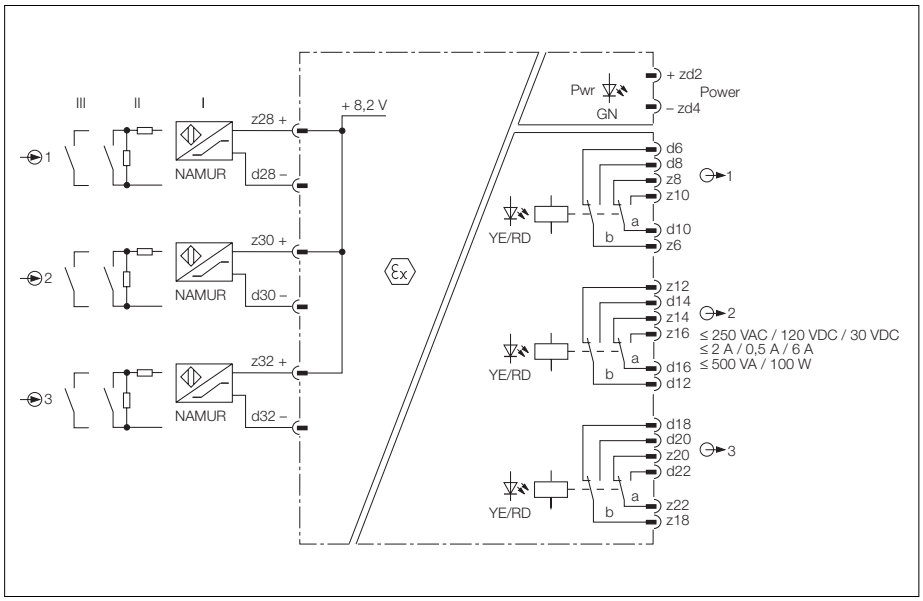
- **Three-channel isolating switching amplifier**
- **Intrinsically safe input circuits EEx ia**
- **Area of application according to ATEX: II (1) GD**
- **Galvanic isolation between input, output and supply circuit**
- **Three relay outputs with two change-over contacts each**
- **Input circuit monitoring for wire-break and short-circuit conditions (can be disabled)**
- **Outputs with progammable N.O. or N.C. mode per channel**

The isolating switching amplifiers MC13-36AEx0-R/... feature three channels and intrinsically-safe input circuits. Sensors according to EN 60947-5-6 (NAMUR) (I) or mechanical contacts (II + III) may be connected.

Each channel is equipped with a relay output with two top grade, gold-plated doublet change-over contacts. Thus circuits with minimum currents of 50 µA and maximum currents of up to 2 A can be securely switched.

The input circuits can be monitored for wire-break and short-circuit conditions. The input circuit monitoring function as well as the output mode can be adjusted via the front panel DIP switches.

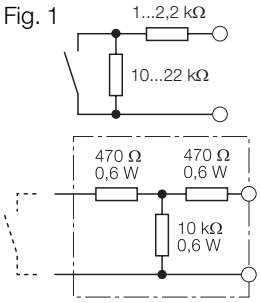
The green LED on the front cover indicates that the device is powered. The three dual colour LEDs indicate the switching status (yellow) as well as fault conditions (red). When the input circuit monitoring feature is activated, red illuminates to indicate a fault in the input circuit and the respective output relay is de-energised.



Isolating Switching Amplifier MC13-36AEx0-R/24VDC

If mechanical contacts are used, the wire-break and short-circuit monitoring function must be disabled or the contact must be wired to a resistor circuitry (see Fig. 1).

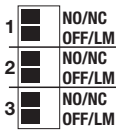
Fig. 1



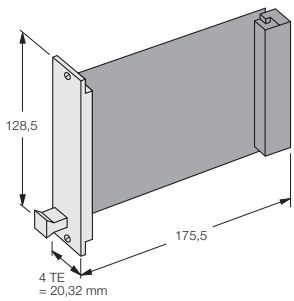
Ready-made resistor module WM1
Ident-no. 0912101

Function programming via front panel DIP switches

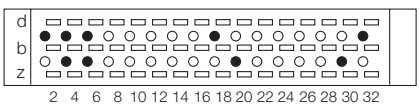
The functions are programmed via front panel DIP switches on the card separately for each channel.



NO normally open mode
NC normally closed mode
LM wire-break and short-circuit monitoring enabled
OFF wire-break and short-circuit monitoring disabled



Type	MC13-36AEx0-R/24VDC
Ident-no.	9023602
Supply voltage U_B	20.4...27.6 VDC
Ripple W_{pp}	≤ 10 %
Power consumption	≤ 2.2 W
Galvanic isolation	between input circuit and output circuit and supply voltage for 250 V_{rms} test voltage 2.5 kV_{rms}
Input circuits	according to EN 60947-5-6 (NAMUR), intrinsically safe according to EN 50020
Operating characteristics	
– Voltage	8.2 V
– Current	8.2 mA
Switching threshold	1.55 mA
Hysteresis	0.2 mA
Wire-break threshold	≤ 0.1 mA
Short-circuit threshold	≥ 6 mA
Output circuits	three relay outputs
Kontaktbestückung	two change-over contacts, twin contact, Ag alloy + 3 µm Au
Switching voltage	≤ 250 VAC/120 VDC/30 VDC
Switching current	≤ 2 A/0.5 A/6 A
Switching power	≤ 500 VA/100 W
Switching frequency	≤ 10 Hz
I.S. approval acc. to certificate of conformity	TÜV 03 ATEX 2378
Maximum nominal values	
– No load voltage U_0	9.6 V
– Short-circuit current I_0	11 mA
– Power P_0	26 mW
External Inductances/Capacitances L_0/C_0	
– [EEx ia] IIC	0.9 mH/1.1 µF
– [EEx ia] IIB	4.9 mH/4.1 µF
Marking of device	⟨Ex⟩ II (1) GD [EEx ia] IIC
LED indications	
– Power	green
– Switching status/Fault indication (2-colour-LED)	3 x yellow/red
Eurocard	100 x 160 mm (DIN 41494)
Base material	Epoxy-resin, glass-fibre reinforced, quality class FR4
Front plate	plastic, 4TE = 20,32 mm for individual interlocking
Connection	connectors according DIN 41612, style F, 32 poles (series z+d)
Operating temperature range	-25…+70 °C
Coding (no. 23)	



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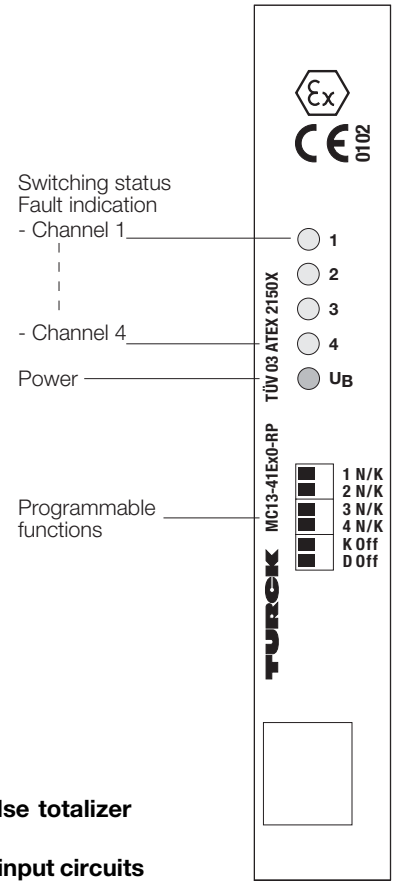
Pulse Totalizer MC13-41Ex0-RP/ 24VDC four channels



- **Four-channel pulse totalizer**
- **Intrinsically safe input circuits EEx ia/ib**
- **Area of application according to ATEX: II (1) GD**
- **Common totaliser function with four inputs**
- **Pulse output via four output relays and one pnp transistor output**
- **Programming via a set of DIP-switches in the front**
- **Input circuit monitoring (can be disabled separately for each channel)**
- **Two-colour LED per channel for status/alarm indications**
- **Galvanic isolation between input circuit, output circuit and supply voltage**
- **Common alarm indication via relay and transitor output**

The MC13-41Ex0-RP is used for totalizing pulses from four intrinsically safe input circuits. Sensors according to EN 60947-5-6 (NAMUR) (I) or mechanical contacts (II...V) may be connected.

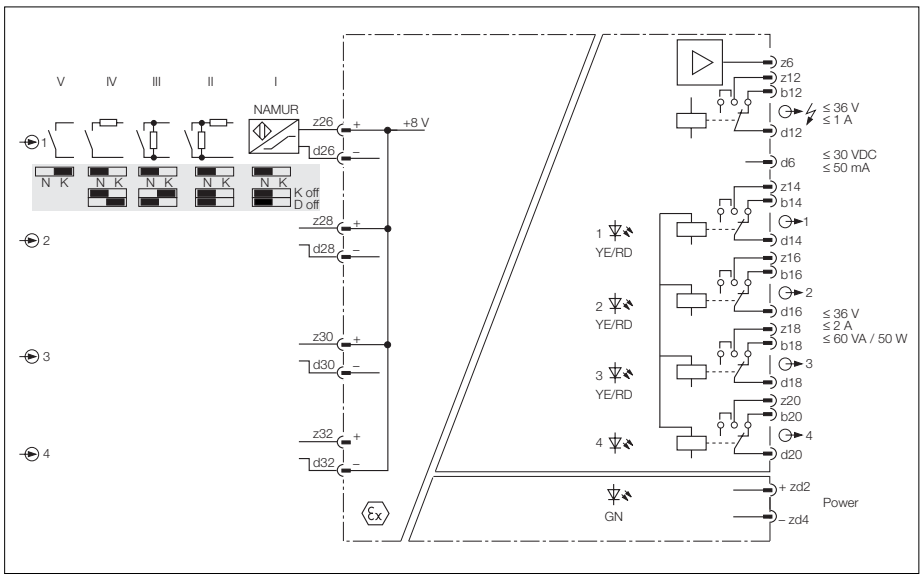
Four parallel switching relay outputs and one pnp transistor output with thermally activated short-circuit protection are available as pulse outputs.

The input circuits are monitored for wire-break and short-circuit conditions. If mechanical contacts are used, the wire-break and short-circuit monitoring function must be disabled or the contact must be wired to a resistor circuitry (see Fig. 1).

The green LED on the front cover indicates that the device is powered. The four dual colour LEDs indicate the switching status (yellow) as well as fault conditions (red). When the input circuit monitoring feature is activated, red illuminates to indicate a fault in the input circuit and the respective output relay is de-energised.

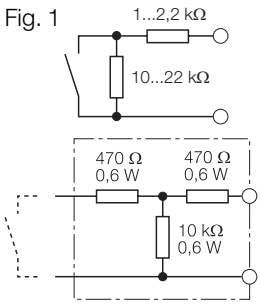
If a fault occurs in any input circuit, the common alarm output is de-actitvated (transistor not conducting, relay open) and the two-colour LED changes to red.

If a 32-pole connection is used, the output relays can be programmed in either N.O. or N.C. mode (programming with plug-in jumpers on the card).



Pulse Totalizer MC13-41Ex0-RP/24VDC

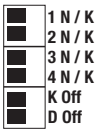
Fig. 1



Ready-made resistor module WM1
Ident-no. 0912101

Programming via front DIP-switches

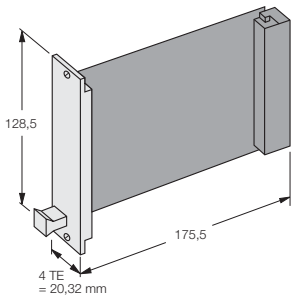
The input functions are programmed via six DIP-switches.



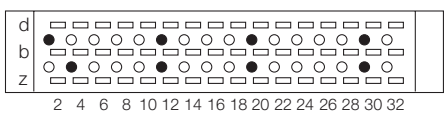
Selection of the input mode (NAMUR sensors or contacts) is accomplished on the individual channels by activating the first four DIP-switches. Position K disables input circuit monitoring, position N enables input circuit monitoring.

The last two DIP-switches on the bottom are for common enabling or disabling of short-circuit and/or wire-break monitoring for all channels with the input circuit monitoring function activated (switch position N):

– DIP-switch position K "OFF" short-circuit monitoring "OFF"
– DIP-switch position D "OFF" wire-break monitoring "OFF".



Type	MC13-41Ex0-RP/24VDC
Ident-no.	9028202
Supply Voltage U_B	20.4...27.6 VDC
Ripple W_{PP}	≤ 10 %
Overvoltage release	33 V ± 1.5 V
Reverse polarity protection	≤ 250 V
Power/Current consumption	≤ 130 mA
Galvanic isolation	between input circuit, output circuit and supply voltage for 250 V_{rms}, test voltage 2.5 kV $_{rms}$
Input circuits	to EN 60947-5-6 (NAMUR), intrinsically safe according to EN50020
Operating values	
– Voltage	8.2 V
– Current	8.2 mA
Switching threshold	1.55 mA
Hysteresis	0.2 mA
Wire-break threshold	≤ 0.1 mA
Short-circuit threshold	≥ 6 mA
Output Circuits	
Relay outputs	four relay outputs (change-over contacts)
– Switching voltage	≤ 36 V
– Switching current	≤ 2 A
– Switching capacity	≤ 60 VA/50 W
– Switching frequency	≤ 10 Hz
– Contact material	silver-alloy + 3 µm Au
Transistor output	pnp, short-circuit protected
– Switching voltage	≤ 30 VDC
– Switchig current	≤ 50 mA
– Switching frequency	≤ 10 Hz
Common alarm output	
– Relay output	relay 36 V/1 A (1 change-over contact)
– Transistor output	pnp, short-circuit protected
I.S. approval acc. to certificate of conformity	TÜV 03 ATEX 2150 X
Maximum nominal values	
– No load voltage U_0	9,6 V
– Short-circuit current I_0	40.7 mA
– Power P_0	100 mW
External Inductances/Capacitances L_0/C_0	
– [EEx ia] IIC	23 mH/3.6 µF
– [EEx ia] IIB	115 mH/26 µF
Marking of device	⟨Ex⟩ II (1) GD [EEx ia] IIC
LED indications	
– Power	green
– Switching status/Fault indication (2-colour-LED)	4 x yellow/red
Eurocard	100 x 160 mm (DIN 41494)
Base material	Epoxy-resin, glass-fibre reinforced, quality class FR4
Front plate	plastic, 4TE = 20,32 mm for individual interlocking
Connection	connectors according DIN 41612, style F, 32 poles (series z+d) or 48-pole
Operating temperature	-25...+60 °C
Coding (no. 20)	



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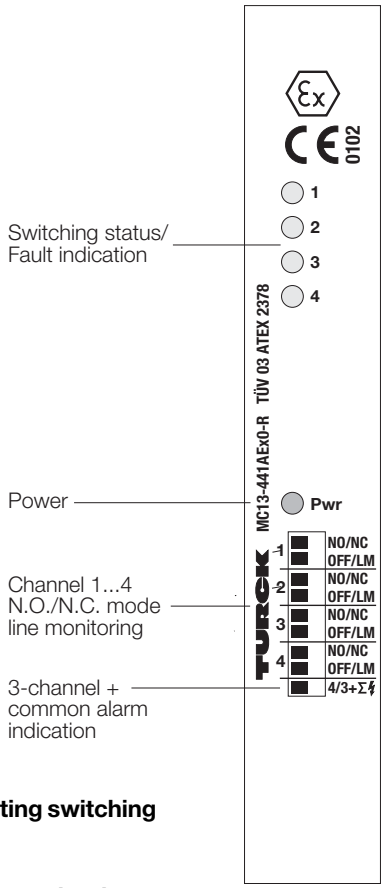
Isolating Switching Amplifier MC13-441AEx0-R/ 24VDC four channels



- **Four-channel isolating switching amplifier**
- **Intrinsically safe input circuits EEx ia**
- **Area of application according to ATEX: II (1) GD**
- **Galvanic isolation between input, output and supply circuit**
- **Input circuit monitoring for wire-break and short-circuit conditions (can be disabled)**
- **Four relay outputs with one change-over contact each**
- **Switching capacity 250 VAC/2 A**
- **Sealed relays with hard gold contacts**
- **Optionally as a 3-channel version with common alarm output**
- **Surge suppressor circuit**
- **Outputs with progammable N.O. or N.C. mode per channel**

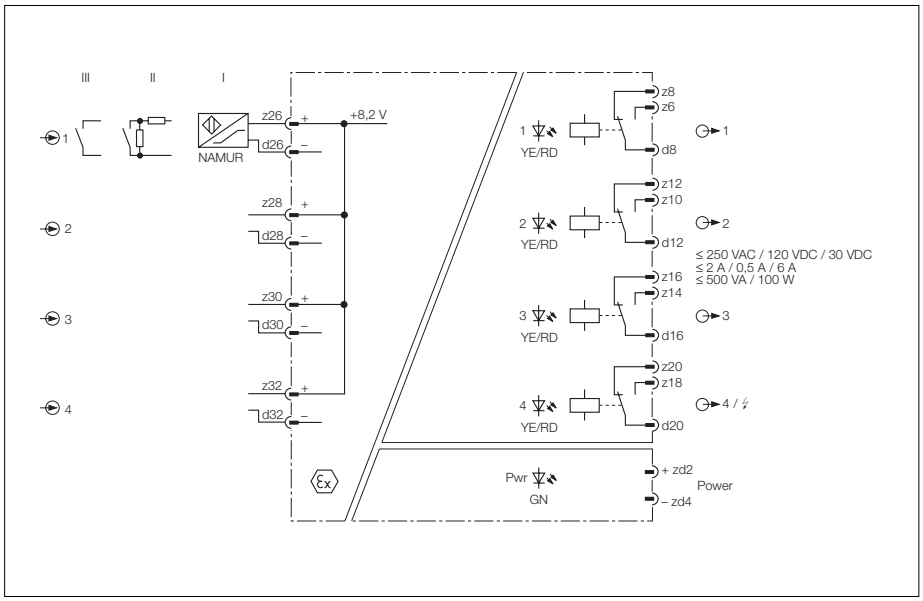
The isolating switching amplifiers MC13-441AEx0-R/... feature four channels and intrinsically-safe input circuits. Sensors according to EN 60947-5-6 (NAMUR) (I) or mechanical contacts (II + III) may be connected.

Each channel is equipped with a relay with a change-over contact. Thus 250V/2A can be switched directly.

The device can also be used as a 3-channel isolating amplifier with separate alarm output.

The input circuits can be monitored for wire-break and short-circuit conditions. The input circuit monitoring function as well as the output mode can be adjusted via the front panel DIP switches.

The green LED on the front cover indicates that the device is powered. The four dual colour LEDs indicate the switching status (yellow) as well as fault conditions (red). When the input circuit monitoring feature is activated, red illuminates to indicate a fault in the input circuit and the respective output relay is de-energised.

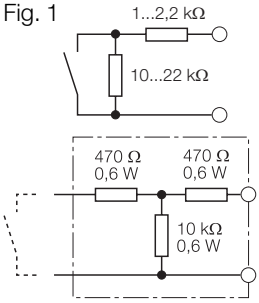


Isolating Switching Amplifier MC13-441AEx0-R/24VDC

Performance with activated alarm output

In case of an error in one of the input circuits, the common alarm output is switched off (relay de-energised); if the device is powered and the inputs are error-free, the alarm circuit is switched (relay energised).
If mechanical contacts are used, the wire-break and short-circuit monitoring function must be disabled or the contact must be wired to a resistor circuitry (see Fig. 1).

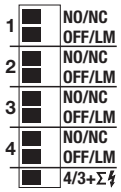
Fig. 1



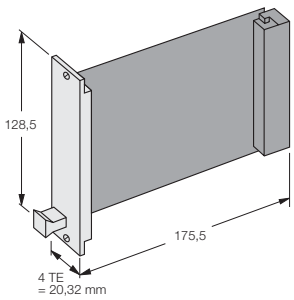
Ready-made resistor module WM1
Ident-no. 0912101

Function programming via front panel DIP switches

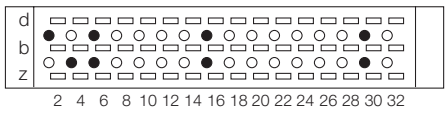
The functions are programmed via front panel DIP switches on the card separately for each channel.



NO normally open mode
NC normally closed mode
LM wire-break and short-circuit monitoring enabled
OFF wire-break and short-circuit monitoring disabled
4/3+Σ↯ 4 channel operation/3 channel operation with common alarm output



Type	MC13-441AEx0-R/24VDC
Ident-no.	9025601
Supply voltage U_B	20.4...27.6 VDC
Ripple W_{pp}	≤ 10 %
Overvoltage threshold	33 V ± 1.5 V
Protection against faulty connection	≤ 250 V
Current consumption	≤ 150 mA
Galvanic isolation	between input circuit and output circuit and supply voltage for 250 V_{rms} test voltage 2.5 kV_{rms}
Input circuits	according to EN 60947-5-6 (NAMUR), intrinsically safe according to EN 50020
Operating characteristics	
– Voltage	8.2 V
– Current	8.2 mA
Switching threshold	1.55 mA
Hysteresis	0.2 mA
Wire-break threshold	≤ 0.1 mA
Short-circuit threshold	≥ 6 mA
Output circuits	four relay outputs
Contact configuration	1 change-over contact, Ag alloy + 3 µm Au
Switching voltage	≤ 250 VAC/120 VDC/30 VDC
Switching current	≤ 2 A/0.5 A/6 A
Switching capacity	≤ 500 VA/100 W
Switching frequency	≤ 10 Hz
I.S. approval acc. to certificate of conformity	TÜV 03 ATEX 2378
Maximum nominal values	
– No load voltage U_0	9.6 V
– Short-circuit current I_0	11 mA
– Power P_0	26 mW
Internal Inductances/Capacitances L_i/C_i	0.1 mH/negligible
External Inductances/Capacitances L_0/C_0	
– [EEx ia] IIC	0.9 mH/1.1 µF
– [EEx ia] IIB	4.9 mH/4.1 µF
Marking of device	⟨Ex⟩ II (1) GD [EEx ia] IIC
LED indications	
– Power	green
– Switching status/Fault indication (2-colour-LED)	4 x yellow/red
Eurocard	100 x 160 mm (DIN 41494)
Base material	Epoxy-resin, glass-fibre reinforced, quality class FR4
Front plate	plastic, 4TE = 20,32 mm for individual interlocking
Connection	connectors according DIN 41612, style F, 32 poles (series z+d)
Operating temperature range	-25…+70 °C
Coding (no. 18)	



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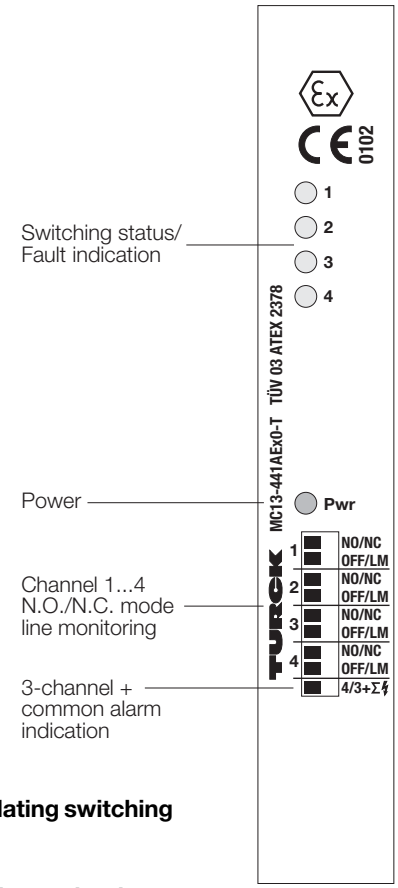
Isolating Switching Amplifier MC13-441AEx0-T/ 24VDC four channels



- **Four-channel isolating switching amplifier**
- **Intrinsically safe input circuits EEx ia**
- **Area of application according to ATEX: II (1) GD**
- **Galvanic isolation between input, output and supply circuit**
- **Input circuit monitoring for wire-break and short-circuit conditions (can be disabled)**
- **Four transistor outputs, potential-free, short-circuit protected**
- **Optionally as a 3-channel version with common alarm output**
- **Surge suppressor circuit**
- **Outputs with progammable N.O. or N.C. mode per channel**

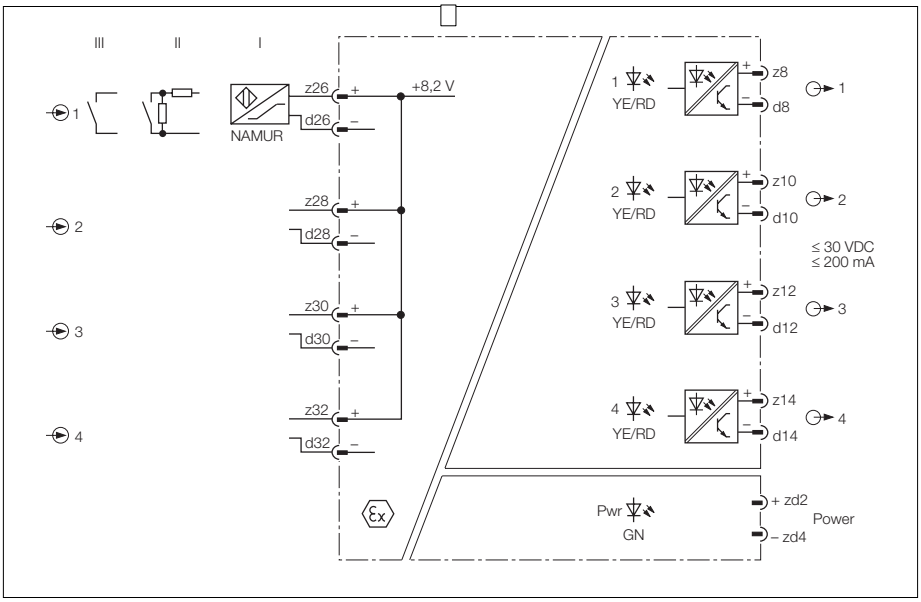
The isolating switching amplifiers MC13-441AEx0-T/... feature four channels and intrinsically-safe input circuits. Sensors according to EN 60947-5-6 (NAMUR) (I) or mechanical contacts (II +III) may be connected.

Each channel is equipped with a potential-free transistor output with thermal (non-cyclic) short-circuit protection.

The device can also be used as a 3-channel isolating amplifier with separate alarm output.

The input circuits can be monitored for wire-break and short-circuit conditions. The input circuit monitoring function as well as the output mode can be adjusted via the front panel DIP switches.

The green LED on the front cover indicates that the device is powered. The four dual colour LEDs indicate the switching status (yellow) as well as fault conditions (red). When the input circuit monitoring feature is activated, red illuminates to indicate a fault in the input circuit and the respective output transistor is disabled.

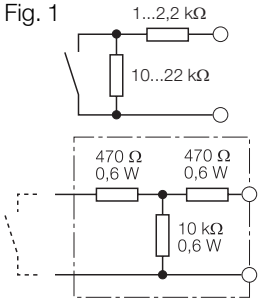


Isolating Switching Amplifier MC13-441AEx0-T/24VDC

Performance with activated alarm output

In case of an error in one of the input circuits, the common alarm output is switched off (transistor inhibited); if the device is powered and the inputs are error-free, the alarm circuit is switched (transistor conductive).
If mechanical contacts are used, the wire-break and short-circuit monitoring function must be disabled or the contact must be wired to a resistor circuitry (see Fig. 1).

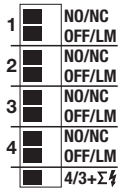
Fig. 1



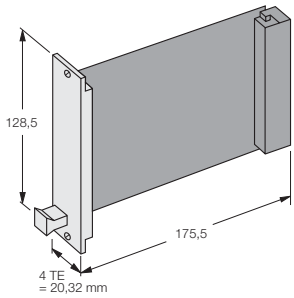
Ready-made resistor module WM1
Ident-no. 0912101

Function programming via front panel DIP switches

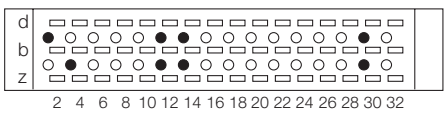
The functions are programmed via front panel DIP switches on the card separately for each channel.



NO normally open mode
NC normally closed mode
LM wire-break and short-circuit monitoring enabled
OFF wire-break and short-circuit monitoring disabled
4/3+Σ 4 channel operation/3 channel operation with common alarm output



Type	MC13-441AEx0-T/24VDC
Ident-no.	9025201
Supply voltage U_B	20.4...27.6 VDC
Ripple W_{pp}	≤ 10 %
Overvoltage threshold	33 V ± 1.5 V
Protection against faulty connection	≤ 250 V
Current consumption	≤ 100 mA
Galvanic isolation	between input circuit and output circuit and supply voltage for 250 V_{rms} test voltage 2.5 kV_{rms}
Input circuits	according to EN 60947-5-6 (NAMUR), intrinsically safe according to EN 50020
Operating characteristics	
– Voltage	8.2 V
– Current	8.2 mA
Switching threshold	1.55 mA
Hysteresis	0.2 mA
Wire-break threshold	≤ 0.1 mA
Short-circuit threshold	≥ 6 mA
Output circuits	four transistor outputs, potential-free, short-circuit protected
Switching voltage	≤ 30 VDC
Switching current	≤ 200 mA
Voltage drop	approx. 4 V/200 mA and approx. 2.7 V/50 mA
Switching frequency	≤ 1 kHz (3 kHz as a special version)
I.S. approval acc. to certificate of conformity	TÜV 03 ATEX 2378
Maximum nominal values	
– No load voltage U_0	9.6 V
– Short-circuit current I_0	11 mA
– Power P_0	26 mW
Internal Inductances/Capacitances L_i/C_i	0.1 mH/negligible
External Inductances/Capacitances L_0/C_0	
– [EEx ia] IIC	0.9 mH/1.1 µF
– [EEx ia] IIB	4.9 mH/4.1 µF
Marking of device	⟨Ex⟩ II (1) GD [EEx ia] IIC
LED indications	
– Power	green
– Switching status/Fault indication (2-colour-LED)	4 x yellow/red
Eurocard	100 x 160 mm (DIN 41494)
Base material	Epoxy-resin, glass-fibre reinforced, quality class FR4
Front plate	plastic, 4TE = 20,32 mm for individual interlocking
Connection	connectors according DIN 41612, style F, 32 poles (series z+d)
Operating temperature range	-25…+70 °C
Coding (no. 17)	



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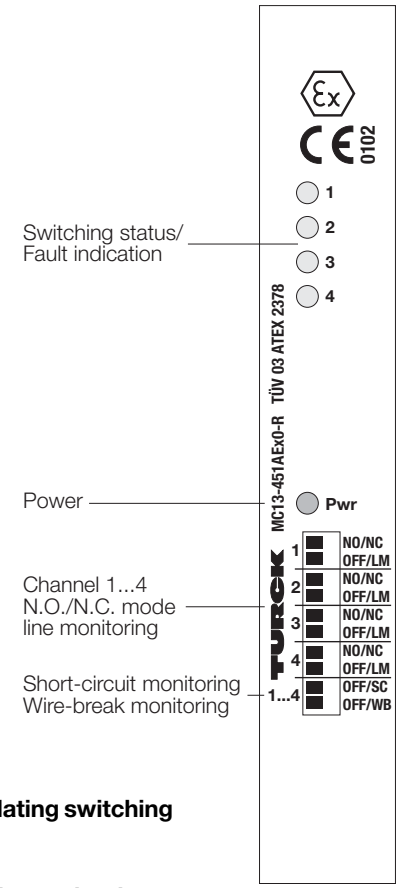
Isolating Switching Amplifier MC13-451AEx0-R/ 24VDC four channels



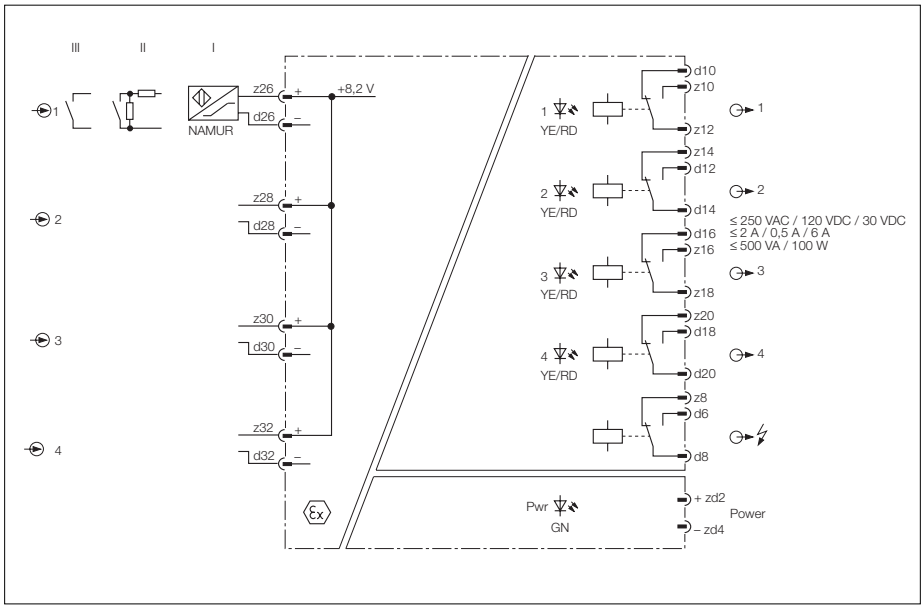
- **Four-channel isolating switching amplifier**
- **Intrinsically safe input circuits EEx ia**
- **Area of application according to ATEX: II (1) GD**
- **Galvanic isolation between input, output and supply circuit**
- **Input circuit monitoring for wire-break and short-circuit conditions (can be disabled separately for each channel)**
- **Five relay outputs with one change-over contact each**
- **Additional common alarm output**
- **Switching capacity 250 V/2 A**
- **Surge suppressor circuit**
- **Per channel one dual colour LED for signal/alarm indication**
- **Sealed relays with hard gold contacts**

The isolating switching amplifiers MC13-451AEx0-R/... feature four channels and intrinsically-safe input circuits. Sensors according to EN 60947-5-6 (NAMUR) (I) or mechanical contacts (II + III) may be connected.

Each channel is equipped with a relay with a change-over contact.
Thus 250 V/2 A can be switched directly.

The input circuits can be monitored for wire-break and short-circuit conditions. The input circuit monitoring function as well as the output mode can be adjusted via the front panel DIP switches.

The green LED on the front cover indicates that the device is powered. The four dual colour LEDs indicate the switching status (yellow) as well as fault conditions (red). When the input circuit monitoring feature is activated, red illuminates to indicate a fault in the input circuit and the respective output relay is de-energised.

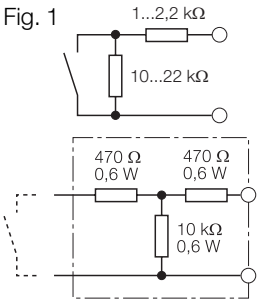


Isolating Switching Amplifier MC13-451AEx0-R/24VDC

Performance with activated alarm output

The card is equipped with a common alarm output via which errors in the four input circuits of the channels are signalled. In case of an error in one of the input circuits, the common alarm output is switched off (relay de-energised); if the device is powered and the inputs are error-free, the alarm circuit is switched (relay energised).
If mechanical contacts are used, the wire-break and short-circuit monitoring function must be disabled or the contact must be wired to a resistor circuitry (see Fig. 1).

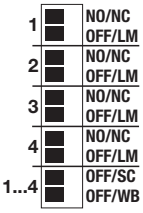
Fig. 1



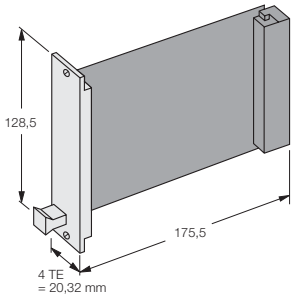
Ready-made resistor module WM1
Ident-no. 0912101

Function programming via front panel DIP switches

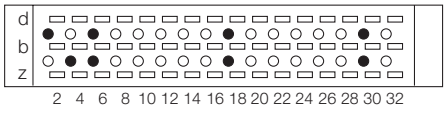
The functions are programmed via front panel DIP switches on the card separately for each channel.



NO normally open mode
NC normally closed mode
LM wire-break and short-circuit monitoring enabled
OFF wire-break and short-circuit monitoring disabled
SC common short-circuit monitoring
WB common wire-break monitoring



Type	MC13-451AEx0-R/24VDC
Ident-no.	9028101
Operating voltage U_B	20.4...27.6 VDC
Ripple W_{pp}	≤ 10 %
Overvoltage threshold	33 V ± 1.5 V
Protection against faulty connection	≤ 250 V
Current consumption	≤ 100 mA
Galavanic isolation	between input circuit and output circuit and supply voltage for 250 V_{rms}, test voltage 2.5 kV_{rms}
Input circuits	to EN 60947-5-6 (NAMUR), intrinsically safe according to EN50020
Operating values	
– Voltage	8.2 V
– Current	8.2 mA
Switching threshold	1.55 mA
Hysteresis	0.2 mA
Wire-break threshold	≤ 0.1 mA
Short-circuit threshold	≥ 6 mA
Output circuits	five relay outputs
Contact configuration	1 change-over contact, Ag alloy + 3 µm Au
Switching voltage	≤ 250 VAC/120 VDC/30 VDC
Switching current	≤ 2 A/0.5 A/6 A
Switching capacity	≤ 500 VA/100 W
Switching frequency	≤ 10 Hz
I.S. approval acc. to certificate of conformity	TÜV 03 ATEX 2378
Max. values	
– No-load voltage U_0	9.6 V
– Short-circuit current I_0	11 mA
– Output power P_0	26 mW
External inductances/capacitances	
– [EEx ia/ib] IIC	0.9 mH/1.1 nF
– [EEx ia/ib] IIB	4.9 mH/4.1 nF
Marking of the Device	II (1) GD [EEx ia] IIC
LED indications	
– Power	green
– Switching status/Fault indication (2-colour-LED)	4 x yellow/red
Eurocard	100 x 160 mm (DIN 41494)
Base material	epoxy-resin, glass-fibre reinforced, quality class FR4,
Front plate	plastic, 4TE = 20.32 mm for individual interlocking
Connection	connector according to DIN 4162 style F, 32 poles (series z+d)
Operating temperature	-25…+70 °C
Coding (no. 19)	



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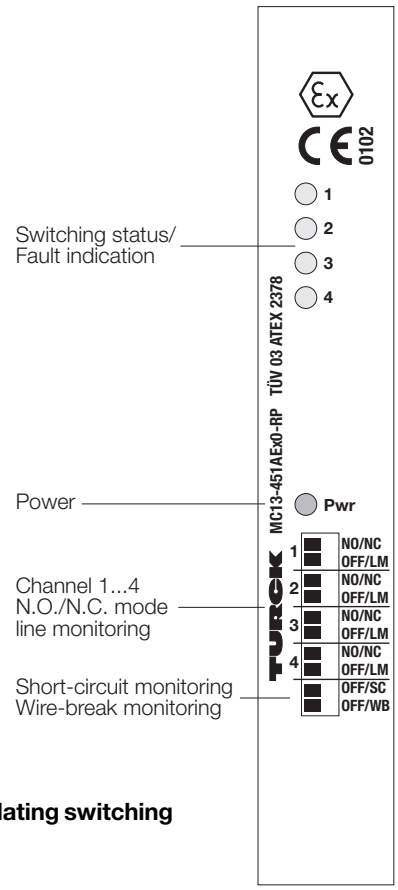
Isolating Switching Amplifier MC13-451AEx0-RP/ 24VDC four channels



- **Four-channel isolating switching amplifier**
- **Intrinsically safe input circuits EEx ia**
- **Area of application according to ATEX: II (1) GD**
- **Programming via a set of DIP-switches in the front**
- **Input circuit monitoring for wire-break and short-circuit conditions**
- **Input circuit monitoring can be disabled separately for each channel**
- **One dual-colour LED per channel for signal/alarm indications**
- **Galvanic isolation between input and output circuits and supply circuit**
- **Output circuits with relays and pnp transistor outputs**
- **Common alarm indication via relay and transistor output**

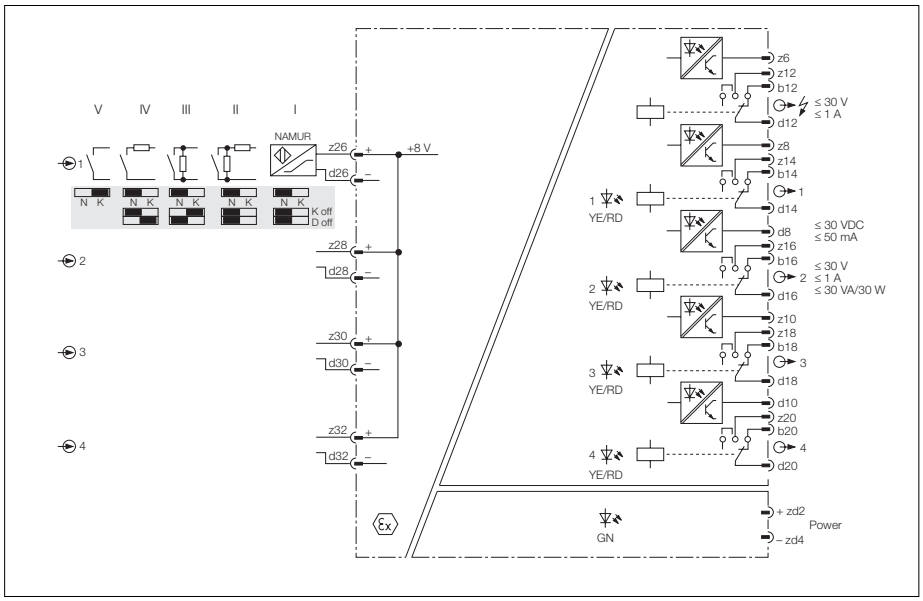
The isolating switching amplifiers MC13-451AEx0-RP/... feature four channels and intrinsically-safe input circuits. Sensors according to EN 60947-5-6 (NAMUR) (I) or mechanical contacts (II...V) may be connected.

Each channel is equipped with a pnp transistor output with thermal (non-cyclic) short-circuit protection.

The input circuits can be monitored for wire-break and short-circuit conditions. The input circuit monitoring function as well as the output mode can be adjusted via the front panel DIP switches.

If mechanical contacts are used, the wire-break and short-circuit monitoring function must be disabled or the contact must be wired to a resistor circuitry (see Fig. 1).

The green LED on the front cover indicates that the device is powered. The four dual colour LEDs indicate the switching status (yellow) as well as fault conditions (red). When the input circuit monitoring feature is activated, red illuminates to indicate a fault in the input circuit and the respective output transistor is disabled.

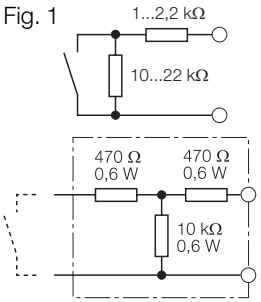


Isolating Switching Amplifier MC13-451AEx0-RP/24VDC

Performance with activated alarm output

The card is equipped with a common alarm output via which errors in the four input circuits of the channels are signalled. In case of an error in one of the input circuits, the common alarm output is switched off (relay de-energised); if the device is powered and the inputs are error-free, the alarm circuit is switched (relay energised).

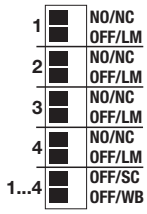
Fig. 1



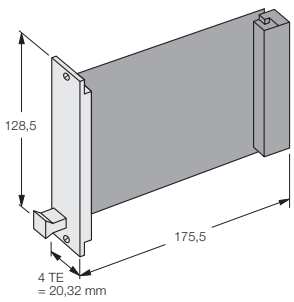
Ready-made resistor module WM1
Ident-no. 0912101

Function programming via front panel DIP switches

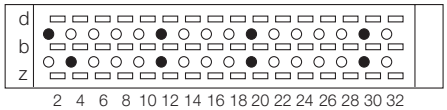
The functions are programmed via front panel DIP switches on the card separately for each channel.



NO normally open mode
NC normally closed mode
LM wire-break and short-circuit monitoring enabled
OFF wire-break and short-circuit monitoring disabled
SC common short-circuit monitoring
WB common wire-break monitoring



Type	MC13-451AEx0-RP/24VDC
Ident-no.	9028207
Supply Voltage U_B	20.4...27.6 VDC
Ripple W_{PP}	≤ 10 %
Overvoltage release	33 V ± 1.5 V
Reverse polarity protection	≤ 250 V
Power/Current consumption	≤ 100 mA
Galvanic isolation	between input circuit, output circuit and supply voltage for 250 V_{rms}, test voltage 2.5 kV_{rms}
Input circuits	to EN 60947-5-6 (NAMUR), intrinsically safe according to EN50020
Operating values	
– Voltage	8.2 V
– Current	8.2 mA
Switching threshold	1.55 mA
Hysteresis	0.2 mA
Wire-break threshold	≤ 0.1 mA
Short-circuit threshold	≥ 6 mA
Output Circuits	
Relay outputs	five relay outputs 1 change-over contact, Ag alloy + 3 µm Au
– Switching voltage	≤ 250 VAC/120 VDC/30 VDC
– Switching current	≤ 2 A/0.5 A/6 A
– Switching capacity	≤ 500 VA/100 W
– Switching frequency	≤ 10 Hz
Transistor output	pnp, short-circuit protected
– Switching output	≤ 30 VDC
– Switching current	≤ 200 mA
– Switching frequency	≤ 1 kHz
Common alarm output	
– Relay output	see data above
– Transistor output	pnp, short-circuit protected
I.S. approval acc. to certificate of conformity	TÜV 03 ATEX 2378
Max. values	
– No-load voltage U_0	9.6 V
– Short-circuit current I_0	11 mA
– Output power P_0	26 mW
External inductances/capacitances	
– [EEx ia/ib] IIC	0.9 mH/1.1 nF
– [EEx ia/ib] IIB	4.9 mH/4.1 nF
Marking of the Device	II (1) GD [EEx ia] IIC
LED indications	
– Power	green
– Switching status/Fault indication (2-colour-LED)	4 x yellow/red
Eurocard	100 x 160 mm (DIN 41494)
Material	glass-fiber reinforced epoxy resin, quality class FR4
Front panel	plastic, 4TE = 20.32 mm, individually interlocking
Connection	connector per DIN 41612, type F, 32-pole (series z+d) or 48-pole
Operating temperature	-25…+70 °C
Coding no. 20	



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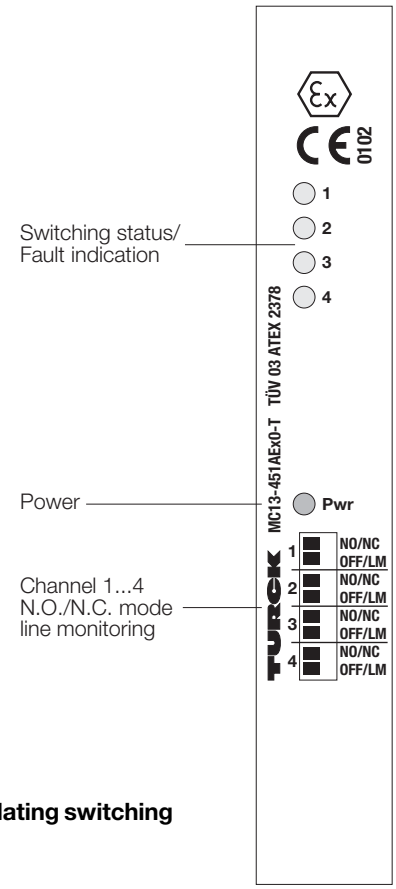
Isolating Switching Amplifier MC13-451AEx0-T/ 24VDC four channels



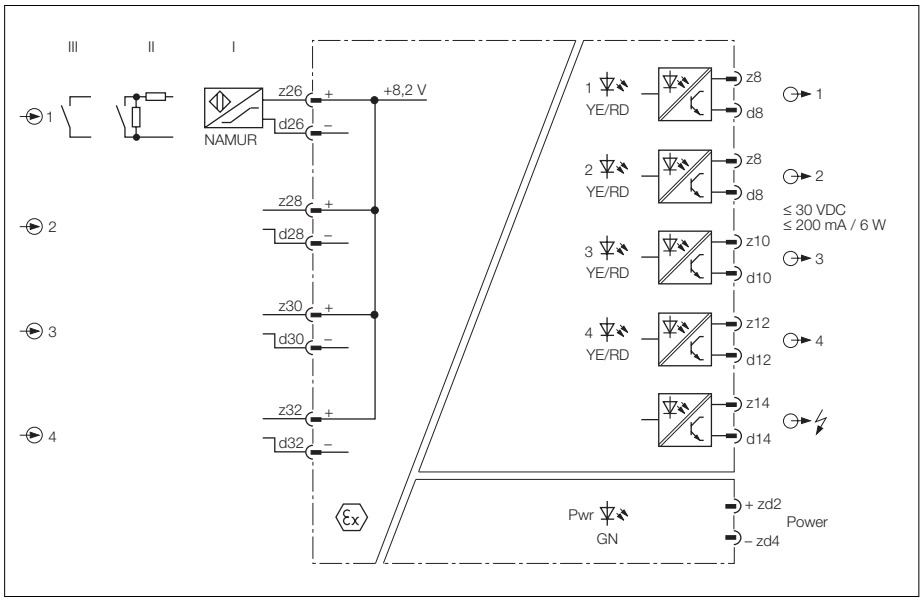
- **Four-channel isolating switching amplifier**
- **Intrinsically safe input circuits EEx ia**
- **Area of application according to ATEX: II (1) GD**
- **Galvanic isolation between input, output and supply circuit**
- **Input circuit monitoring for wire-break and short-circuit conditions (can be disabled)**
- **Transistor outputs, potential-free, short-circuit protected**
- **Additional common alarm output**

The isolating switching amplifiers MC13-451AEx0-T/... feature four channels and intrinsically-safe input circuits. Sensors according to EN 60947-5-6 (NAMUR) (I) or mechanical contacts (II +III) may be connected.

Each channel is equipped with a potential-free short-circuit protected transistor output. The short-circuit protection is thermal (non-cyclic).

The input circuits can be monitored for wire-break and short-circuit conditions. The input circuit monitoring function as well as the output mode can be adjusted via the front panel DIP switches.

The green LED on the front cover indicates that the device is powered. The four dual colour LEDs indicate the switching status (yellow) as well as fault conditions (red). When the input circuit monitoring feature is activated, red illuminates to indicate a fault in the input circuit and the respective output transistor is disabled.

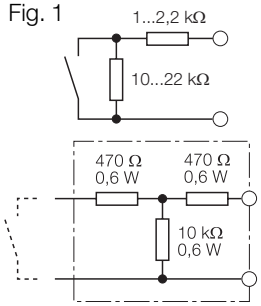


Isolating Switching Amplifier MC13-451AEx0-T/24VDC

Performance with activated alarm output

The card is equipped with a common alarm output via which errors in the four input circuits of the channels are signalled. In case of an error in one of the input circuits, the common alarm output is switched off (transistor inhibited); if the device is powered and the inputs are error-free, the alarm circuit is switched (transistor conductive).
If mechanical contacts are used, the wire-break and short-circuit monitoring function must be disabled or the contact must be wired to a resistor circuitry (see Fig. 1).

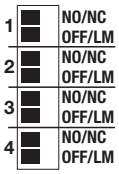
Fig. 1



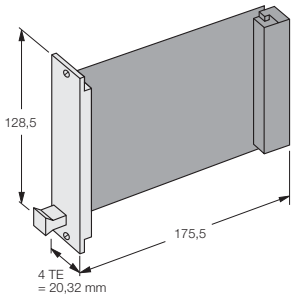
Ready-made resistor module WM1
Ident-no. 0912101

Function programming via front panel DIP switches

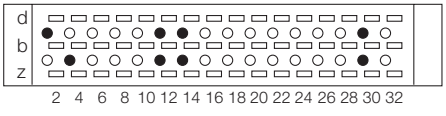
The functions are programmed via front panel DIP switches on the card separately for each channel.



NO normally open mode
NC normally closed mode
LM wire-break and short-circuit monitoring enabled
OFF wire-break and short-circuit monitoring disabled



Type	MC13-451AEx0-T/24VDC
Ident-no.	9028002
Supply voltage U_B	20.4...27.6 VDC
Ripple W_{pp}	≤ 10 %
Overvoltage threshold	33 V ± 1.5 V
Protection against faulty connection	≤ 250 V
Current consumption	≤ 100 mA
Galvanic isolation	between input circuit and output circuit and supply voltage for 250 V_{rms} test voltage 2.5 kV_{rms}
Input circuits	according to EN 60947-5-6 (NAMUR), intrinsically safe according to EN 50020
Operating characteristics	
– Voltage	8.2 V
– Current	8.2 mA
Switching threshold	1.55 mA
Hysteresis	0.2 mA
Wire-break threshold	≤ 0.1 mA
Short-circuit threshold	≥ 6 mA
Output circuits	five transistor outputs, potential-free, short-circuit protected
Switching voltage	≤ 30 VDC
Switching current	≤ 200 mA
Switching capacity	≤ 6 W
Voltage drop	appr. 4 V/200 mA and appr. 2.7 V/50 mA
Switching frequency	≤ 1 kHz (3 kHz as a special version)
I.S. approval acc. to certificate of conformity	TÜV 03 ATEX 2378
Maximum nominal values	
– No load voltage U_0	9.6 V
– Short-circuit current I_0	11 mA
– Power P_0	26 mW
Internal Inductances/Capacitances L_i/C_i	0.1 mH/negligible
External Inductances/Capacitances L_0/C_0	
– [EEx ia] IIC	0.9 mH/1.1 µF
– [EEx ia] IIB	4.9 mH/4.1 µF
Marking of device	⟨Ex⟩ II (1) GD [EEx ia] IIC
LED indications	
– Power	green
– Switching status/Fault indication (2-colour-LED)	4 x yellow/red
Eurocard	100 x 160 mm (DIN 41494)
Base material	Epoxy-resin, glass-fibre reinforced, quality class FR4
Front plate	plastic, 4TE = 20,32 mm for individual interlocking
Connection	connectors according DIN 41612, style F, 32 poles (series z+d)
Operating temperature range	-25…+70 °C
Coding (no. 17)	



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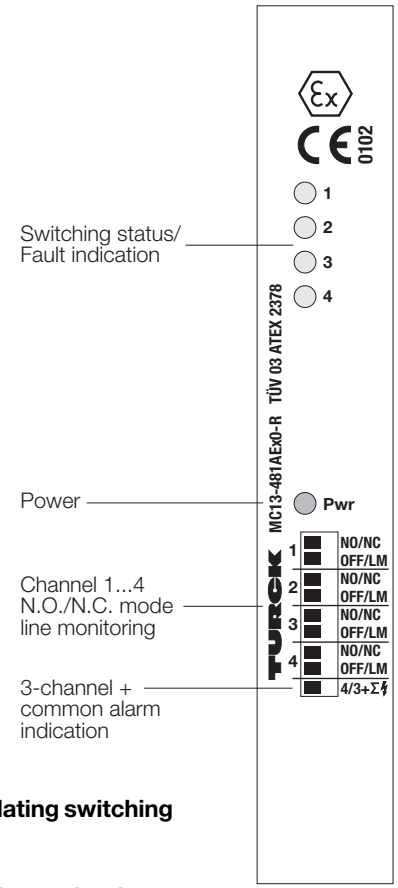
Isolating Switching Amplifier MC13-481AEx0-R/ 24VDC four channels



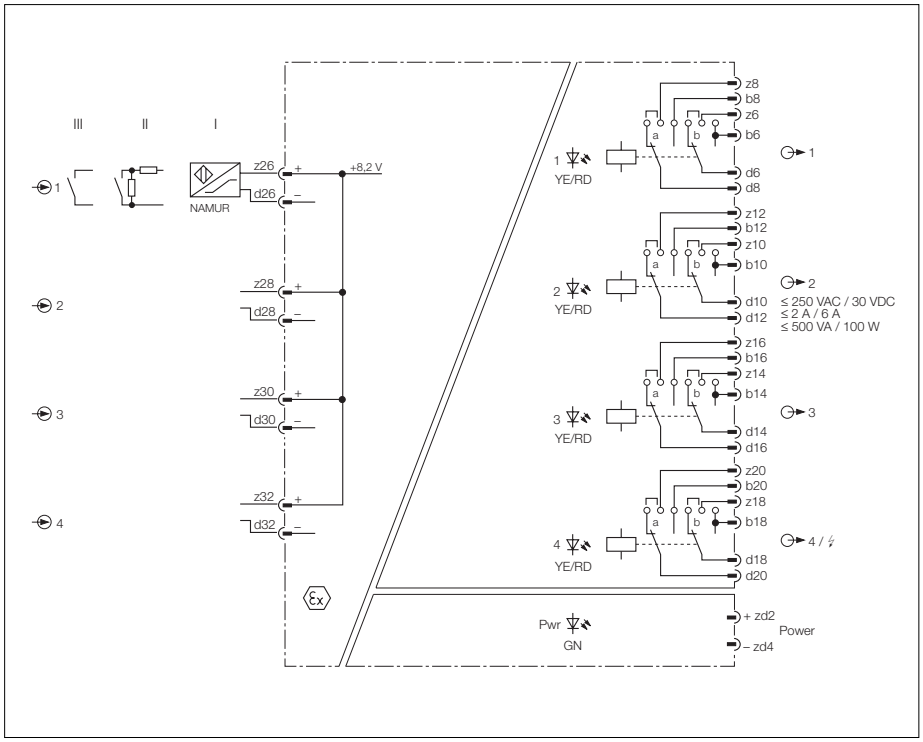
- **Four-channel isolating switching amplifier**
- **Intrinsically safe input circuits, EEx ia**
- **Area of application according to ATEX: II (1) GD**
- **Galvanic isolation between input, output and supply circuit**
- **Input circuit monitoring for wire-break and short-circuit (can be disabled)**
- **Four relay outputs with two change-over contacts each**
- **Selectable configuration: three channels with common alarm output**
- **Surge suppressor circuit**
- **Use of 32 and 48-pole socket connectors possible**
- **Sealed relays with hard gold contacts**
- **Outputs with progammable N.O. or N.C. mode per channel**

The isolating switching amplifier MC13-481AEx0-R/... features four channels and intrinsically safe input circuits. Sensors according to EN 60947-5-6 (NAMUR) (I) or mechanical contacts (II + III) may be connected. Each channel is equipped with a relay output with two top grade, gold-plated doublet change-over contacts. Thus circuits with minimum currents of 50 µA and maximum currents of up to 2 A can be securely switched.

The green LED on the front cover indicates that the device is powered. The four dual colour LEDs indicate the switching status (yellow) as well as fault conditions (red). When the input circuit monitoring feature is activated, red illuminates to indicate a fault in the input circuit and the respective output relay is de-energised.

The card can also be operated as a three-channel isolating switching amplifier with a separate common alarm output.

The input circuits can be monitored for wire-break and short-circuit conditions. The input circuit monitoring function as well as the output mode can be adjusted via the front panel DIP switches.

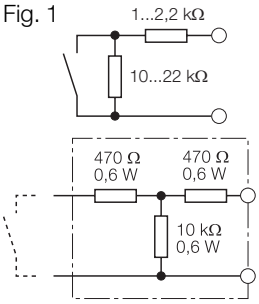


Isolating Switching Amplifier MC13-481AEx0-R/24VDC

Performance with activated alarm output

If an input circuit error occurs, the common alarm relay is de-energised; if the operating voltage applies and there are no input circuit errors, the alarm relay is energised. If mechanical contacts are used, the wire-break and short-circuit monitoring function must be disabled or the contact must be wired to a resistor circuitry (see Fig. 1).

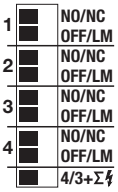
Fig. 1



Ready-made resistor module WM1
Ident-no. 0912101

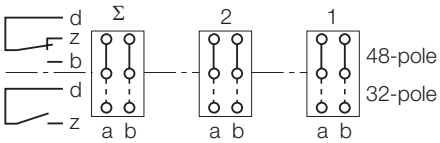
Function programming via front panel DIP switches

The input functions are programmed via front panel DIP switches on the card separately for each channel.



NO normally open mode
NC normally closed mode
LM wire-break and short-circuit monitoring enabled
OFF wire-break and short-circuit monitoring disabled
4/3+Σ 4-channel operation/3-channel operation with common alarm output

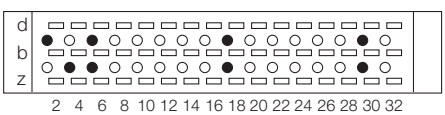
The card can be connected via a 32 or 48-pole socket connector. With the 48-pole socket connector there are two change-over contacts per output, wheras with the 32-pole socket connector, the contact (normally open or normally closed mode) needed is determined via plug-in jumpers (directly at the relay on the card).

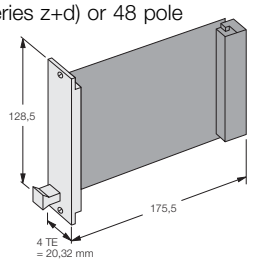


The output functions are programmed via jumper blocks on the card.

Type	MC13-481AEx0-R/24VDC
Ident-no.	9026603
Operating voltage U_B	20.4...27 VDC
Ripple W_{pp}	≤ 10 %
Overvoltage threshold	33 V ± 1.5 V
Protection against faulty connection	≤ 250 V
Current consumption	≤ 130 mA
Galvanic isolation	between input circuit and output circuit and supply voltage for 250 V_{rms}, test voltage 2.5 kV_{rms}
Input circuits	to EN 60947-5-6 (NAMUR), intrinsically safe according to EN 50020
Operating values	
– Voltage	8.2 V
– Current	8.2 mA
Switching threshold	1.55 mA
Hysteresis	typ. 0.2 mA
Wire-break threshold	≤ 0.1 mA
Short-circuit threshold	≥ 6 mA
Output circuits	
Relay outputs	four relay outputs
Contact configuration	2 change-over contact, Ag alloy + 3 µm Au (other contacts on request)
– Switching voltage	≤ 250 VAC/30VDC
– Switching current	≤ 2 A/6 A
– Switching capacity	≤ 500 VA/100 W
– Switching frequency	≤ 10 Hz
Common alarm output	
– Relay output	see data above
– Transistor output	pnp, short-circuit protected
I.S. approval acc. to certificate of conformity	TÜV 03 ATEX 2378
Max. values	
– No-load voltage U_0	9.6 V
– Short-circuit current I_0	11 mA
– Output power P_0	26 mW
External inductances/capacitances	
– [EEx ia] IIC	0.9 mH/1.1 µF
– [EEx ia] IIB	4.9 mH/4.1 µF
Marking of the device	⟨Ex⟩ II (1) GD [EEx ia] IIC
LED indications	
– Power	green
– Switching status/Fault indication (2-colour-LED)	4 x yellow/red
Eurocard	100 x 160 mm (DIN 41494)
Base material	epoxy resin, glass-fibre reinf., quality class FR4,
Front plate	plastic, 4 TE = 20.32 mm, for individual interlocking
Connection	connector according to DIN 4162 style F, 32 poles (series z+d) or 48 pole
Operating temperature	-25…+60 °C

Coding (no. 19)





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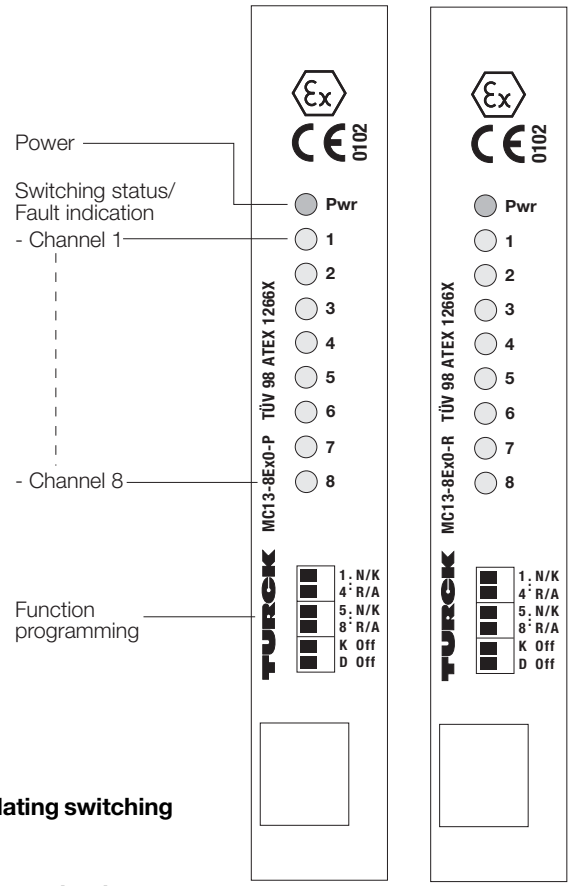
Isolating Switching Amplifier MC13-8Ex0-R/24VDC MC13-8Ex0-P/24VDC eight channels



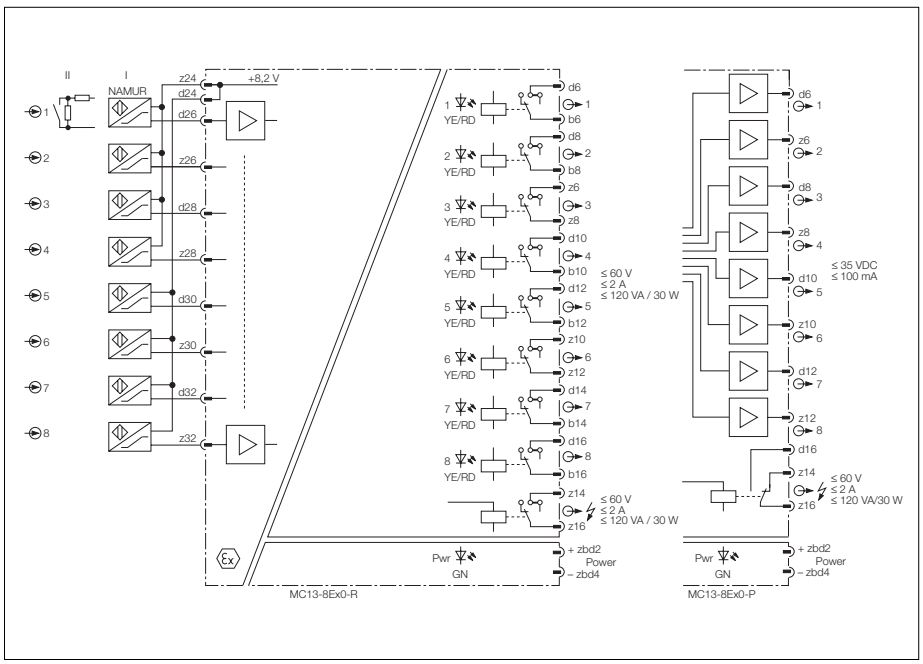
- **Eight-channel isolating switching amplifier**
- **Intrinsically safe input circuits EEx ia/ib**
- **Area of application acc. to ATEX: II (1) GD**
- **Programmable functions with front DIP-switches**
- **Input circuit monitoring for wire-break and short-circuit (can be disabled)**
- **One dual-colour LED per channel for status indications**
- **Input circuits galvanically isolated from supply voltage and outputs**
- **Output circuits with**
  - **Relay outputs: MC13-8Ex0-R**
  - **pnp output transistors: MC13-8Ex0-P**
- **Common alarm circuit via relay output**

The MC13-8Ex0-R and the MC13-8Ex0-P are eight-channel switching amplifiers with intrinsically safe input circuits. They can be connected to sensors according to EN 60947-5-6 (NAMUR) (I) or potential-free contacts (II).

Depending on the device used, each channel provides a relay output (N.O. or N.C. mode is jumper programmable) or a pnp transistor output with thermally (non-cyclic) activated short-circuit protection.

The input circuits are monitored for short-circuit and wire-break.

The green LED on the front cover indicates that the device is powered. The four dual colour LEDs indicate the switching status (yellow) as well as fault conditions (red). When the input circuit monitoring feature is activated, red illuminates to indicate a fault in the input circuit and the respective output relay is de-energised or the output transistor is disabled.

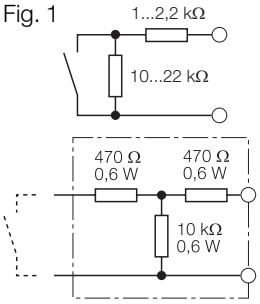


Isolating Switching Amplifier MC13-8Ex0-R.../24VDC/MC13-8Ex0-P.../24VDC

If a fault occurs in one of the input circuits, the common alarm relay is de-energised and the two-colour LED of the channel changes to red. The mode of the output relay is selected by programming jumpers on the card (N.O. or N.C.)

When using mechanical contacts as the input device, wire-break and short-circuit monitoring must be disabled or shunt resistors (II) must be connected to the contacts (see Fig. 1).

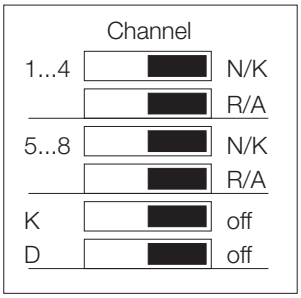
Fig. 1



Ready-made resistor module WM1
Ident-no. 0912101

Function programming with front panel DIP switches

Programming is accomplished with six DIP-switches located in the front of the device.



The four switches on the top are used to individually select the following functions of channels 1...4 and 5...8:

– DIP-switch position N/K (NAMUR or mechanical contacts):
  Switch position K disables input circuit monitoring, position N enables input circuit monitoring.

– DIP-switch position R/A (N.O. or N.C. mode):
  The mode indicated refers to a mechanical contact. Because the signal mode of inductive sensors according to EN 60947-5-6 is inverse to that of of mechanical contacts, this switch can be used to reverse the performance mode of the input circuits.

The two DIP-switches on the bottom are used to enable or disable the wire-break or short-circuit monitoring function for all channels with activated input circuit monitoring (Switch position N).

– Switch K off:
  Short-ciruit monitoring de-activated
– Switch D off:
  Wire-break monitoring de-activated

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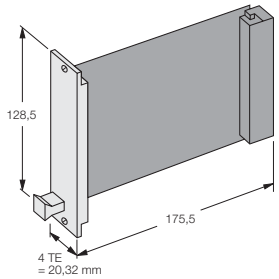
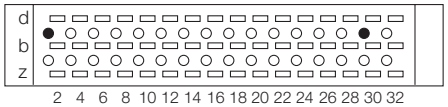
Isolating Switching Amplifier MC13-8Ex0-R.../24VDC/MC13-8Ex0-P.../24VDC

Type	MC13-8Ex0-R/24VDC	MC13-8Ex0-P/24VDC
Ident-no.	9028700	9028720
Supply Voltage U_B	18...35 VDC	18...35 VDC
Ripple W_{PP}	≤ 10 %	≤ 10 %
Overvoltage release	39 V ± 1 V	39 V ± 1 V
Reverse polarity protection	≤ 250 V	≤ 250 V
Current consumption	≤ 4 W	≤ 4 W
Galvanic isolation	between input circuit, output circuit and supply voltage for 250 V_{rms} test voltage 2.5 kV $_{rms}$	between input circuit, output circuit and supply voltage for 250 V_{rms} test voltage 2.5 kV $_{rms}$
Input Circuits	EN 60947-5-6 (NAMUR), intrinsically safe	En 60947-5-6 (NAMUR), intrinsically safe
Operating characteristics		
– No-load voltage U_0	8.2 V	8.2 V
– Short-circuit current I_0	8.2 mA	8.2 mA
Switching threshold	1.2 ≥ I_e ≥ 2.1 mA	1.2 ≥ I_e ≥ 2.1 mA
Hysteresis	0.4 mA	0.4 mA
Wire-break threshold	typ. 0.2 mA	typ. 0.2 mA
Short-circuit threshold	≥ 6 mA	≥ 6 mA
Output Circuits		
Relay outputs	relay (N.O./N.C. programmable)	–
– Switching voltage	≤ 36 V	–
– Switching current	≤ 2 A	–
– Switching capacity	≤ 72 VA/32 W	–
– Switching frequency	≤ 10 Hz	–
– Contact material	silver-alloy + 3 µm Au	–
Transistor outputs	–	pnp, short-circuit protected
– Switching voltage	–	P_{wr} - 3 V
– Switching current	–	≤ 100 mA
– Switching frequency	–	≤ 100 Hz
Common alarm output	relay 60 V/2 A (N.O./N.C. programmable)	relay 60 V/2 A (1 SPDT contact)
I.S. approval acc. to Certification of Conformity	TÜV 98 ATEX 1266X	TÜV 98 ATEX 1266X
Maximum nominal values		
– No-load voltage U_0	9.6 V	9.6 V
– Short-circuit current I_0	57.2 mA	57.2 mA
– Power P_0	137.3 mW	137.3 mW
Maximum external inductances/capacitances		
– [EEx ia] IIC	10 mH/3.6 µF	10 mH/3,6 µF
– [EEx ia] IIB	40 mH/26 µF	40 mH/26 µF
Marking of device	⟨Ex⟩ II (1) GD [EEx ia] IIC	⟨Ex⟩ II (1) GD [EEx ia] IIC
LED Indications		
– Power	green	green
– Status indication/fault indication	8 x yellow/red (two-colour LEDs)	8 x yellow/red (two-colour LEDs)
Eurocard	100 x 160 mm (DIN 41494)	
Material	glass-fiber reinforced epoxy resin, quality class FR4	
Front panel	plastic, 4TE = 20.32 mm, individually interlocking	
Connection	connector per DIN 41612, type F, 48-pole	
Operating temperature	-25...+60 °C	

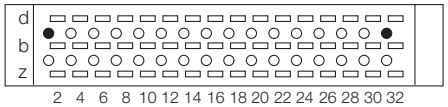


Coding

No. 116



No. 117



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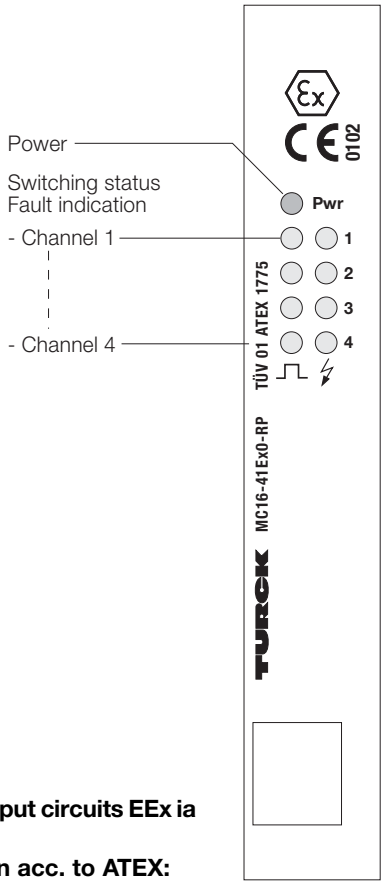
Isolating Switching Amplifier MC16-41Ex0-RP four channels



- **Intrinsically safe input circuits EEx ia**
- **Area of application acc. to ATEX: II (1) GD**
- **Four input circuits, galvanically isolated from each other, from the output circuits and the supply voltage**
- **Input circuit monitoring for wire-break and short-circuit conditions**
- **Output mode of each channel separately adjustable**
- **Two relay contacts per channel, selectable normally open or normally closed mode, and one pnp transistor output**
- **One transistor alarm output per channel**
- **Pin and function compatible with the device type EG4-RLK from PEPPERL+FUCHS**

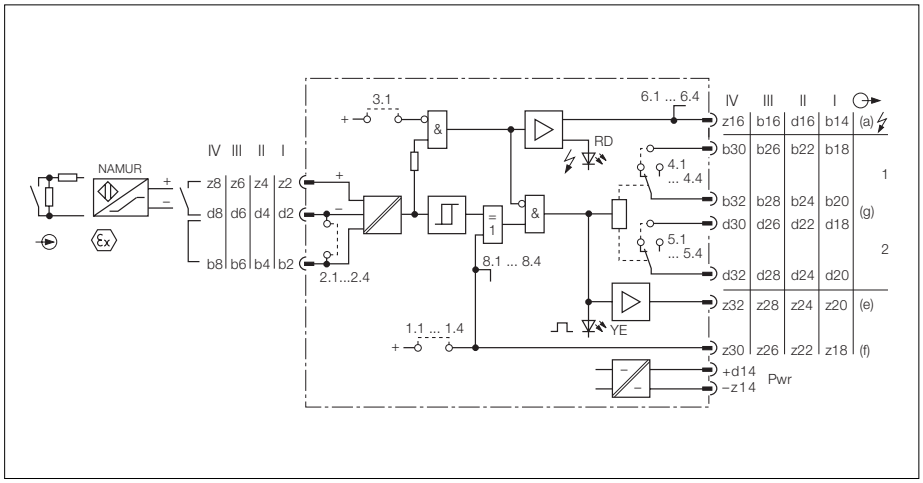
The isolating switching amplifier type MC16-41Ex0-RP has four channels with intrinsically safe input current circuits which are galvanically isolated from each other. Sensors according to EN 60947-5-6 (NAMUR) or mechanical contacts may be connected. Each input circuit is monitored for short-circuit and wire-break conditions (ex factory setting).

Short-circuit and wire-break monitoring can be disabled for all channels via a plug-in jumper on the card (3.1). Further it is possible to disable the wire-break monitoring function of each channel via a plug-in jumper (2.1...2.4) or via a jumper on the multipoint connector. Each channel features a pnp short-circuit protected transistor output (e) and two relay contacts (g) which can be configured as normally closed or normally open (ex factory setting) outputs via plug-in jumpers (4.1...5.4). In addition, each channel is equipped with a short-circuit protected pnp transistor alarm output (a): If an error is detected in the input circuit, the alarm output switches the operating voltage to the output. The alarm outputs of the individual channels can be configured as a single common alarm output (3.1) via a plug-in jumper (6.1...6.4).
If an error occurs, the output relays are de-energised and the transistor output is inhibited.

Regarding the load capacity of the relay outputs, it is required to observe the respective load limit curves.
The maximum current or voltage value of the working point should be evaluated (see curve on page 2). The relay's switching performance can be adjusted via plug-in jumpers 4 and 5.

The output mode of each channel can be adjusted separately. This can be accomplished by plug-in jumpers (1.1...1.4) on the card or by applying operating voltage to the according inputs at the multipoint connector (f). If the output mode is selected via plug-in jumpers, configuration via the operating voltage is not admissible. With further plug-in jumpers (8.1...8.4) the output mode of several channels can be configured by applying operating voltage.

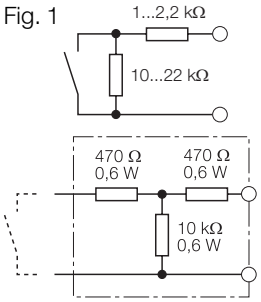
The Pwr LED illuminates green if the device is powered. Each channel features a switching status LED which illuminates yellow if the relay is energised or the transistor output is conducting.



Isolating Switching Amplifier MC16-41Ex0-RP

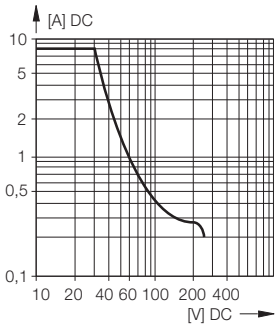
When using mechanical contacts as the input device, wire-break and short-circuit monitoring must be disabled or shunt resistors (II) must be connected to the contacts (see Fig. 1).

Fig. 1

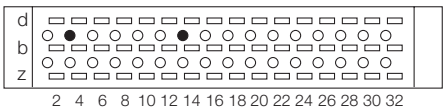


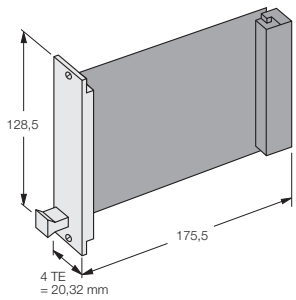
Ready-made resistor module WM1
Ident-no. 0912101

Relay load limit curve



Coding (no. 122)





Type	MC16-41Ex0-RP
Ident-no.	9011102
Operating voltage U_B	20...28 VDC
Internal current consumption	< 140 mA
Galvanic isolation	between input circuits, output circuits and supply or 250 V_{rms}, test voltage 2 kV_{rms} according to EN 50020, between control circuits – 75 V (3.5 mm creepage distance) according to EN 50020, between relay circuits – min. 125 V according to EN 50178
Input circuits	according to EN 60947-5-6 (NAMUR), intrinsically safe per EN 50020
Operating values	
– Voltage	8.2 V
– Current	8.2 mA
Switching threshold	1.55 mA
Switching hysteresis	0.25 mA
Wire-break threshold	≤ 0.2 mA
Short-circuit threshold	≥ 6 mA
Conversion of line of action	
– 1-signal	5...30 VDC
– 0-signal	open or 0...0.7 V
– Input current	< 1 mA
Output circuits	8 relay and transistor outputs
Relay outputs	per channel 2 normally closed or normally open outputs, selectable
– Switching voltage	≤ 125 VAC / 125 VDC
– Switching current	3 A
– Switching capacity	360 VA / 100 W
– Contact material	silver alloy + 5 µm Au
– Switching frequency	< 25 Hz
Transistor outputs	per channel 1 switching and alarm output, pnp, short-circuit protected
– Switching current	< 40 mA
– Switching frequency	< 25 Hz
– Leakage current	< 10 µA
I.S. Approval according to EC type examination certificate:	TÜV 01 ATEX 1775
Max. values	
– No-load voltage U_0	9.6 V
– Short-circuit current I_0	10 mA
– P_0	25 mW
Charcteristic curve	linear
External inductances/capacitances L_0/C_0	
– [EEx ia] IIC	1 H/3.6 µF
– [EEx ia] IIB	1 H/26 µF
Marking of the device	⟨Ex⟩ II (1) GD [EEx ia] IIC
LED indications	
– Power	green
– Switching status	4 x yellow
– Fault indication	4 x red
Eurocard	100 x 160 mm (DIN 41494)
Base material	Epoxy resin, glass fibre reinf., quality class FR4
Front plate	plastic 4TE = 20,32 mm for individual interlock.
Connection	connectors to DIN 41612, type F, 48 poles (series z+d+b)
Operating temperature range	-25...+60 °C

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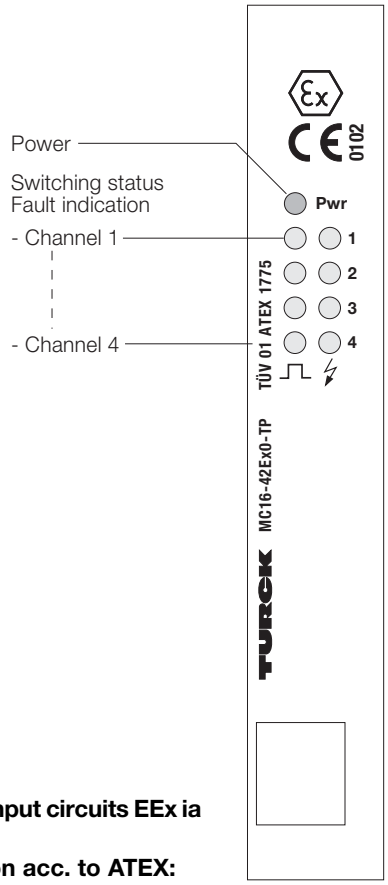
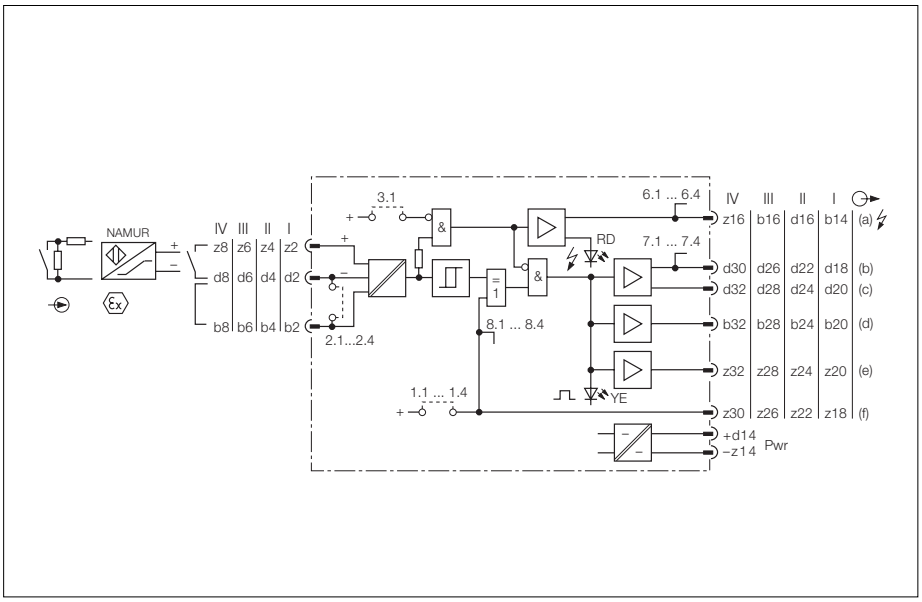
Isolating Switching Amplifier MC16-42Ex0-TP four channels



- **Intrinsically safe input circuits EEx ia**
- **Area of application acc. to ATEX: II (1) GD**
- **Four input circuits, galvanically isolated from each other, from the output circuits and the supply voltage**
- **Input circuit monitoring for wire-break and short-circuit conditions**
- **Output mode of each channel separately adjustable**
- **Three pnp transistor outputs per channel**
- **One transistor alarm output per channel**
- **Pin and function compatible with the device type EG4-TLK from PEPPERL+FUCHS**

The isolating switching amplifier type MC16-42Ex0-TP has four channels with intrinsically safe input current circuits which are galvanically isolated from each other. Sensors according to EN 60947-5-6 (NAMUR) or mechanical contacts may be connected. Each input circuit is monitored for short-circuit and wire-break conditions (ex factory setting). Short-circuit and wire-break monitoring can be disabled for all channels via a plug-in jumper on the card (3.1). Further it is possible to disable the wire-break monitoring function of each channel via a plug-in jumper (2.1...2.4) or via a jumper on the multipoint connector.

Each channel is equipped with three short-circuit protected pnp transistor outputs. Two transistor outputs switch the operating voltage with a max. load of 40 mA to the outputs (d, e). The third transistor output is suited to switching currents of up to 200 mA (c). This third output of each channel must be powered externally (b). The 40 mA transistor outputs are powered via the supply voltage connection +Pwr (Pin: d14), whereas the 200 mA transistor outputs are supplied externally. Loads and the external supply of the 200 mA outputs have connection –Pwr (Pin: z14) as a common reference point. Via plug-in jumpers (7.1...7.4) the same voltage can be applied to all outputs via one input. When the jumpers are left open, it is possible to individually power each output (ex factory setting) or groups of outputs using different voltages.
In addition, each channel is equipped with a short-circuit protected pnp transistor alarm output (a). If an error is detected in the control circuit, the alarm output switches the operating voltage to the output. Via plug-in jumpers (6.1...6.4) the alarm outputs of the individual channels can be configured as a single common alarm output. If an error occurs, the according transistor outputs are inhibited. The output mode of each channel can be adjusted separately. This can be accomplished by plug-in jumpers (1.1...1.4) on the card or by applying the operating voltage to the according inputs at the multipoint connector. If the output mode is selected via plug-in jumpers, configuration via application of the operating voltage is not admissible.

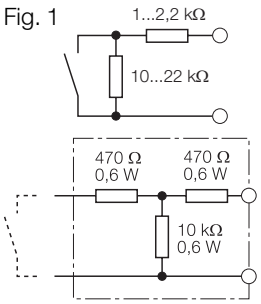


Isolating Switching Amplifier MC16-42Ex0-TP

With further plug-in jumpers (8.1...8.4) the output mode of several channels can be configured by applying operating voltage. The Pwr LED illuminates green if the device is powered. Each channel features a switching status LED which illuminates yellow if the transistor output is conducting. The alarm LED illuminates red if there is an error.

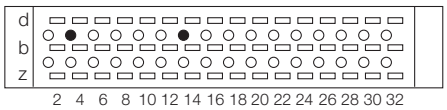
When using mechanical contacts as the input device, wire-break and short-circuit monitoring must be disabled or shunt resistors (II) must be connected to the contacts (see Fig. 1).

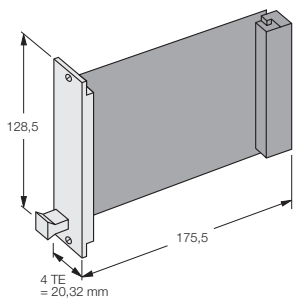
Fig. 1



Ready-made resistor module WM1
Ident-no. 0912101

Coding (no. 122)





Type	MC16-42Ex0-TP
Ident-no.	9011101
Operating voltage U_B	20...28 VDC
Internal current consumption	< 80 mA
Galvanic isolation	between control circuits, output circuits and supply for 250 V_{rms}, test voltage 2 kV_{rms} according to EN 50020 between control circuits – 75 V (3.5 mm creepage distance) according to EN 50020
Input circuits	according to EN 60947-5-6 (NAMUR), intrinsically safe per EN 50020
Operating values	
– Voltage	8 V
– Current	8 mA
Switching threshold	1.55 mA
Switching hysteresis	0.25 mA
Wire-break threshold	≤ 0.2 mA
Short-circuit threshold	≥ 6 mA
Conversion of line of action	
– 1-signal	5...30 VDC
– 0-signal	open or 0...0.7 V
– Input current	< 1 mA
Output circuits	16 transistor outputs
Transistor outputs	per channel 2 low power transistor outputs and one alarm output, short-circuit protected, pnp
– Switching current	40 mA
– Switching frequency	< 1 kHz
– Leakage current	< 10 µA
– Voltage drop	< 3 V
Transistor outputs	per channel 1 power transistor output, pnp, short-circuit protected
– Switching current	< 200 mA
– Switching frequency	< 1 kHz
– Leakage current	< 10 µA
– Voltage drop	< 3 V
Ex Approval according to EC type examination certificate:	TÜV 01 ATEX 1775
Max. values	
– No-load voltage U_0	9.6 V
– Short-circuit current I_0	10 mA
– Power P_0	25 mW
Charcteristic curve	linear
External inductances/capacitances L_0/C_0	
– [EEx ia] IIC	1 H/3.6 µF
– [EEx ia] IIB	1 H/26 µF
Marking of the device	⟨Ex⟩ II (1) GD [EEx ia] IIC
LED indications	
– Power	green
– Switching status	4 x yellow
– Fault indication	4 x red
Eurocard	100 x 160 mm (DIN 41494)
Base material	Epoxy resin, glass fibre reinf., quality class FR4
Front plate	plastic 4TE = 20,32 mm for individual interlocking
Connection	connectors to DIN 41612, type F, 48 poles (series z+d+b)
Operating temperature range	-25...+60 °C

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Industrial Automation

ROTATIONAL SPEED METERS/ MONITORS

2

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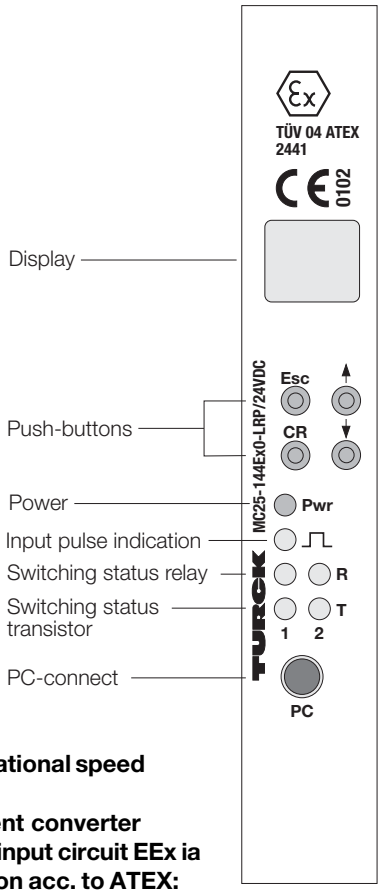
Rotational Speed Monitor MC25-144Ex0-LRP/ 24VDC



- **One-channel rotational speed monitor/meter**
- **Frequency-current converter**
- **Intrinsically safe input circuit EEx ia**
- **Area of application acc. to ATEX: II (1) GD**
- **Overspeed and underspeed detection**
- **Detection range 1 mHz...10 kHz (0.06...600000 min^{-1})**
- **For use with NAMUR sensors, 3-wire sensors (I) or 24 VDC signals**
- **Easy parameter setting:**
  - **Lower measuring range value**
  - **Upper measuring range value**
  - **Limit values**
- **Every relay or transistor output can be parameterised individually:**
  - **Alarm output**
  - **2 setpoints (on and off)**
  - **4 setpoints (window function)**
  - **Pulse scaler (transistor T2 only)**
- **Pulse output (II)**
- **Current output and voltage output can be parameterised**
- **Parameter setting via PC, optional via four front push-buttons**

The MC25-144Ex0-LRP is a rotational speed monitor designed to monitor and evaluate frequencies, rotational speeds and pulse sequences, e.g. from rotating shafts on motors, gears or turbines, and to monitor overspeeds and underspeeds referenced to set limits. A display located on the front cover indicates the actual speed –also beyond the set measuring range. Card parameterisation is menu-assisted via four push-buttons or via a personal computer (PC) and the IM-PROG programming adapter.

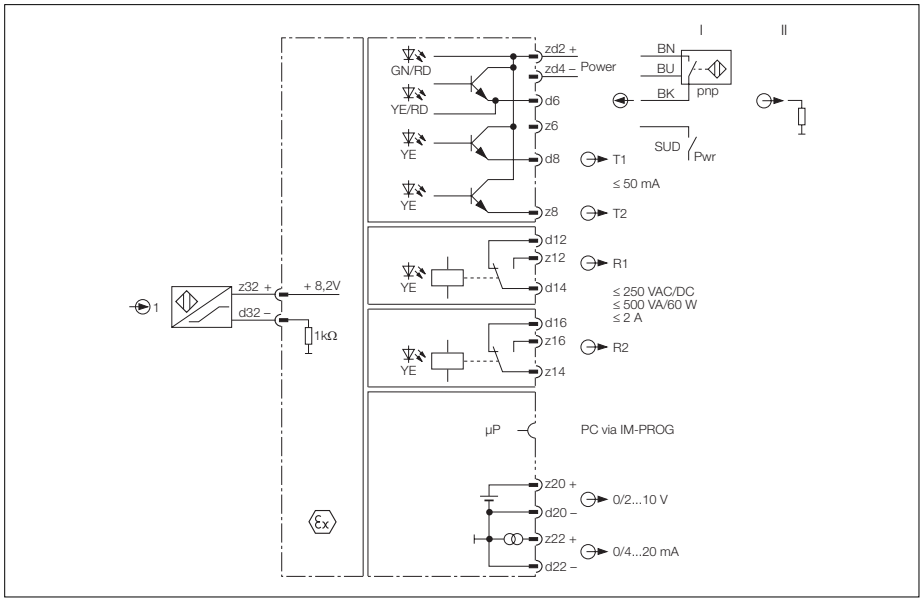
The following alternatives can be connected to the input:
- sensors per EN 60947-5-6 (NAMUR)
- 3-wire sensors
- external signal sources (24 VDC).

The input signal type is set during parameterisation. Further monitoring devices can be controlled via the short-circuit protected pulse output (d6). This connection can also be used as a pulse input for 3-wire pnp sensors or external signal sources, provided NAMUR sensors are not used. An invertible current output (0/4...20 mA) and a voltage output (0/2...10 V) are available.

Two relay outputs and two pnp short-circuit protected transistor outputs are available for limit value or alarm indications. Each digital output (relay or transistor) can be parameterised individually:
- overspeed and underspeed
- window function (combination of overspeed and underspeed)
- alarm output
- pulse scaler (transistor 2 only).

The switching hysteresis is defined by setting a switch-on and a switch-off point. The switching outputs are operated in the NO operating mode, the outputs are active in the normal state.

The respective alarm output de-energises when a limit value is reached. A switch-off delay can be set for each output so that brief frequency bursts do not trigger shutdown.



Rotational Speed Monitor MC25-144Ex0-LRP

An interlock feature prevents the output relay from re-energising.
The lower and upper measuring range limit can be freely selected. The frequency is converted linearly to a current of 0/4...20 mA and a voltage of 0/2...10 V within the measuring range. An adjustable damping time can be set to filter measurement errors resulting from possible interference frequencies.

The input signal can be divided by a set factor and output via transistor output T2. For operation as pulse scaler, a divider is set for the input signal. This factor can be programmed as a whole number in the range from 2...9999.

Depending on the setting, the NAMUR input is monitored for wire-break and/or short-circuits. In case of input circuit errors, the relays de-energise, the transistors are disabled and the yellow pulse LED changes to red.

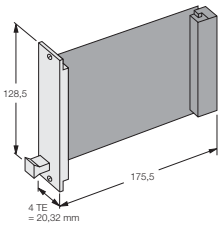
The analogue output performance in response to a wire-break and short-circuit on the input circuit can be set. In case of an error, either 0 mA/0 V or > 22 mA/11 V is output.

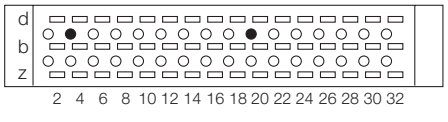
With monitoring for underspeed or a window function, a start up delay time can be set. During this the respective output remains energised or conductive, i.e. an underspeed will not trigger a system shutdown. The start-up delay is started by applying 24 VDC to z6 or applying the supply voltage.

The display of the actual frequency/ rotational speed, the setting of the limit values and the measuring range are implemented by default in Hz. The display and settings can be matched to suit the required unit by setting the time base and details of the pulses per revolution. For example, set the time base to a value of 60 for a display in min^{-1} (rpm).

To ensure the fastest possible reaction time in all applications, lower frequencies are measured according to the digital pulse principle and higher frequencies are monitored on the basis of a time window. At lower frequencies, the reaction time depends exclusively on the time of period of the signal.

Type	MC25-144Ex0-LRP/24VDC
Ident-no.	9054531
Supply voltage U_B	18...30 VDC
Ripple W_{PP}	≤ 10 %
Current consumption	< 200 mA
Galvanic isolation	between input circuit and output circuit and supply voltage for 250 V_{rms}, test voltage 2.5 kV_{rms}
Input circuit	alternative: NAMUR input/24 VDC input
NAMUR input (terminal: zd32)	intrinsically safe acc. to EN 60947-5-6 for NAMUR sensors
24 VDC input (terminal: d6)	3-wire sensors, mechanical contacts, 24 V signals
Overflow protected to	15 kHz
Output circuits	
2 x transistor outputs	pnp, short-circuit protected (I_L ≤ 50 mA) voltage drop U_{CE} < 2 V
2 x relay outputs	one potential free changeover contact each
– Switching voltage	≤ 250 VAC/DC
– Switching current	≤ 2 A
– Switching capacity	≤ 500 VA/60 W
– Contact material	Ag alloy + 3 µm Au
Current output (invertible)	0/4...20 mA or 20...4/0 mA
Voltage output (invertible)	0/2...10 V or 10...2/0 V
Pulse output	transistor output: pnp, short-circuit protected (I_L ≤ 50 mA)
I.S. approval acc. to certificate of conformity	TÜV 04 ATEX 2441
Maximum ratings	
– No-load voltage U_0	≤ 9.6 V
– Short-circuit current I_0	≤ 10.7 mA
– Power P_0	≤ 25.7 mW
External Inductances/Capacitances L_0/C_0	
– [EEx ia] IIC	1 mH/1.1 µF
– [EEx ia] IIB	5 mH/4.4 µF
Marking of device	Ⓔx II (1) GD [EEx ia] IIC
Operating range	1 mHz…10 kHz (0.06…600000 min^{-1})
LED indications	
Power	green
Pulse indication (2-colour LED)	yellow – error: red
Switching status	4 x yellow
Display	transflective
Eurocard	100 x 160 mm (DIN 41494)
Base material	Epoxy-resin, glass-fibre reinforced, quality class FR4
Front plate	plastic, 4TE = 20.32 mm for individual interlocking
Connection	connectors according DIN 41612, style F, 32 poles (series z+d)
Operating temperature range	-25…+60 °C
Coding (no. 125)	





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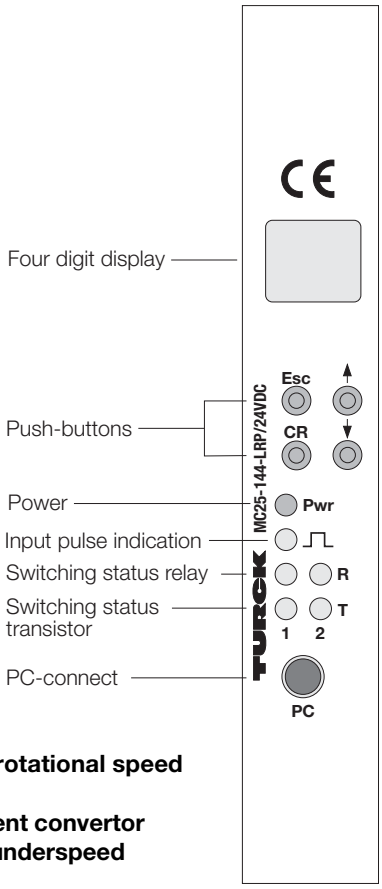
Rotational Speed Monitor MC25-144-LRP/24VDC

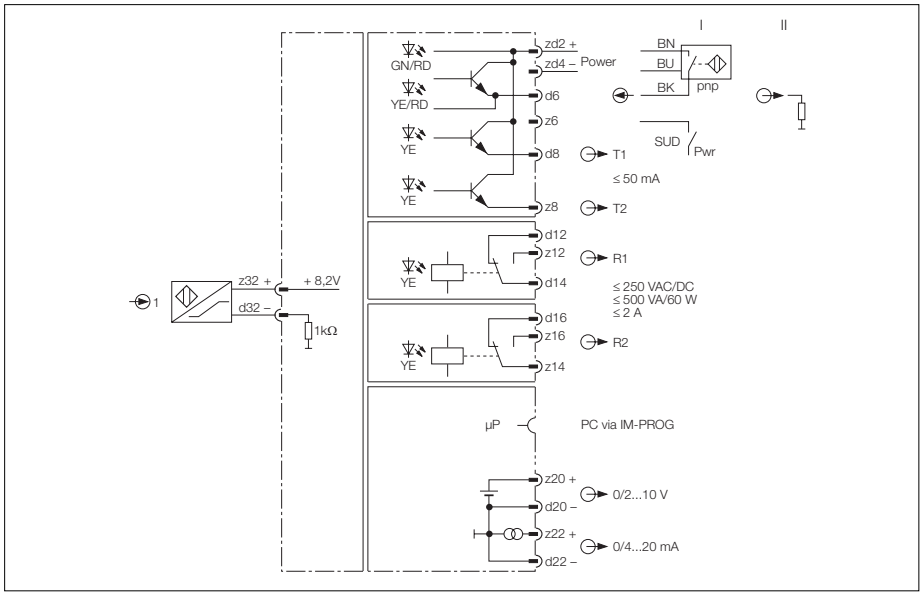


- **Single-channel rotational speed monitor/meter**
- **Frequency-current convertor**
- **Overspeed and underspeed detection**
- **Detection range 1 mHz...10 kHz (0.06...600000 min^{-1})**
- **For use with NAMUR sensors, 3-wire sensors (I) or 24 VDC signals**
- **Easy parameter setting:**
  - **Lower measuring range value**
  - **Upper measuring range value**
  - **Limit values**
- **Every relay or transistor output can be parameterised individually:**
  - **Alarm output**
  - **2 setpoints (on and off)**
  - **4 setpoints (window function)**
  - **Pulse scaler (transistor T2 only)**
- **Pulse output (II)**
- **Current output 0/4...20 mA or 20...4/0 mA and voltage output 0/2...10 V or 10...2/0 V can be parameterised**
- **Parameter setting via PC, optional via four front pushbuttons**

The MC25-144-LRP is a rotational speed monitor designed to monitor and evaluate frequencies, rotational speeds and pulse sequences, e.g. from rotating shafts on motors, gears or turbines, and to monitor overspeeds and underspeeds referenced to set limits. A display located on the front cover indicates the actual speed – also beyond the set measuring range. Card parameterisation is menu-assisted via four front push-buttons or via personal computer (PC) with the IM-PROG programming adapter.
The following alternatives can be connected to the input:
– sensors per EN 60947-5-6 (NAMUR)
– 3-wire sensors
– external signal sources (24 VDC).

The input signal type is set during parameterisation. Further monitoring devices can be controlled via the short-circuit protected pulse output (d6). This connection can also be used as a pulse input for 3-wire pnp sensors or external signal sources if NAMUR sensors are not used.
An invertible current output (0/4...20 mA) and a voltage output (0/2...10 V) are available.

Two relay outputs and two pnp short-circuit protected transistor outputs are available for limit value or alarm indications.
Each digital output (relay or transistor) can be parameterised individually:
– overspeed and underspeed
– window function (combination of overspeed and underspeed)
– alarm output
– pulse scaler (transistor 2 only).
The switching hysteresis is defined by setting a switch-on and a switch-off point.
The switching outputs are operated in the NO operating mode; the outputs are active in the normal state.
The respective alarm output de-energises when a limit value is reached. A switch-off delay can be set for each output so that brief frequency bursts do not trigger shutdown.



Rotational Speed Monitor MC25-144-LRP

An interlock feature prevents the output relay from re-energising.

The lower and upper measuring range limit can be freely selected. The frequency is converted linearly to a current of 0/4...20 mA and a voltage of 0/2...10 V within the measuring range. An adjustable damping time can be set to filter measurement errors resulting from possible interference frequencies.

The input signal can be divided by a set factor and output via transistor output T2. For operation as pulse scaler, a factor is set for the input signal. This factor can be programmed as a whole number in the range from 2...9999.

Depending on the setting, the NAMUR input is monitored for wire-break and/or short-circuits. In case of input circuit errors, the relays de-energise, the transistors are disabled and the yellow pulse LED changes to red.

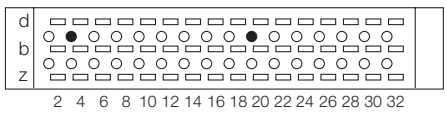
The analogue output performance in response to a wire-break and short-circuit on the input circuit can be set. In case of an error, either 0 mA/0 V or > 22 mA/11 V is output.

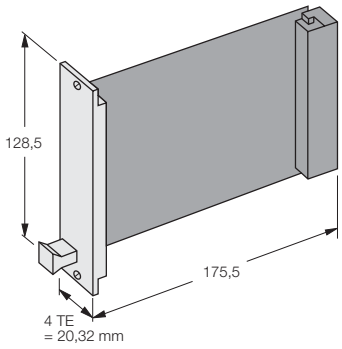
With monitoring for underspeed or a window function, a start-up delay time can be set. During this time, the respective output remains energised or conductive, i.e. an underspeed will not trigger system shutdown. The start-up delay is started by applying 24 VDC to z6 or applying the supply voltage.

The display of the actual frequency/ rotational speed, the setting of the limit values and the measuring range is implemented by default in Hz. The display and settings can be matched to suit the required unit by setting the time base and details of the pulses per revolution. For example, set the time base to a value of 60 for a display in min^{-1} (rpm).

To ensure the fastest possible reaction time in all applications, lower frequencies are measured according to the digital pulse principle and higher frequencies are monitored on the basis of a time window. At lower frequencies, the reaction time depends exclusively on the time of period of the signal.

Type	MC25-144-LRP/24VDC
Ident-no.	9054532
Supply voltage U_B	18...30 VDC
Ripple W_{PP}	≤ 10 %
Current consumption	< 200 mA
Galvanic isolation	between input circuit and output circuit and supply voltage for 250 V_{rms}, test voltage 2.5 kV_{rms}
Input circuit	alternative: NAMUR input/24 VDC input
NAMUR input (terminal: zd32)	NAMUR sensors acc. to EN 60947-5-6
24 VDC input (terminal: d6)	3-wire sensors, mechanical contacts 24 V signals
Overflow protected to	15 kHz
Output circuits	
2 x transistor outputs	pnp, short-circuit protected (I_L ≤ 50 mA) voltage drop U_{CE} < 2 V
2 x relay outputs	one potential free change-over contact each
– Switching voltage	≤ 250 VAC/DC
– Switching current	≤ 2 A
– Switching capacity	≤ 500 VA/60 W
– Contact material	Ag alloy + 3 µm Au
Current output (invertible)	0/4...20 mA or 20...4/0 mA
Voltage output (invertible)	0/2...10 V or 10...2/0 V
Pulse output	transistor output: pnp, short-circuit protected (I_L ≤ 50 mA)
Operating range	1 mHz…10 kHz (0.06…600000 min^{-1})
LED indications	
Power	green
Pulse indication (2-colour LED)	yellow – error: red
Switching status	4 x yellow
Display	transflective
Eurocard	100 x 160 mm (DIN 41494)
Base material	Epoxy-resin, glass-fibre reinforced, quality class FR4
Front plate	plastic, 4TE = 20.32 mm for individual interlocking
Connection	connectors according DIN 41612, style F, 32 poles (series z+d)
Operating temperature range	-25…+60 °C
Coding (no. 125)	





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Industrial Automation

ANALOGUE DATA TRANSMITTERS/ MEASURING AMPLIFIERS

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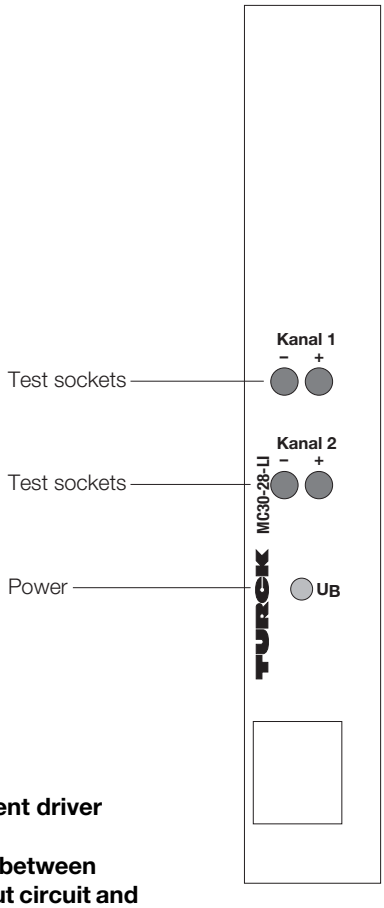
Current Driver for Standard Current Signals MC30-28-Li/24VDC two channels



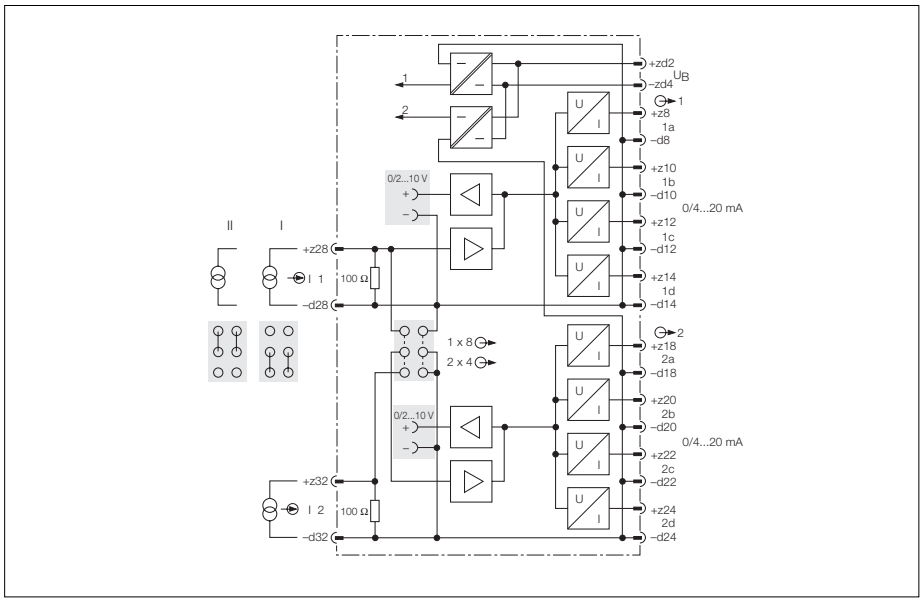
- **Two-channel current driver**
- **Galvanic isolation between input circuit, output circuit and power supply**
- **Two inputs for standard current signals 0/4...20 mA**
- **Four 0/4...20 mA current outputs for each channel**
- **Outputs isolated from each other**
- **0/2...10 V front test socket for each channel**

The MC30-28-Li/24VDC current driver isolates, distrubutes and amplifies standard current signals. The card provides two isolated circuits, each with four 0/4...20 mA current outputs.

The input signal of one channel is isolated and passed in a 1:1 mode to the four outputs (I).

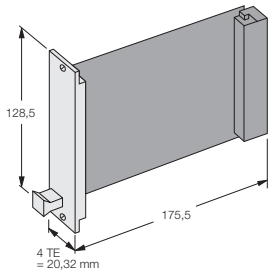
For additional distribution, both circuits can be coupled (II) which will override the isolation between the channels.

All output circuits have a common minus potential for each channel.



Current Driver for Standard Current Signals MC30-28-Li/24VDC

Type	MC30-28-Li/24VDC
Ident-no.	9040110
Supply Voltage U_B	20.4...27.6 VDC
Ripple W_{PP}	≤ 10 %
Power/Current consumption	≤ 250 mA
Galvanic isolation	between both channels and supply voltage for 500 V
Input Circuits	current inputs
Input resistance	100 Ω
Operating characteristics	0/4...20 mA
Maximum value	60 mA
Output Circuits	4 current outputs per channel with common minus potential
Current outputs	0/4…20 mA
Load	≤ 400 Ω
Test Sockets on Front Plate	1 per channel
Output voltage	0/2...10 V, short-circuit protected
Load resistance	≥ 5 kΩ
Transfer Characertistics	
Zero error	≤ 0.025 % of final value (≤ 5 µA)
Conversion error	≤ 0.1 % of final value (≤ 20 µA)
Effect of load impedance	≤ 0.01 % of final value
Effect of supply voltage impedance	negligible
Ambient temperature sensitivity	≤ 0.005 % / K of final value
Pulse rise time (10 %…90%)	< 50 ms
Pulse release time (90 %…10%)	< 50 ms
LED Indications	
– Power	green
Eurocard	100 x 160 mm (DIN 41494)
Material	glass-fiber reinforced epoxy resin, quality class FR4
Front panel	plastic, 4TE = 20.32 mm individually interlocking
Connection	connector per DIN 41612, type F, 32-pole (series z+d)
Operating temperature	-25…+60 °C



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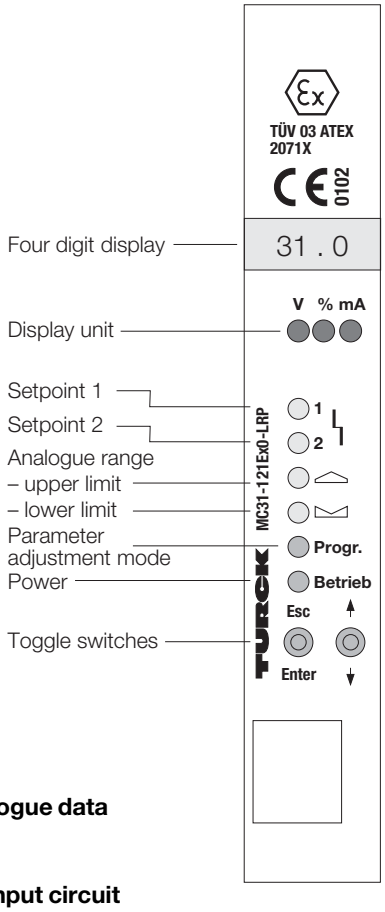
Analogue Data Transmitter MC31-121Ex0-LRP/ 24VDC one channel



- **One-channel analogue data transmitter**
- **Intrinsically safe input circuit EEx ia**
- **Area of application according to ATEX: II (1) GD**
- **Input circuit monitoring for wire-break and short-circuit**
- **Intrinsically safe 10 V reference voltage for potentiometer supply**
- **Selectable inputs:**
  - **Potentiometers 2...20 kΩ**
  - **0/2...10 V voltage signals**
  - **0/4...20 mA current signals**
- **Simple analogue range and setpoint adjustment:**
  - **Upper limit**
  - **Lower limit**
  - **Two setpoints 1 and 2**
- **Hysteresis adjustable for both setpoint outputs (in %)**
- **Voltage output 0...10 V and current output 0/4...20 mA**
- **Galvanic isolation between input circuit, output circuit and power supply**
- **One transistor and one relay output for each setpoint (1 and 2)**
- **Internal interface for parameter programming via PC**

The MC31-121Ex0-LRP analogue data transmitter is used to evaluate resistance changes from potentiometers located in the hazardous (classified) area and to convert them into standard signals. This allows a more flexible use of potentiometers in the hazardous area without requiring approvals and enclosures.

Alternatively, the device can also transfer standard 0/4...20 mA current signals or 0/2...10 voltage signals from the hazardous areas into the safe area.

A display on the front shows the current and voltage output value or the respective input value as a percentage in reference to the preset range.

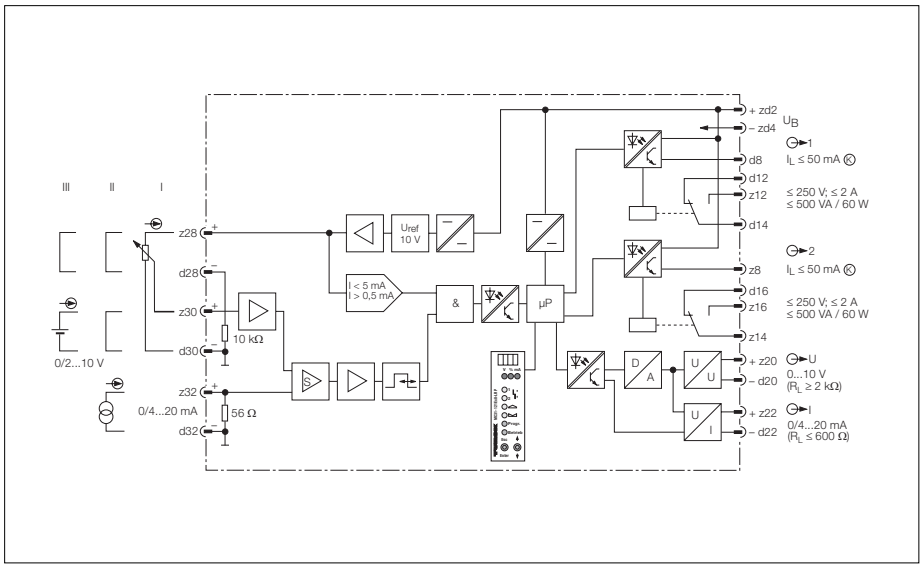
The potentiometer value is always displayed as a percentage.

Programming of the potentiometer range (I) is accomplished via the menu for card parameter setting either by:

– receiving/accepting of potentiometer position

– direct preselection in % rate (independent of potentiometer position)

The output presets can accept voltage signal inputs (III) or current signal inputs (II) that are at least 10 % of the final value (ΔU = 1 V; ΔI = 2 mA) of the maximum output signals. This allows for instance amplification of 5...6 V or 4...6 mA onto the standardised output signals.



Analogue Data Transmitter MC31-121Ex0-LRP/24VDC

The current signal output 0/4...20 mA and the voltage signal output 0...10 V may be used at the same time. Two outputs, each with relay and pnp short-circuit protected transistor, provide setpoint indication.

The two setpoint outputs are independently adjustable. They are so designed that they can be used for either "overrange" or "underrange" monitoring.

The potentiometer circuit is monitored for wire-break and short-circuit condition ($I < 0.5$ mA; $I > 5$ mA). When faults in the input circuit occur, both setpoint outputs de-activate (relay contacts open, transistors not conducting). The display indicates "Err" (Error) and the green Power LED turns red.

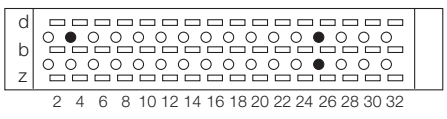
In "live-zero mode" the input circuit is monitored for undervoltage/undercurrent (1 V/2 mA). Both relay outputs de-activate in case of faults.

The current output during a malfunction in the input circuit can be programmed to automatically either go to 0 mA or ≥ 22 mA, or to follow the direction of the input signal (0 mA for wire-break, ≥ 22 mA during a short-circuit condition).

Programming is accomplished with a set of toggle switches on the front of the device, or via personal computer (PC). The following parameters can be preselected:

- low value of range
- high value of range
- setpoint 1and setpoint 2
- input: R/U/I
- input signal: live zero/dead zero
- current output: 0/4...20 mA
- setpoint outputs to indicate overrange or underrange
- hysteresis of setpoint outputs 1...20 % in 1 % increments in reference to the output signal
- analogue output characteristics during fault condition: linear/0 mA/≥ 22 mA
- unit of display
- resistance values for maximum and minimum switching point

Coding (no. 105)



Type	MC31-121Ex0-LRP/24VDC
Ident-no.	9040250
Supply Voltage U_B	20.4...27.6 VDC
Ripple W_{PP}	≤ 10 %
Overvoltage release	33 V ± 1.5 V
Power/Current consumption	≤ 200 mA
Galvanic isolation	between input circuit, output circuit and supply voltage for 250 V_{rms}, test voltage 2.5 kV_{rms}
Input Circuit	intrinsically safe per EN 50020
Potentiometer input	10 VDC; intrinsically safe
Input resistance	2...20 kΩ
Current input	0...20 mA; R_i = 56 Ω
Voltage input	0...10 V; R_i = ∞
Output Circuits	
Voltage output	0...10 V (R_L ≥ 2 kΩ)
Current output	0/4...20 mA (load ≤ 600 Ω)
Setpoint control/alarm outputs	
– Transistor output	pnp, short-circuit protected (I_L ≤ 50 mA)
– Relay output	1 potential-free change-over contact
Switching voltage	≤ 250 V
Switching current	≤ 2 A
Switching capacity	≤ 500 VA/60 W
Contact material	silver-alloy + 3 µm Au
Interface	RS232 serial/V.24 via adapter MC-IM-232
I.S. approval acc. to Certificate of Conformity	TÜV 03 ATEX 2071 X
Max. values	
– No-load voltage U_0	19 V
– Short-circuit current I_0	31 mA
– Power P_0	145 mW
External Inductances/Capacitances L_0/C_0	
– [EEx ia] IIC	2 mH/187 nF (alternatively: 5 mH/177 nF)
– [EEx ia] IIB	2 mH/1.2 µF (alternatively: 5 mH/967 nF)
Marking of device	⟨Ex⟩ II (1) GD [EEx ia] IIC
Transfer Characteristics	
Potentiometer range	2...20 kΩ (high and low values adjustable in %)
Minimum input signal for maximum output signal	ΔU = 1 V; ΔI = 2 mA
Linearity tolerance	≤ 0.1 % of final value (typically 0.03 %)
Effect of load impedance	≤ 0.01 % of final value
Effect of supply voltage impedance	negligible
Ambient temperature sensitivity	≤ 0.01 % / K of final value
Pulse rise time (10 %…90 %)	≤ 1 s
Pulse relase time (90 %…10 %)	≤ 1 s
LED Indications	
– Power (2-colour LED)	green: power "ON" – red: fault
– Limit value (2-colour LED)	green: program. mode – yellow: at preset value
– Parameter selected for programming	green
– Card parameter selected (progr.)	green
Display	red (4 digits)
Eurocard	100 x 160 mm (DIN 41494)
Material	glass-fiber reinforced epoxy resin, quality class FR4
Front panel	plastic, 4TE = 20.32 mm individually interlocking
Connection	connector per DIN 41612, type F, 32-pole (series z+d)
Operating temperature	-25…+60 °C

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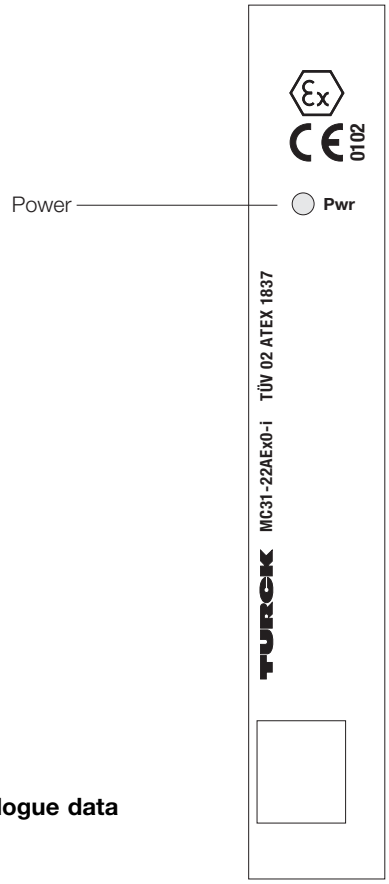
Analogue Data Transmitter MC31-22AEx0-i/24VDC two channels



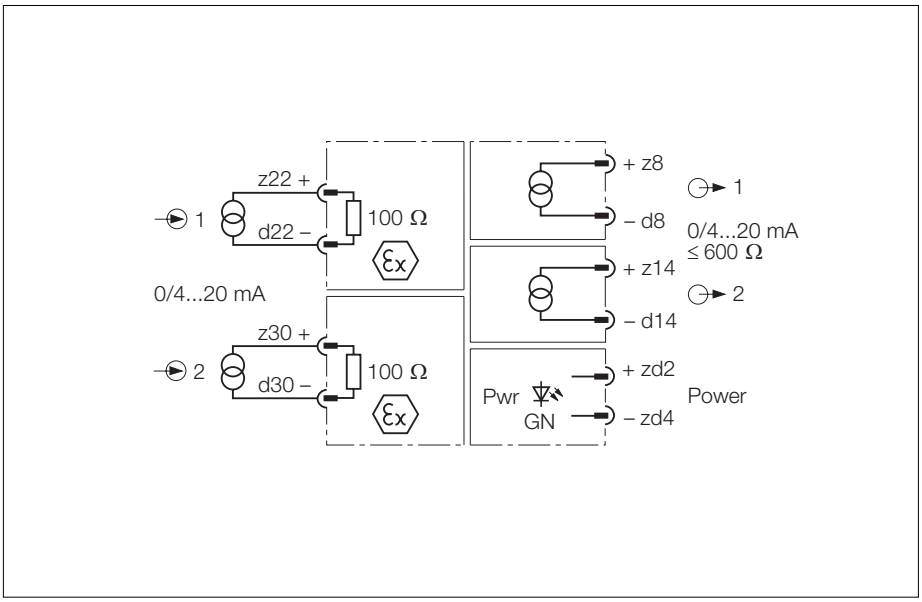
- **Two-channel analogue data transmitter**
- **Intrinsically safe input circuit EEx ia**
- **Area of application according to ATEX: II (1) GD**
- **Two completely isolated channels**
- **Input circuits 0/4…20 mA**
- **Output circuits 0/4…20 mA**
- **Galvanic isolation of standard analogue signals**
- **Linearity error ≤ 0.1 %**

The data transmitter MC31-22AEx0-i/24VDC is designed to transfer galvanically isolated standard current signals from the explosion hazardous to the safe area. The device features 2 channels and 0/4…20 mA input and output circuits.

Due to the 1:1 transfer characteristics a wire-break or short-circuit of the transducer circuit will be output as a current of 0 mA or > 22.5 mA.

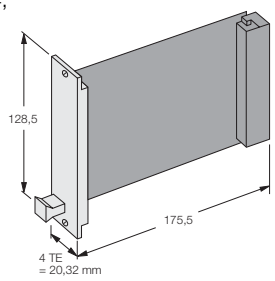
Input, output and supply circuits are galvanically isolated from each other.

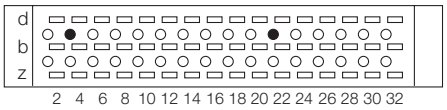
A green LED indicates that the device is powered.



Analogue Data Transmitter MC31-22AEx0-i/24VDC

Type	MC31-22AEx0-i/24VDC
Ident-no.	9040209
Supply voltage U_B	19...35 VDC
Ripple W_{PP}	≤ 10 %
Power consumption	< 2 W
Galvanic isolation	between input and output circuits and supply voltage for 250 V_{rms}, test voltage 4 kV_{rms}
Input circuits	current inputs, intrinsically safe per EN 50020
– Input resistance	100 Ω
– Operating values	0/4…20 mA
Output circuits	current outputs
Output current	0/4…20 mA (load ≤ 600 Ω)
– Wire-break detection	0 mA
– Short-circuit detection	> 22.5 mA
I.S. approval acc. to Certificate of Conformity	TÜV 02 ATEX 1837
Max. values	
– No-load voltage U_0	8.6 V
– Short-circuit current I_0	0.4 mA
– Power P_0	0.86 mW
Characteristic curve	linear
External inductances/capacitances L_0/C_0	
– [EEx ia/ib] IIC	1 H/6.2 µF
– [EEx ia/ib] IIB	1 H/55 µF
Marking of device	Ⓔx II (1) GD [EEx ia] IIC/IIB
Transfer characteristics	
Linearity error	≤ 0.1 % of final value
Measuring tolerance	≤ 0.2 %
Long-term error	0.05 %/year
Effect of load impedance	≤ 0.02 % of final value
Effect of supply voltage impedance	≤ 0.05 %/ of final value
Ambient temperature sensitivity	≤ 0.01 %/K of final value
Pulse rise time (10 %…90 %)	< 90 ms
Pulse release time (90 %…10 %)	< 90 ms
LED Indications	
– Power	green
Eurocard	100 x 160 mm (DIN 41494)
Base material	Epoxy-resin, glass-fibre reinforced, quality class FR4, plastic front plate, 4TE = 20,32 mm for individual interlocking
Connection	connectors according to DIN 4162 style F, 32 poles (series z+d)
Operating temperature range	-25…+60 °C
Coding (no. 126)	





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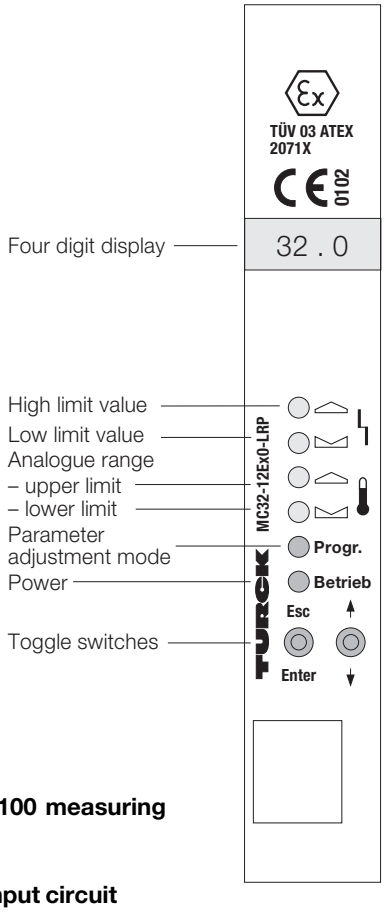
Pt100 Measuring Amplifier MC32-12Ex0-LRP/24VDC single-channel



- **Single-channel Pt100 measuring amplifier**
- **Intrinsically safe input circuit EEx ia**
- **Area of application according to ATEX: II (1) GD**
- **Input circuit monitoring for wire-break and short-circuit**
- **Input for 2-, 3- or 4-wire RTDs (PT100)**
- **Automatic line compensation for 2-wire RTDs**
- **Operating range -100…+650 °C**
- **Simple parameterisation of:**
  - **Upper limit**
  - **Lower limit**
  - **Two setpoints**
- **Hysteresis adjustable for limit value output (in %)**
- **Voltage output 0…10 V and Current output 0/4…20 mA**
- **Galvanic isolation between input circuit, output circuit and power supply**
- **One transistor and one relay output for limit value and alarm indication**
- **Internal interface for parameter programming via PC**

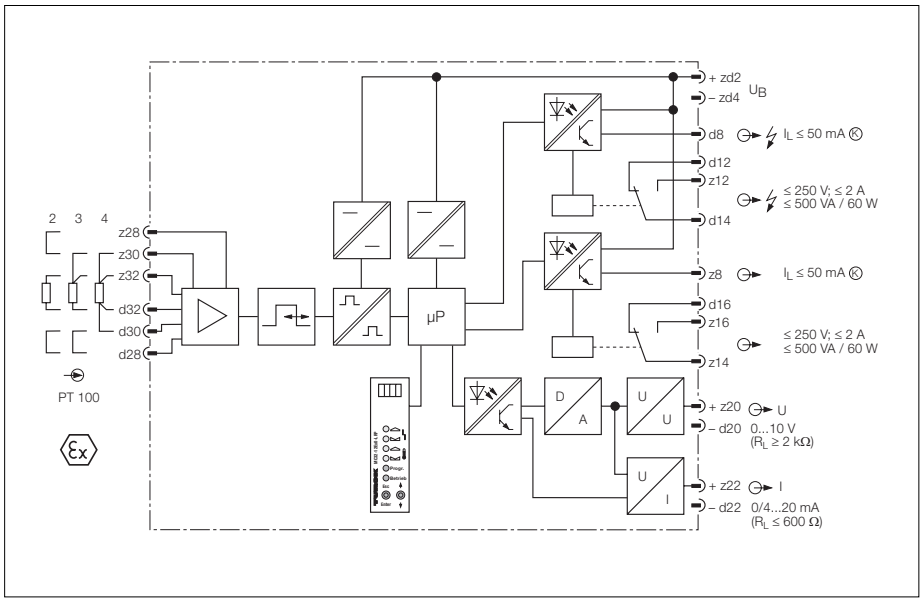
The Pt100 measuring amplifier type MC32-12Ex0-LRP is designed to evaluate temperature dependent changes from Pt100 RTDs (IEC 60751) and to convert them into standard signals. A four digit display on the front of the device indicates the actual temperature, independent of the pre-set range.

The input circuit of the transducer can process signals from 2-, 3-, or 4-wire Pt100 RTDs; the input device type is selected during programming.

Line compensation for 2-wire circuits is accomplished via the transducer circuit. For this a 100 Ω resistor must be connected prior to parameter adjustment to close the input circuit of the instrument.

The current signal output (0/4...20 mA) and the voltage signal output (0...10 V) may be used at the same time. Two relay outputs and pnp short-circuit protected transistor outputs are available for setpoint and alarm indication.

When the temperature falls between the high and low limits, the pre-set outputs are energised (relay contacts closed, transistor conducting). When the temperature falls below the low pre-set value or exceeds the high preset value, the pre-set outputs are de-activated (output relay de-energised, transistor not conducting). This function can be reversed during programming.



Pt100 Measuring Amplifier MC32-12Ex0-LRP/24VDC

The input circuit is monitored for wire-break and short-circuit conditions. The alarm outputs will de-activate during a malfunction (relay contacts open, transistor not conducting), an "Err" (Error) message will flash on the four digit display and the green Power LED turns red.

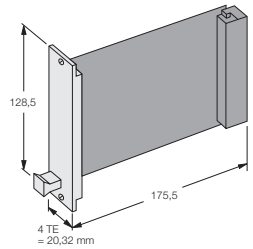
The current output during a malfunction (wire-break, short-circuit condition) can be programmed to automatically either go to 0 mA or ≥ 22 mA, or to follow the direction of the input signal (0 mA for wire-break, ≥ 22 mA for short-circuit condition).

All functions are programmed by two toggle switches on the front panel, or with personal computer (PC). The follo-wing parameters can be preselected:
- Low value of analogue range
- High value of analogue range
- Low limit value
- High limit value
- Current output: 0/4...20 mA
- Function of limit value output
- Switching hysteresis (1...30 % of adjusted measuring range)
- Analogue output characteristics during a malfunction: linear/0 mA/≥ 22 mA
- Input: 2-/3-/4-wire circuits

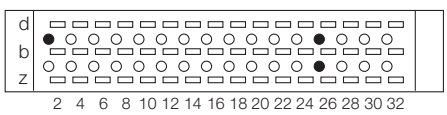
The pre-set output relay can be programmed:
- to energise if the temperature is within the adjusted range
- to de-energise if the temperature is within the adjusted range

The four digit LED character display on the front of the device indicates which parameter has been selected and shows the predefined parameter value.

The temperature for the full input range is adjustable from -100 °C...+650 °C (the smallest measuring span is 20 K).



Coding (no. 16)



Type	MC32-12Ex0-LRP/24VDC
Ident-no.	9041000
Supply Voltage U_B	20.4...27.6 VDC
Ripple W_{PP}	≤ 10 %
Overvoltage release	33 V ± 1.5 V
Power/Current consumption	< 200 mA
Galvanic isolation	between input circuit, output circuit and supply voltage for 250 V_{rms}, test voltage 2.5 kV_{rms}
Input Circuit	intrinsically safe per EN 50020
RTD input	Pt100 IEC 60751, for 2-, 3- and 4-wire inputs
Input resistance	20 Ω/cable
Sensor current	< 2 mA at 0 °C; < 1 mA at < 100 °C
Output Circuits	
Voltage output	0…10 V (R_L ≥ 2 kΩ)
Current output	0/4…20 mA (load ≤ 600 Ω)
Status output/alarm output	
– Transistor output	pnp, short-circuit protected (I_L ≤ 50 mA)
– Relay output	1 potential-free change-over contact
Switching voltage	≤ 250 V
Switching current	≤ 2 A
Switching capacity	≤ 500 VA/60 W
Contact material	silver-alloy + 3 µm Au
Interface	RS232 serial/V.24 via adapter MC-IM-232
I.S. approval acc. to Certificate of Conformity	TÜV 03 ATEX 2071 X
Max. values	
– No-load voltage U_0	19 V
– Short-circuit current I_0	31 mA
– Power P_0	145 mW
External Inductances/Capacitances L_0/C_0	
– [EEx ia] IIC	2 mH/187 nF (alternatively: 5 mH/177 nF)
– [EEx ia] IIB	2 mH/1,2 µF (alternatively: 5 mH/967 nF)
Marking of device	⟨Ex⟩ II (1) GD [EEx ia] IIC
Transfer Characteristics	
Effective temperature range	-100…+650 °C (low and high values adjust.)
Temperature difference	> 20 °C for full range
Linearity tolerance	≤ 0.1 % of final value (typically 0.03 %)
Effect of load impedance	≤ 0.01 % of final value
Effect of supply voltage impedance	negligible
Ambient temperature sensitivity	≤ 0.01 % / K of full scale
Pulse rise time (10 %…90 %)	< 1 s
Pulse release time (90 %…10 %)	< 1 s
LED Indications	
– Power (2-colour LED)	green: power "ON" – red: fault
– Limit values (2-colour LED)	green: program. mode – red: at preset value
– Parameter selected for programming	green
– Card parameter selected (progr.)	green
Display	red (4 digits)
Eurocard	100 x 160 mm (DIN 41494)
Material	glass-fiber reinforced epoxy resin, quality class FR4
Front panel	plastic, 4TE = 20.32 mm individually interlocking
Connection	connector per DIN 41612, type F, 32-pole (series z+d)
Operating temperature	-25…+60 °C

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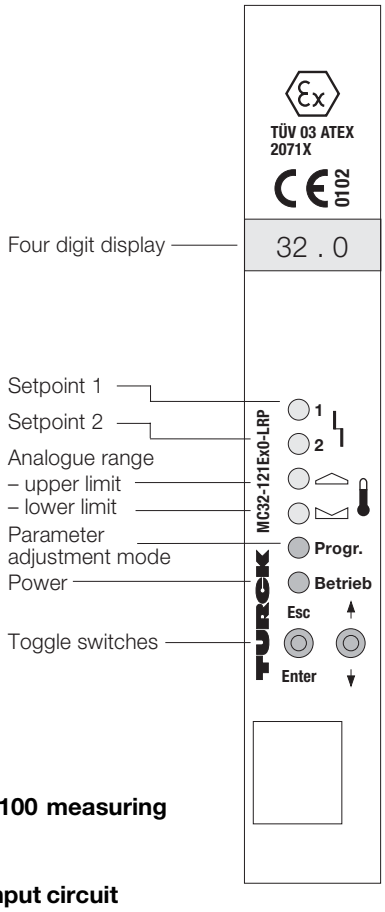
Pt100 Measuring Amplifier MC32-121Ex0-LRP/ 24VDC single-channel



- **Single-channel Pt100 measuring amplifier**
- **Intrinsically safe input circuit EEx ia**
- **Area of application according to ATEX: II (1) GD**
- **Input circuit monitoring for wire-break and short-circuit**
- **Input for 2-, 3- or 4-wire RTDs (PT100)**
- **Automatic line compensation for 2-wire RTDs**
- **Operating range -100…+650 °C**
- **Simple adjustment of:**
  - **Upper range limit**
  - **Lower range limit**
  - **Setpoint 1 and 2**
- **Hysteresis adjustable for both setpoint outputs (in %)**
- **Voltage output 0…10 V and Current output 0/4…20 mA**
- **Galvanic isolation between input circuit, output curcuit and power supply**
- **One transistor and one relay output for indication of limit value 1 and 2**
- **Internal interface for parameter programming via PC**

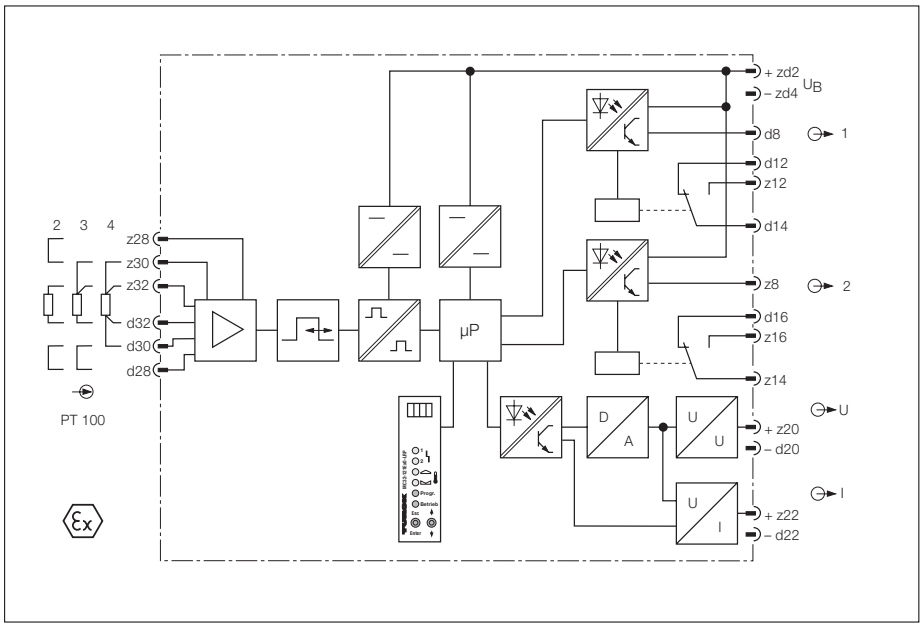
The Pt100 measuring amplifier type MC32-121Ex0-LRP is designed to evaluate temperature dependent changes from Pt100 RTDs (IEC 60751) and to convert them into standard signals. A four digit display on the front of the device indicates the actual temperature, independent of the pre-set range.

The input circuit of the transducer can process signals from 2, 3 or 4-wire PT100 RTDs; the input device type is selected during programming.

Line compensation for 2-wire circuits can be accomplished via the transducer circuit. For this a 100 Ω resistor must be connected prior to parameter adjustment to close the input circuit of the measuring junction.

The current signal output (0/4...20 mA) and the voltage signal output (0...10 V) may be used at the same time. Two limit value outputs, each with relay and pnp short-circuit protected transistor, provide status indications.

The two setpoints are independently adjustable. The MC32 transducer offers the possibility to change functions from over-range to underrange monitoring.



Pt100 Measuring Amplifier MC32-121Ex0-LRP/24VDC

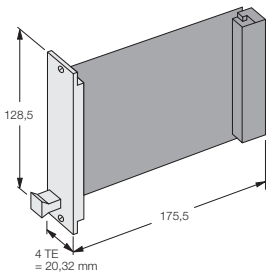
The input circuit is monitored for wire-break and short-circuit conditions. The alarm outputs will de-activate during a malfunction (relay contacts open, transistor not conducting), an "Err" (Error) message will flash on the four digit display and the green Power LED turns red.

The current output during a malfunction (wire-break, short-circuit condition) can be programmed to automatically either go to 0 mA or ≥ 22 mA, or to follow the direction of the input signal (0 mA for wire-break, ≥ 22 mA for short-circuit condition).

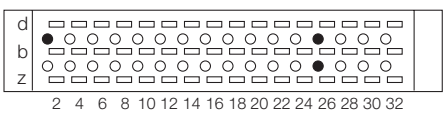
All functions are programmed by two toggle switches on the front panel, or with personal computer (PC). The following parameters can be pre-selected:
- Low value of analogue range
- High value of analogue range
- Limit value 1
- Limit value 2
- Current output: 0/4...20 mA
- Function of preset outputs (overrange/underrange)
- Switching hysteresis (1...30 % of preset measuring range)
- Analogue output characteristics during a malfunction: linear/0 mA/≥ 22 mA
- Input: 2-/3-/4-wire circuits

The four digit LED character display on the front of the device indicates which parameter has been selected and shows the predefined parameter value.

The temperature for the full input range is adjustable from -100°...+650 °C (the smallest measuring span is 20 K).



Coding (no. 16)



Type	MC32-121Ex0-LRP/24VDC
Ident-no.	9041001
Supply Voltage U_B	20.4...27.6 VDC
Ripple W_{PP}	≤ 10 %
Overvoltage release	33 V ± 1.5 V
Power/Current consumption	≤ 200 mA
Galvanic isolation	between input circuit, output circuit and supply voltage for 250 V_{rms}, test voltage 2.5 kV_{rms}
Input Circuit	intrinsically safe per EN 50020
RTD input	Pt100 IEC 60751, 2-, 3- and 4-wire inputs
Input resistance	20 Ω/cable
Sensor current	< 2 mA at 0 °C; < 1 mA at < 100 °C
Output Circuits	
Voltage output	0…10 V (R_L ≥ 2 kΩ)
Current output	0/4…20 mA (load ≤ 600 Ω)
Status outputs	
– Transistor output	pnp, short-circuit protected (I_L ≤ 50 mA)
– Relay output	1 potential-free change-over contact
Switching voltage	≤ 250 V
Switching current	≤ 2 A
Switching capacity	≤ 500 VA/60 W
Contact material	silver-alloy + 3 µm Au
Interface	RS232 serial/V.24 via adapter MC-IM-232
I.S. approval acc. to Certificate of Conformity	TÜV 03 ATEX 2071 X
Max. values	
– No-load voltage U_0	19 V
– Short-circuit current I_0	31 mA
– Power P_0	145 mW
External Inductances/Capacitances L_0/C_0	
– [EEx ia] IIC	2 mH/187 nF (alternatively: 5 mH/177 nF)
– [EEx ia] IIB	2 mH/1.2 µF (alternatively: 5 mH/967 nF)
Marking of device	⟨Ex⟩ II (1) GD [EEx ia] IIC
Transfer Characteristics	
Effective temperature range	-100…+650 °C (high and low value adjustable)
Temperature difference	> 20 °C for full range
Linearity tolerance	≤ 0.1 % of final value (typically 0.03 %)
Effect of load impedance	≤ 0.01 % of final value
Effect of supply voltage impedance	negligible
Ambient temperature sensitivity	≤ 0.01 % / K of final value
Pulse rise time (10 %…90 %)	< 1 s
Pulse release time (90 %…10 %)	< 1 s
LED Indications	
– Power (2-colour LED)	green: power "ON" – red: fault
– Limit values (2-colour LED)	green: program. mode – yellow: at preset mode
– Parameter selected for programming	green
– Card parameter selected (progr.)	green
Display	red (4 digits)
Eurocard	100 x 160 mm (DIN 41494)
Material	glass-fiber reinforced epoxy resin, quality class FR4
Front panel	plastic, 4TE = 20.32 mm individually interlocking
Connection	connector per DIN 41612, type F, 32-pole (series z+d)
Operating temperature	-25…+60 °C

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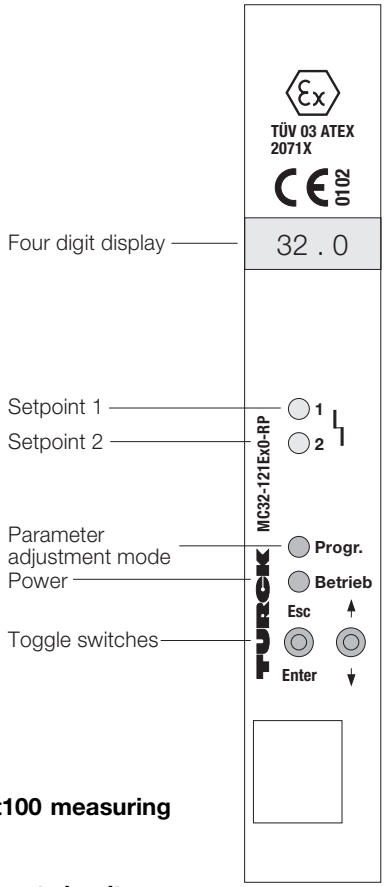
Pt100 Measuring Amplifier MC32-121Ex0-RP/24VDC single-channel



- **Single-channel Pt100 measuring amplifier**
- **Intrinsically safe input circuit EEx ia**
- **Area of application according to ATEX: II (1) GD**
- **Input circuit monitoring for wire-break and short-circuit**
- **Input for 2-, 3- or 4-wire RTDs (PT100)**
- **Automatic line compensation for 2-wire circuits**
- **Operating range -100...+650 °C**
- **Simple adjustment of setpoint 1 and 2**
- **Hysteresis adjustable for both setpoint outputs (in °C)**
- **Galvanic isolation between input circuit, output curcuit and power supply**
- **One transistor and one relay output for indication of setpoint 1 and 2**
- **Internal interface for parameter programming via PC**

The Pt100 measuring amplifier type MC32-121Ex0-RP is designed to evaluate and control temperature dependent changes from Pt100 RTDs (IEC 60751). A four digit display on the front of the device indicates the actual temperature, independent of the pre-set range.

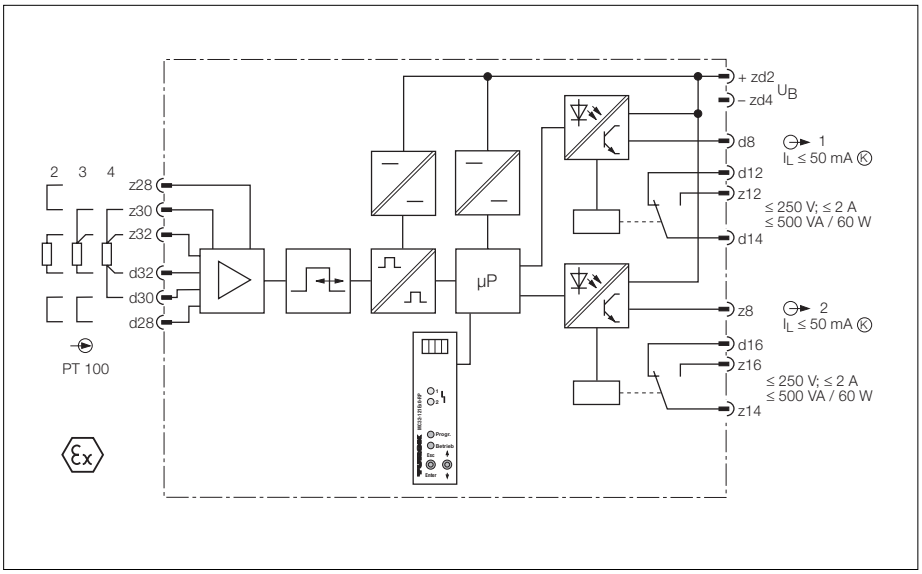
The input circuit of the transducer can process signals from 2, 3 or 4-wire Pt100 RTDs; the type of input device is selected during programming.

Line compensation for 2-wire circuits can be accomplished via the transducer circuit. For this, a 100 Ω resistor must be connected prior to parameter adjustment to close the input circuit of the instrument.

Two setpoint outputs, each with relay and pnp short-circuit protected transistor, provide status indications.

The two setpoints are independently adjustable. They are so designed that they can be used for either "overrange" or "underrange" monitoring.

The input circuit is monitored for wire-break and short-circuit conditions. The setpoint outputs will de-activate during a malfunction (relay contacts open, transistor not conducting). An "err" (error) message will flash on the four digit display and the green "Power" LED changes to red.



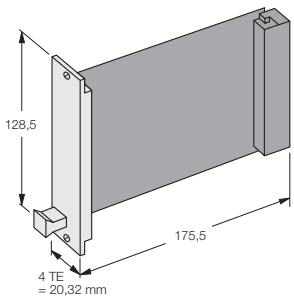
Pt100 Measuring Amplifier MC32-121Ex0-RP/24VDC

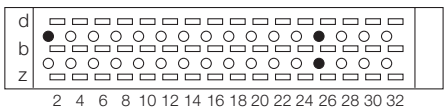
All functions are programmed by two toggle switches on the front panel, or with personal computer (PC). The follow-ing parameters can be preselected:

- Setpoint 1
- Setpoint 2
- Function of preset outputs (underrange/overrange)
- Switching hysteresis (preset outputs): between 0.1 and 50 °C
- Input: 2-, 3-, 4-wire circuits

The four digit LED character display on the front of the device indicates which parameter has been selected and shows the predefined parameter value.

Type	MC32-121Ex0-RP/24VDC
Ident-no.	9041002
Supply Voltage U_B	20.4...27.6 VDC
Ripple W_{PP}	≤ 10 %
Overvoltage release	33 V ± 1.5 V
Power/Current consumption	< 160 mA
Galvanic isolation	between input circuit, output circuit and supply voltage for 250 V_{rms}, test voltage 2.5 kV_{rms}
Input Circuit	intrinsically safe per EN 50020
RTD input	Pt100 DIN IEC 60751, for 2-, 3- and 4-wire circuits
Incoming cable resistance	20 Ω/cable
Sensor current	< 2 mA at 0 °C; < 1 mA at < 100 °C
Output Circuits	
Stauts outputs	
– Transistor output	pnp, short-circuit protected (I_L ≤ 50 mA)
– Relay output	1 potential-free change-over contact
Switching voltage	≤ 250 V
Switching current	≤ 2 A
Switching capacity	≤ 500 VA/60 W
Contact material	silver-alloy + 3 µm Au
Interface	RS232 serial/V.24 via adapter MC-IM-232
I.S. approval acc. to Certificate of Conformity	TÜV 03 ATEX 2071 X
Max. values	
– No-load voltage U_0	19 V
– Short-circuit current I_0	31 mA
– Power P_0	145 mW
External Inductances/Capacitances L_0/C_0	
– [EEx ia] IIC	2 mH/187 nF (alternatively: 5 mH/177 nF)
– [EEx ia] IIB	2 mH/1,2 µF (alternatively: 5 mH/967 nF)
Marking of device	⟨Ex⟩ II (1) GD [EEx ia] IIC
Effective Temperature Range	-100…+650 °C (low and high setpoint adjustable with switches located on the front)
LED Indications	
– Power (2-colour LED)	green: power "ON" – red: fault
– Limit values (2-colour LED)	green: program. mode – yellow: at preset value
– Parameter selected for programming	green
Display	red (4 digits)
Eurocard	100 x 160 mm (DIN 41494)
Material	glass-fiber reinforced epoxy resin, quality class FR4
Front panel	plastic, 4TE = 20.32 mm individually interlocking
Connection	connector per DIN 41612, type F, 32-pole (series z+d)
Operating temperature	-25…+60 °C
Coding (no. 16)	





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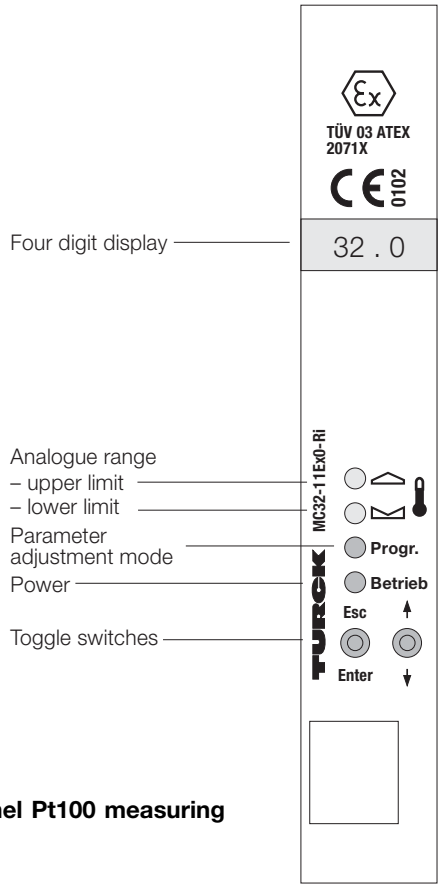
Pt100 Measuring Amplifier MC32-11Ex0-Ri/24VDC single-channel



- **Single-channel Pt100 measuring amplifier**
- **Intrinsically safe input circuit EEx ia**
- **Area of application according to ATEX: II (1) GD**
- **Input circuit monitoring for wire-break and short-circuit**
- **Input for 2-, 3- or 4-wire RTDs (Pt100)**
- **Automatic line compensation for 2-wire circuits**
- **Operating range -100…+650 °C**
- **Simple adjustment of high limit and low limit**
- **Current output 0/4…20 mA**
- **Galvanic isolation between input circuit, output curcuit and power supply**
- **Alarm output for input circuit monitoring**
- **Internal interface for parameter programming via PC**

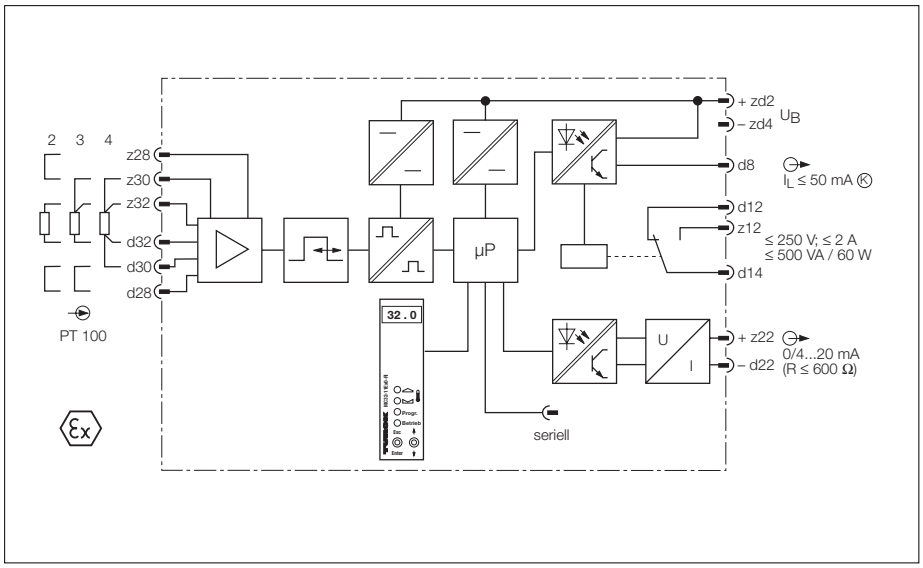
The Pt100 measuring amplifier type MC32-11Ex0-Ri is designed to evaluate temperature dependent changes from Pt100 RTDs (IEC 60751) and to convert them into analogue current signals from 0/4...20 mA. A four digit display on the front of the device indicates the actual temperature.

The input circuit of the transducer can process signals from 2, 3 or 4-wire Pt100 RTDs; the input device type is selected during programming.

Line compensation for 2-wire circuits can be accomplished via the transducer. To do this, a 100 Ω resistor must be connected prior to parameter adjustment to close the input circuit of the instrument.

The input circuit is monitored for wire-break and short-circuit conditions. When faults in the input circuit occur, the alarm output de-activates (relay contact open, transistor not conducting). The display indicates "err" (Error) and the green power LED changes to red.

The current output during a malfunction in the input circuit (wire-break, short-circuit condition) can be programmed to automatically go either to 0 mA or ≥ 22 mA, or to follow the direction of the input signal (0 mA for wire-break, ≥ 22 mA for short-circuit condition).



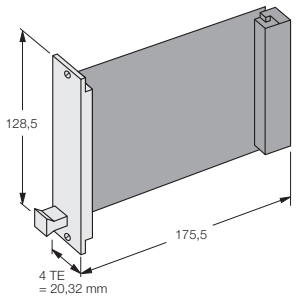
Pt100 Measuring Amplifier MC32-11Ex0-Ri/24VDC

All functions are programmed by two toggle switches on the front panel, or with personal computer (PC). The following parameters can be preselected:

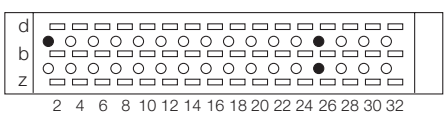
- Upper limit of analogue range
- Lower limit of analogue range
- Current output: 0/4...20 mA
- Analogue output characteristics during malfunction:
  linear/0 mA/≥ 22 mA
- Input: 2-, 3-, 4-wire circuits

The four digit LED character display on the front of the device indicates which parameter has been selected and shows the predefined parameter value.

The temperature for the full input range is adjustable from -100...+650 °C
(the smallest measuring span is 20 K).



Coding (no. 16)



Type	MC32-11Ex0-Ri/24VDC
Ident-No.	9041004
Supply Voltage U_B	20.4...27.6 VDC
Ripple W_{PP}	≤ 10 %
Overvoltage release	33 V ± 1.5 V
Power/Current consumption	< 180 mA
Galvanic isolation	between input circuit, output circuit and supply voltage for 250 V_{rms}, test voltage 2.5 kV_{rms}
Input Circuit	intrinsically safe per EN 50020
RTD input	Pt100 IEC 60751, for 2-, 3- and 4-wire circuits
Incoming cable resistance	20 Ω/cable
Sensor current	< 2 mA at 0 °C; < 1 mA at < 100 °C
Output Circuits	
Current output	0/4…20 mA (load ≤ 600 Ω)
Alarm outputs	
– Transistor output	pnp, short-circuit protected (I_L ≤ 50 mA)
– Relay output	1 potential-free SPDT contact
Switching voltage	≤ 250 V
Switching current	≤ 2 A
Switching capacity	≤ 500 VA/60 W
Contact material	silver-alloy + 3 µm Au
Interface	RS232 serial/V.24 via adapter MC-IM-232
I.S. approval acc. to Certificate of Conformity	TÜV 03 ATEX 2071 X
Max. values	
– No-load voltage U_0	19 V
– Short-circuit current I_0	31 mA
– Power P_0	145 mW
External Inductances/Capacitances L_0/C_0	
– [EEx ia] IIC	2 mH/187 nF (alternatively: 5 mH/177 nF)
– [EEx ia] IIB	2 mH/1.2 µF (alternatively: 5 mH/967 nF)
Marking of device	⟨Ex⟩ II (1) GD [EEx ia] IIC
Transfer Characteristics	
Effective temperature range	-100…+650 °C (high and low value adjustable with switches located on the front)
Temperature difference	> 20 °C for full range
Linearity tolerance	≤ 0.1 °C / 0.1 % of final value
Effect of load impedance	≤ 0.01 % of final value
Effect of supply voltage impedance	negligible
Ambient temperature sensitivity	≤ 0.01 %/K of final value
Pulse rise time (10…90 %)	< 1 s
Pulse release time (90…10 %)	< 1 s
LED Indication	
– Power (2-colour LED)	green: Power "ON" – red: fault
– Pulse range selected for programming	green
– Parameter selected for programming	green
Display	red (4 digits)
Eurocard	100 x 160 mm (DIN 41494)
Material	glass-fiber reinforced epoxy resin, quality class FR4
Front panel	plastic, 4TE = 20.32 mm individually interlocking
Connection	connector per DIN 41612, type F, 32-pole (series z+d)
Operating temperature	-25…+60 °C

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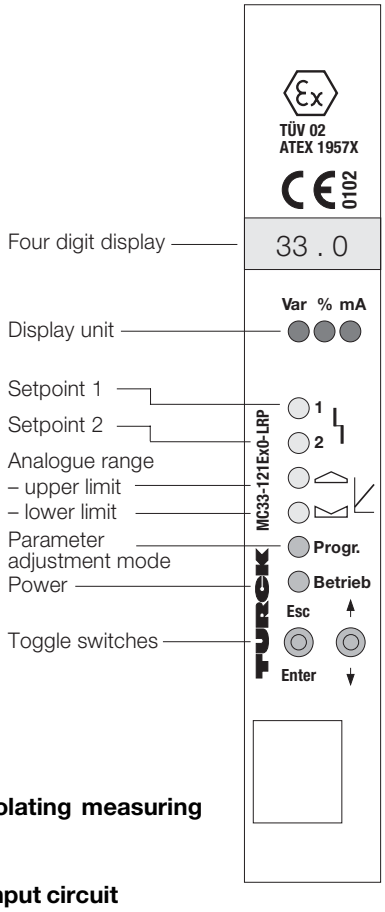
Isolating Measuring Transducer MC33-121Ex0-LRP/ 24VDC single-channel



- **Single-channel isolating measuring transducer**
- **Intrinsically safe input circuit EEx ia**
- **Area of application according to ATEX: II (1) GD**
- **Input circuit monitoring for wire-break and short-circuit**
- **Power supply for 2-wire measuring transducers**
- **Current limiting within the transmitter loop**
- **Constant voltage on transmitter loop**
- **Galvanic isolation between input circuit, output curcuit and power supply**
- **Simple adjustment**
- **Programmable, 4 digit character display**
- **Voltage output 0…10 V and current output 0/4…20 mA**
- **One transistor and one relay output for status indication of setpoint 1 and 2**
- **Sealed relays with hard gold-plated contacts**
- **Interface for parameter programming via PC**

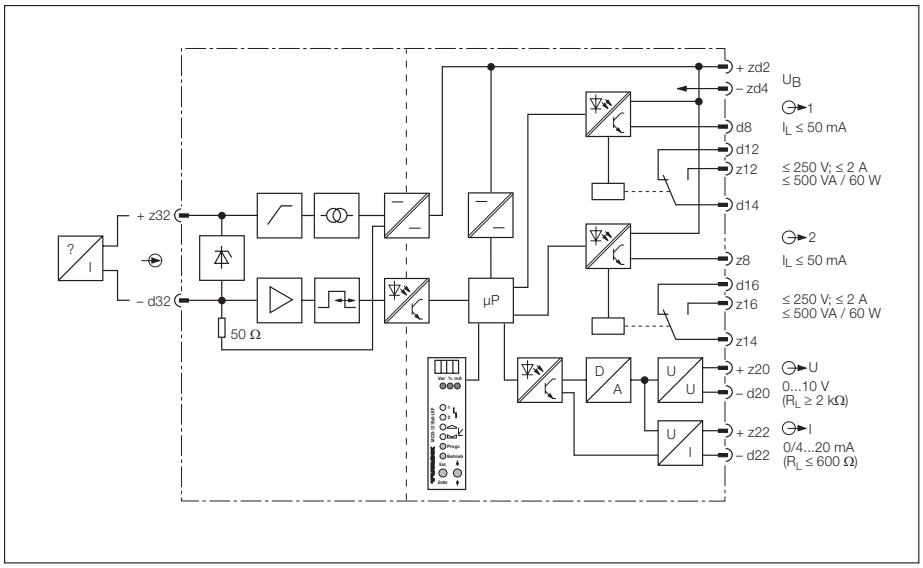
The MC33-121Ex0-LRP is used to energise intrinsically safe 2-wire measuring transducers located in the hazardous area. The input and output circuits are isolated from each other and from the power supply.

The current signal output (0/4...20 mA) and the voltage signal output (0/2...10 V) may be used at the same time. During standard operation, the output signal corresponds to the input signal of 4...20 mA.

The intrinsically safe input circuit is statically monitored for wire-break and short-circuit conditions. When faults in the input circuit occur, both setpoint outputs deactivate (relay contacts open, transistor not conducting).

The display indicates ”err” (Error) and the green power LED changes to red. The current output during a malfunction in the input circuit (wire-break, short-circuit condition) can be programmed to automatically go either to 0 mA or ≥ 22 mA, or to follow the direction of the input signal (0 mA for wire-break, ≥ 22 mA for short-circuit condition).

Two relay outputs and two pnp short-circuit protected transistor outputs are available for setpoint indications. Both setpoints are independently adjustable. They are so designed that they can be used for either ”overrange” or ”underrange” monitoring.



2-wire Loop Isolator MC33-121Ex0-LRP/24VDC

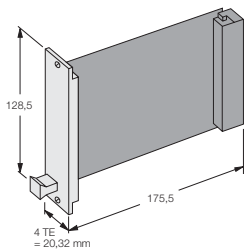
All functions are programmed by two toggle switches on the front panel, or with personal computer (PC). The following parameters can be preselected:
- low value of analogue range
- high value of analogue range
- setpoint 1
- setpoint 2
- function of preset outputs
- switching hysteresis for both preset outputs from 1...20 %
- character display: as a percentage value, or as a numerical value from the adjustable range, or current in input circuit
- current output during a malfunction in input circuit (linear/0 mA/≥ 22 mA)

Programming
The four digit LED character display on the front of the device indicates the input signal. It can be displayed in one of three ways:
- as a percentage
- as a numerical parameter value
- current in input circuit (mA)

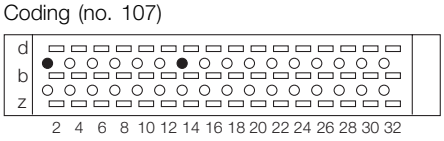
When the percentage is displayed, the preset levels are:
- low: 4 mA = 0 %
- high: 20 mA = 100 %

The input signal is displayed as a percentile value between 0 and 100 %.
To match the display to the application, the display is programmable in values from -999...+9999. The numerical value within this range is proportional to the input signal.

Example: Flow meter
Operating range 1...5 l/min = 4...20 mA:
To directly display the flow in l/m, 1 is used as status display for the low preset (4 mA) and 5 for the high preset (20 mA) of the predetermined values. A numerical value between 1 and 5 will therefore indicate the signal deviation between 4 and 20 mA.



Coding (no. 107)



Type	MC33-121Ex0-LRP/24 VDC
Ident-no.	9040500
Power Supply U_B	20.4...27.6 VDC
Ripple W_{PP}	≤ 10 %
Overvoltage release	33 V ± 1.5 V
Power/Current consumption	≤ 200 mA
Galvanic isolation	between input circuit, output circuit and supply voltage for 250 V_{rms}, test voltage 2.5 kV_{rms}
Transducer Circuit	intrinsically safe per EN 50020
Input resistance	50 Ω
Operating characteristics	
– Voltage	15.2 V constant
– Current	4…20 mA
Wire-break threshold	≤ 2 mA
Short-circuit threshold	≥ 22 mA
Short-circuit current limitation	25 mA ± 1 mA
Output Circuits	
Current output	0/4…20 mA (load ≤ 600 Ω)
Voltage output	0...10 V (R_L ≥ 2 kΩ)
Setpoint control/alarm output	1 transistor and 1 relay output each
– Transistor output	pnp, short-circuit protected (I_L ≤ 50 mA)
– Relay output	1 potential-free change-over contact
Switching voltage	≤ 250 V
Switching current	≤ 2 A
Switching capacity	≤ 500 VA/60 W
Contact material	silver-alloy + 3 µm Au
Interface	RS232 serial/V.24 via adapter MC-IM-232
I.S. approval acc. to Certificate of Conformity	TÜV 02 ATEX 1957 X
Max. values	
– No-load voltage U_0	18,9 V
– Short-circuit current I_0	≤ 60 mA
– Internal resistance R_i	467 Ω
External Inductances/Capacitances	
– [EEx ia] IIC	1 mH/262 nF
– [EEx ia] IIB	18 mH/1,6 µF
Marking of device	⟨Ex⟩ II (1) GD [EEx ia] IIC
Transfer Characteristics	
Measuring range	4...20 mA
Linearity tolerance	≤ 0.1 % of final value (typically 0.03 %)
Effect of load impedance	≤ 0.01 % of final value
Effect of supply voltage	negligible
Ambient temperature sensitivity	≤ 0.005 % / K of final value
LED Indication	
– Power (2-colour LED)	green: power "ON" – red: fault
– Limit values (2-colour LED)	green: program. mode – yellow: at preset value
– Pulse range programming	green
– Card parameter programming	green
– Readout in %/var/mA	red
Display	red (4 digits)
Eurocard	100 x 160 mm (DIN 41494)
Material	glass-fiber reinf. epoxy resin, quality class FR4
Front panel	plastic, 4TE = 20.32 mm individually interlocking
Connection	connector per DIN 41612, type F, 32-pole (series z+d)
Operating temperature	-25…+60 °C

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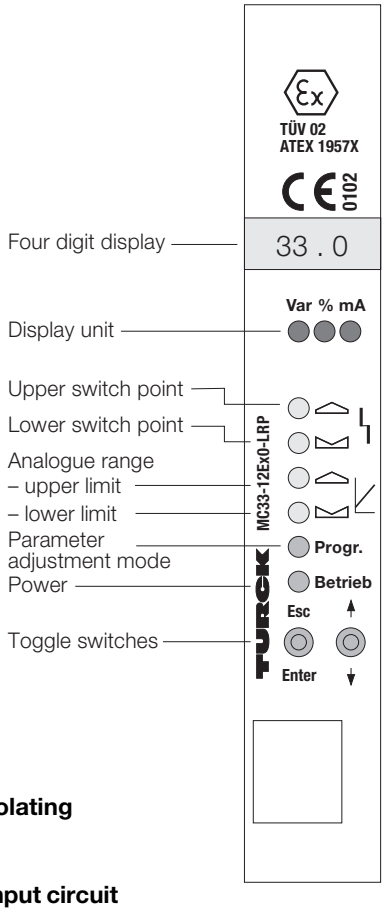
Isolating Measuring Transducer MC33-12Ex0-LRP/ 24VDC single-channel



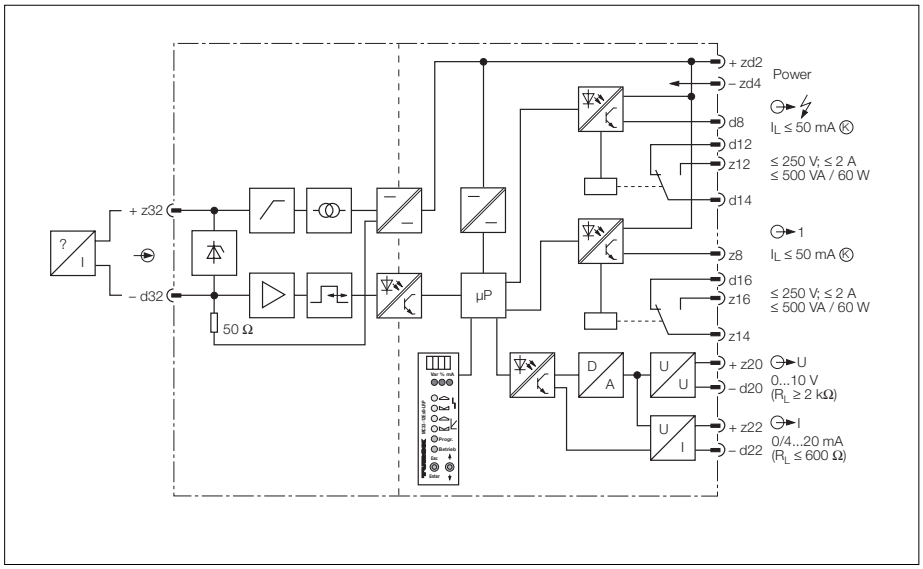
- **Single-channel isolating transducer**
- **Intrinsically safe input circuit EEx ia**
- **Area of application according to ATEX: II (1) GD**
- **Input circuit monitoring for wire-break and short-circuit**
- **Power supply of 2-wire measuring transducers**
- **Defined current limitation in measuring transducer circuit**
- **Constant voltage at measuring transducer**
- **Complete galvanic isolation**
- **Simple parameterisation**
- **4-digit display with selectable unit**
- **Voltage output 0...10 VDC and current output 0/4…20 mA**
- **Each one transistor and one relay output for limit value indication and alarm indication**
- **Sealed relays with hard gold contacts**
- **Interface for the parameterisation via Personal Computer (PC)**

The measuring transducer, type MC33-12Ex0-LRP, is used to operate 2-wire intrinsically safe measuring transducers in explosion hazardous areas. The output circuits are galvanically isolated from the power supply and the input circuits.

The device's output configuration features a current output 0/4...20 mA and a voltage signal of 0…10 V. In standard operation, the output signal accords to the input signal of 4...20 mA.

The intrinsically safe input circuit is monitored statically for wire-break and short-circuit conditions. In case of input circuit errors, the outputs are inhibited (relay de-energised, transistor non-conducting) and the display reads "Err" (error) and the green power LED changes to red.
The current output performance in case of a wire-break or short-circuit in the measuring transducer circuit is parameterisable. In the event of an error, either 0 mA or ≥ 22 mA are output, or the output signal follows the input signal (wire-break 0 mA, short-circuit ≥ 22 mA).

A pnp short-circuit protected transistor output and a relay output are available for limit value indications. An upper and lower limit value are adjusted (window function). If the input current is within the limit values, the relay energises and the transistor conducts. Outside the adjusted limit values, the relay de-energises, the transistor is inhibited and the according LED illuminates. The alarm output is only switched off if an error is detected.

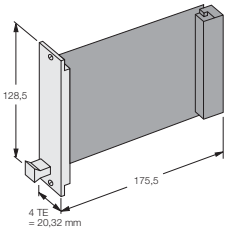


Isolating Measuring Transducer MC33-12Ex0-LRP/24VDC

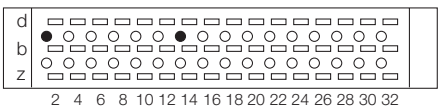
The card is parameterised either menu-assisted via two front panel toggle switches or via a personal computer.
The following parameters can be adjusted:
- display value for lower measuring range limit
- display value for upper measuring range limit
- upper switch point
- lower switch point
- hysteresis for limit value output between 1 and 20 %
- display indication: in %, either a numerical value from the value range or input current
- performance of the current output in the event of input circuit errors (linear/0 mA/> 22 mA)

Adjustment of the display
The input signal is indicated by a 4-digit display. It is possible to choose between three display modes:
- display in %
- display according to a parameterisable value range (Var)
- current in input circuit (mA)

If the display in % is selected, the lower measuring range limit (4 mA = 0 %) and the upper measuring range limit (20 mA = 100 %) are clearly defined. The input signal is reproduced as a percentage value between 0 and 100 %.
In order to adapt the display to the specific application, it is possible to assign display values in a range of –999 to +9999 to the lower and upper measuring range limits. A numerical value from the value range is then displayed which accords to the input signal.
For example: Flow transmitter, operating range 1...5 l/min. = 4...20 mA:
To ensure that the display indicates the flow rate directly in l/min., the display value 1 is parameterised to indicate the lower range limit (4 mA) and the display value 5 to indicate the upper range limit (20 mA). The signal variation between 4 and 20 mA is then displayed as a numerical value between 1 and 5.



Coding (no. 107)



Type	MC33-12Ex0-LRP/24VDC
Ident-no.	9040602
Operating voltage U_B	20.4...27.6 VDC
Ripple W_{pp}	≤ 10 %
Over voltage threshold	33 V ± 1.5 V
Current consumption	≤ 200 mA
Galvanic isolation	input circuit to output circuit and to supply voltage for 250 V_{rms}, test voltage 2.5 kV_{rms}
Measuring transducer circuit	intrinsically safe acc. to EN 50020
Input resistance	50 Ω
Operating values	
– Voltage	15.2 V permanent voltage
– Current	4…20 mA
Wire-break threshold	≤ 2 mA
Short-circuit threshold	≥ 22 mA
Short-circuit current limitation	25 mA ± 1 mA
Output Circuits	
Current output	0/4…20 mA (load ≤ 600 Ω)
Voltage output	0...10 V (R_L ≥ 2 kΩ)
Alarm and limit value output	each one transistor and relay output
Transistor output	pnp, short-circuit protected (I_L ≤ 50 mA)
Relay output	1 potential-free change-over contact
– Switching voltage	≤ 250 V
– Switching current	≤ 2 A
– Switching capacity	≤ 500 VA/60 W
– Contact material	Ag alloy + 3 µm Au
Interface	RS232 serial/V.24 via adapter MC-IM-232
I.S. approval acc. to Certificate of Conformity	TÜV 02 ATEX 1957 X
Max. values	
– No-load voltage U_0	18.9 V
– Short-circuit current I_0	≤ 60 mA
– Internal resistance R_i	467 Ω
Charcteristic curve	trapezoidal
External Inductances/Capacitances	
– [EEx ia] IIC	1 mH/262 nF
– [EEx ia] IIB	18 mH/1.6 µF
Marking of device	⟨Ex⟩ II (1) GD [EEx ia] IIC
Transfer characteristics	
Measuring range	4...20 mA
Linearity error	≤ 0.1 % of final value (typ. 0,03 %)
Effect of load impedance	≤ 0.01 % of final value
Effect of supply voltage impedance	negligible
Ambient temperature sensitivity	≤ 0.005 %/K of final value
LED indications	
– Power (dual colour LED)	measuring operation: green – error: red
– Limit values (dual colour LED)	parameterisation: green – at limit value: yellow
– Parameterisation of measuring range	green
– Parameterisation of card parameters	green
– Display unit (%/Var/mA)	red
Display	red (4-digit)
Eurocard	100 x 160 mm (DIN 41494)
Material	glass-fiber reinf. epoxy resin, quality class FR4
Front panel	plastic, 4TE = 20.32 mm individually interlock.
Connection	connector per DIN 41612, type F, 32-pole (series z+d)
Operating temperature	-25…+60 °C

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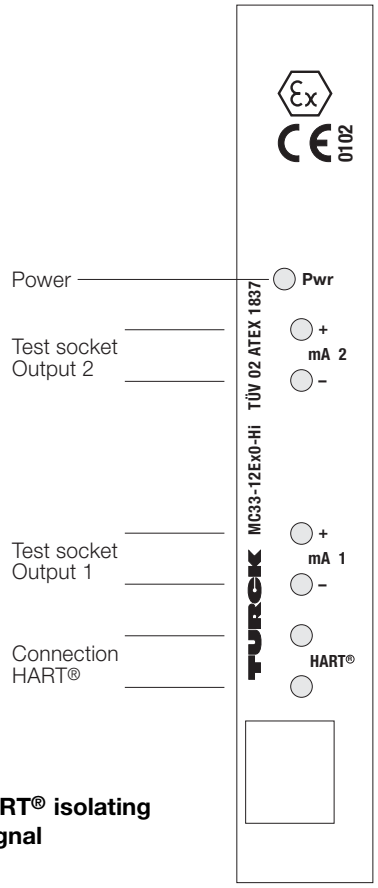
HART® Isolating Measuring Transducer MC33-12Ex0-Hi/24VDC single-channel with signal duplication



- **Single-channel HART® isolating transducer with signal duplication**
- **Intrinsically safe input circuit EEx ia**
- **Area of application according to ATEX: II (1) GD**
- **Input circuit monitoring for wire-break and short-circuit**
- **Supply of measuring transducers in 2 and 3-wire technology and active 2-wire transmitters with HART® communication**
- **Complete galvanic isolation**
- **Short-circuit proof transducer circuit**
- **Two current outputs 0/4...20 mA**
- **Test sockets for analogue signals and HART® handheld on front panel**

The single channel isolating transducer MC33-12Ex0-Hi is used to operate intrinsically safe transducers in the explosion hazardous area and to transfer the measuring signal to the safe area. Alternatively, active 2-wire and passive 3-wire transmitters may be connected.

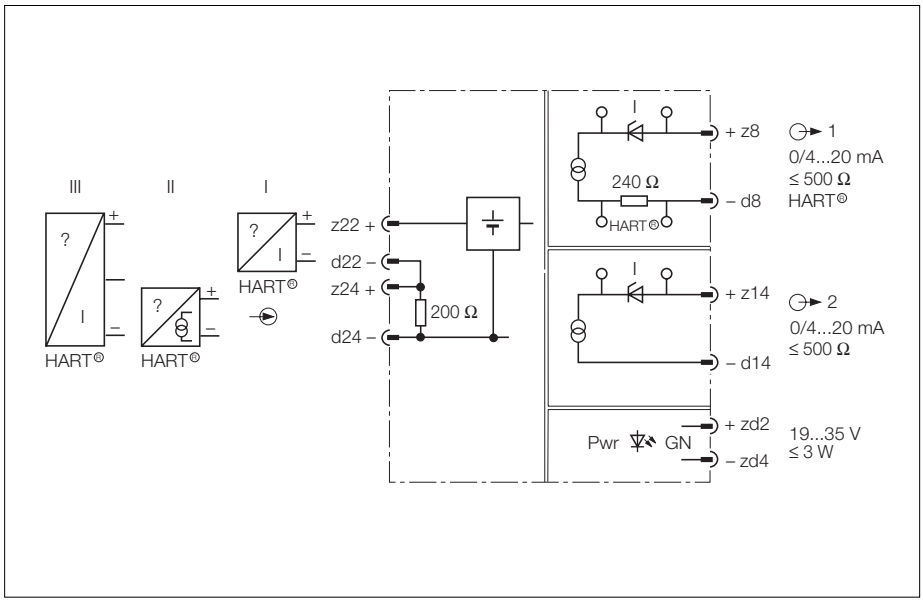
Alongside the analogue signal, the digital HART® communication signal can be transferred bi-directionally.

The front panel provides test sockets. (Ø 2 mm) for connection of a HART® handheld or a measuring device with an internal resistance of ≤ 50 Ω for testing the analogue current outputs.

A green LED indicates that the device is powered. The input circuit is galvanically isolated from the output circuit and supply voltage.

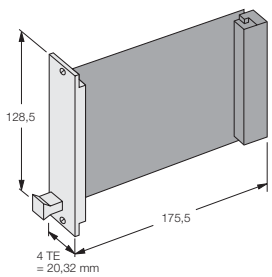
The input signal is transferred in a 1:1 mode to the outputs in the non-explosion hazardous area.

Due to the 1:1 transfer characteristic. a wire-break or short-circuit is signalled by an output current of 0 mA or > 22.5 mA.

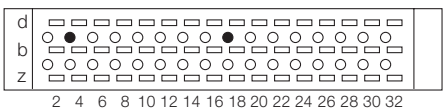


HART® Isolating Measuring Transducer MC33-12Ex0-Hi/24VDC

Type	MC33-12Ex0-Hi/24VDC
Ident-no.	9043013
Supply voltage U_B	19...35 VDC
Power consumption	≤ 3.0 W
Ripple W_{PP}	≤ 10 %
Galvanic isolation	between input and output circuits and supply voltage for 250 V_{rms}, test voltage 4 kV_{rms}
Transducer circuits	intrinsically safe per EN 50020
Input resistance	200 Ω
Operating values	
– Voltage	> 17.0 V at 20 mA
– Current	0...20 mA
Short-circuit current (short-term)	60 mA (for 60 ms)
Output circuit	
Current output	0/4…20 mA
– Load	≤ 500 Ω
– Wire-break detected	0 mA
– Short-circuit detected	> 22.5 mA
I.S. approval acc. to Certificate of Conformity	TÜV 02 ATEX 1837
No-load voltage U_0	22.1 V
Short-circuit current I_0	94 mA
Power P_0	738 mW
Internal resistance R_i	335 W
Characteristic curve	trapezoidal
External inductances/capacitances L_0/C_0	
– [EEx ia] IIC	1 mH/62 nF
– [EEx ia] IIB	413 nF/2 mH
Marking of device	⟨Ex⟩ II (1) GD [EEx ia] IIC/IIB
Transfer characteristics	
Linearity error	≤ 0.1 % of final value
Measuring tolerance	≤ 0.2 %
Long-term error	0.05 %/year
Effect of load impedance	≤ 0.02 % of final value
Effect of supply voltage impedance	≤ 0.05 %/ of final value
Ambient temperature sensitivity	≤ 0.01 %/K of final value
Pulse rise time (10 %…90 %)	< 90 ms
Pulse release time (90 %…10 %)	< 90 ms
LED indications	
– Power	green
Eurocard	100 x 160 mm (DIN 41494)
Base material	Epoxy-resin, glass-fibre reinforced, quality class FR4, plastic front plate, 4TE = 20,32 mm for individual interlocking
Connection	connectors according to DIN 4162 style F, 32 poles (series z+d)
Operating temperature range	-25…+60 °C



Coding (no. 124)



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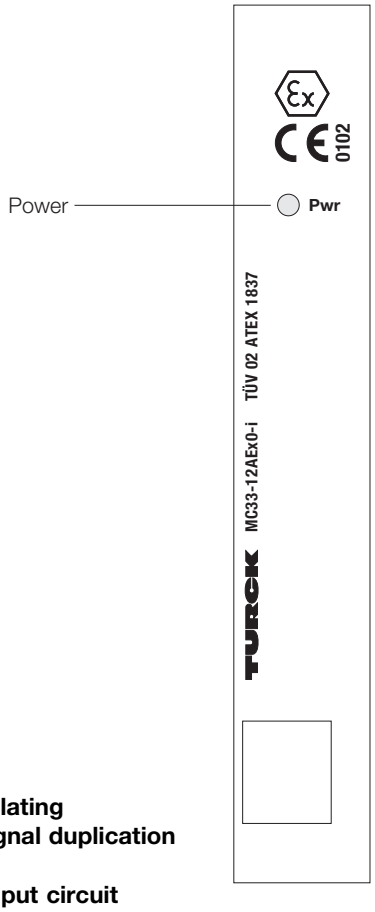


Isolating Measuring Transducer MC33-12AEx0-i/24VDC single-channel with signal duplication

- **Single-channel isolating transducer with signal duplication**
- **Intrinsically safe input circuit EEx ia**
- **Area of application according to ATEX: II (1) GD**
- **Supply of measuring transducers in 2-wire technology**
- **Short-circuit proof transducer circuit**
- **Two current outputs 0/4...20 mA**
- **Complete galvanic isolation**

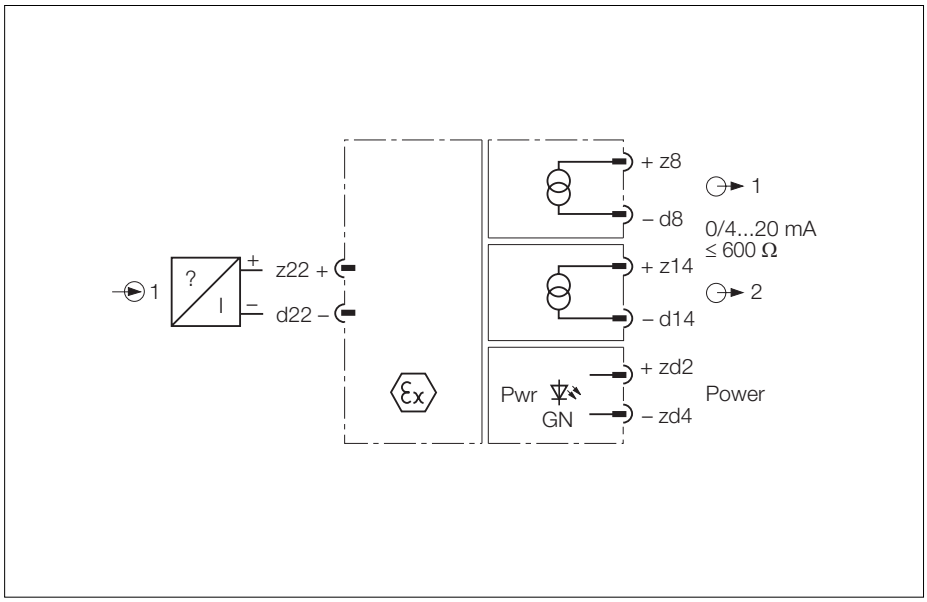
The single channel isolating transducer MC33-12AEx0-i is used to operate intrinsically safe 2-wire transducers in the explosion hazardous area and to transfer the measuring signal to the safe area.

The input signal is transferred in a 1:1 mode to the outputs in the non-explosion hazardous area.

Due to the 1:1 transfer characteristic. a wire-break or short-circuit is signalled by an output current of 0 mA or

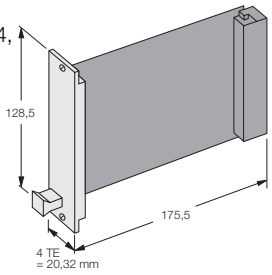
The device features galvanic isolation between input and output circuits and supply voltage.

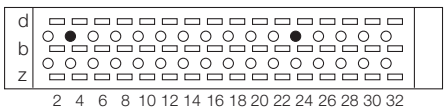
A green LED indicates that the device is powered.



HART® Isolating Measuring Transducer MC33-12AEx0-i/24VDC

Type	MC33-12AEx0-i/24VDC
Ident-no.	9040211
Supply voltage U_B	19...35 VDC
Power consumption	≤ 3.0 W
Ripple W_{PP}	≤ 10 %
Galvanic isolation	between input and output circuits and supply voltage for 250 V_{rms}, test voltage 4 kV_{rms}
Transducer circuits	intrinsically safe per EN 50020
Input resistance	91 Ω
Operating values	
– Voltage	> 17.0 V at 20 mA
– Current	0/4...20 mA
Short-circuit current (short-term)	60 mA (for 60 ms)
Output circuits	
Current output	0/4…20 mA
– Load	≤ 600 Ω
– Wire-break detected	0 mA
– Short-circuit detected	> 22.5 mA
I.S. approval acc. to Certificate of Conformity	TÜV 02 ATEX 1837
Max. values	
– No-load voltage U_0	22.1 V
– Short-circuit current I_0	79.5 mA
– Power P_0	625 mW
– Internal resistance R_i	395 Ω
Characteristic curve	trapezoidal
External inductances/capacitaces L_0/C_0	
– [EEx ia] IIC	1 mH/63 nF
– [EEx ia] IIB	2 mH/415 nF
Marking of device	⟨Ex⟩ II (1) GD [EEx ia] IIC/IIB
Transfer characteristics	
Linearity error	≤ 0.1 % of final value
Measuring tolerance	≤ 0.2 %
Long-term error	0.05 %/year
Effect of load impedance	≤ 0.02 % of final value
Effect of supply voltage impedance	≤ 0.05 %/ of final value
Ambient temperature sensitivity	≤ 0.01 %/K of final value
Pulse rise time (10 %…90 %)	< 90 ms
Pulse release time (90 %…10 %)	< 90 ms
LED indications	
– Power	green
Eurocard	100 x 160 mm (DIN 41494)
Base material	Epoxy-resin, glass-fibre reinforced, quality class FR4, plastic front plate, 4TE = 20,32 mm for individual interlocking
Connection	connectors according to DIN 4162 style F, 32 poles (series z+d)
Operating temperature range	-25…+60 °C
Coding (no.127)	





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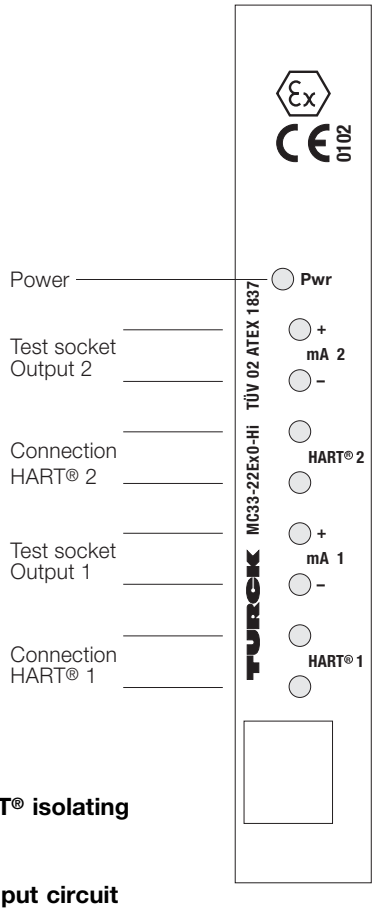
HART® Isolating Measuring Transducer MC33-22Ex0-Hi/24VDC two channels



- **Dual-channel HART® isolating transducer**
- **Intrinsically safe input circuit EEx ia**
- **Area of application according to ATEX: II (1) GD**
- **Supply of measuring transducers in 2 and 3-wire technology (I + III) and active 2-wire transmitters (II) with HART® communication**
- **Short-circuit proof transducer circuit**
- **Two current outputs 0/4...20 mA**
- **Complete galvanic isolation**
- **Test sockets for analogue signals and HART® handheld on front panel**

The dual-channel isolating transducer MC33-22Ex0-Hi is used to operate 2-wire and 3-wire measuring transducers (I + III) in the explosion hazardous area and to transfer the measuring signal to the safe area. Alternatively, active 2-wire transmitters (II) may be powered.

Alongside the analogue signal, the digital HART® communication signal can be transferred bi-directionally.

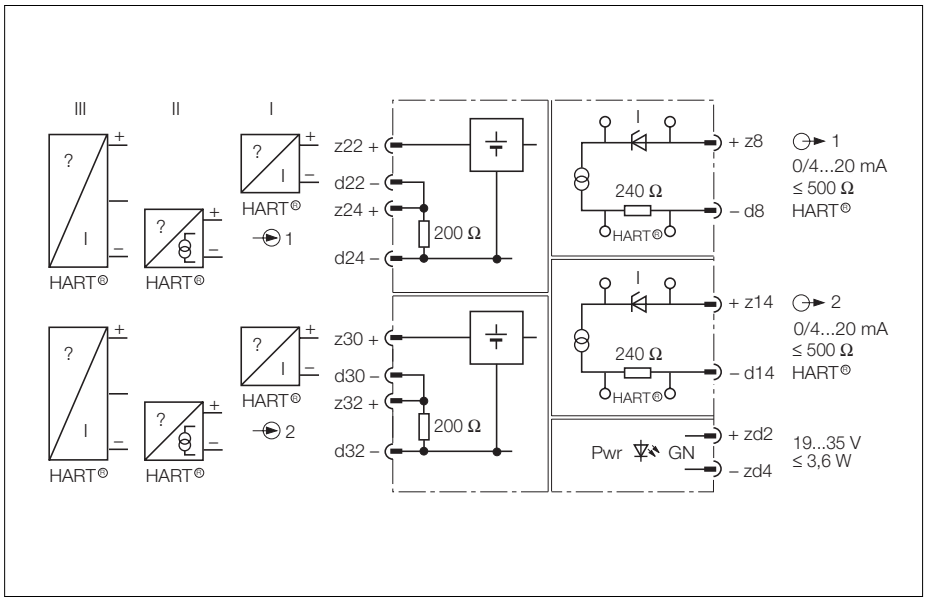
The input signal is transferred in a 1:1 mode to the outputs in the non-explosion hazardous area.

Due to the 1:1 transfer characteristic. a wire-break or short-circuit is signalled by an output current of 0 mA or > 22.5 mA.

The input circuits are galvanically isolated from the output circuit and the supply voltage.

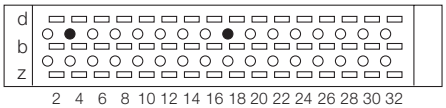
The front panel provides test sockets. (Ø 2 mm) for connection of a HART® handheld or a measuring device with an internal resistance of ≤ 50 Ω for testing the analogue current outputs.

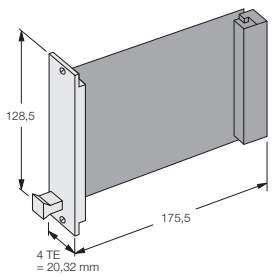
A green LED indicates that the device is powered.



HART® Measuring Isolating Transducer MC33-22Ex0-Hi/24VDC

Type	MC33-22Ex0-Hi/24VDC
Ident-no.	9043012
Supply voltage U_B	19...35 VDC
Power consumption	≤ 3.6 W
Ripple W_{PP}	≤ 10 %
Galvanic isolation	between input and output circuits and supply voltage for 250 V_{rms}, test voltage 4 kV_{rms}
Transducer circuits	intrinsically safe per EN 50020
Input resistance	200 Ω
Operating values	
– Voltage	> 17.0 V (at 20 mA)
– Current	0...20 mA
Short-circuit current (short-term)	60 mA (for 60 ms)
Ouput circuits	
Current output	0/4…20 mA
– Load	≤ 500 Ω
– Wire-break detected	0 mA
– Short-circuit detected	> 22.5 mA
I.S. approval acc. to Certificate of Conformity	TÜV 02 ATEX 1837
Max. values	
– No-load voltage U_0	22.1 V
– Short-circuit current I_0	94 mA
– Power P_0	738 mW
– Internal resiatance R_i	335 Ω
Characteristic curve	trapezoidal
Internal inductances/capacitances $\Sigma L_i/\Sigma C_i$	5 nF/negigible
External inductances/capacitances L_0/C_0	
– [EEx ia] IIC	1 mH/62 nF
– [EEx ia] IIB	413 nF/2 mH
Marking of device	⟨Ex⟩ II (1) GD [EEx ia] IIC
Transfer characteristics	
Linearity error	≤ 0.1 % of final value
Measuring tolerance	≤ 0.2 %
Long-term error	0.1 %/year
Effect of load impedance	≤ 0.02 % of final value
Effect of supply voltage impedance	≤ 0.05 %/ of final value
Ambient temperature sensitivity	≤ 0.01 %/K of final value
Pulse rise time (10 %…90 %)	< 90 ms
Pulse release time (90 %…10 %)	< 90 ms
LED indications	
– Power	green
Eurocard	100 x 160 mm (DIN 41494)
Base material	Epoxy-resin, glass-fibre reinforced, quality class FR4, plastic front plate, 4TE = 20,32 mm for individual interlocking
Connection	connectors according to DIN 4162 style F, 32 poles (series z+d)
Operating temperature range	-25…+60 °C
Coding (no.124)	





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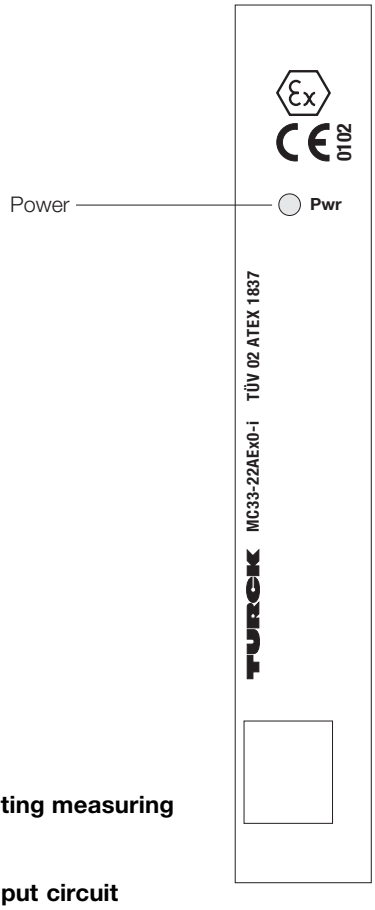
Isolating Measuring Transducer MC33-22AEx0-i/24VDC two channels



- **Dual-channel isolating measuring transducer**
- **Intrinsically safe input circuit EEx ia**
- **Area of application according to ATEX: II (1) GD**
- **Supply of measuring transducers in 2-wire technology**
- **Short-circuit proof transducer circuit**
- **Two current outputs 0/4...20 mA**
- **Complete galvanic isolation**

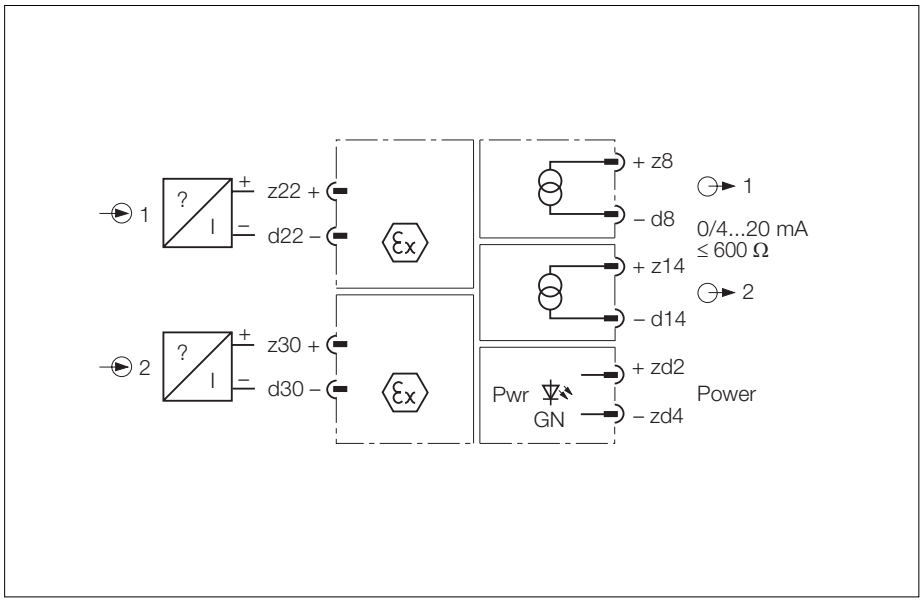
The dual-channel isolating transducer MC33-22AEx0-i is used to operate 2-wire measuring transducers in the explosion hazardous area and to transfer the measuring signal to the safe area.

The input signal is transferred in a 1:1 mode to the outputs in the non-explosion hazardous area.

Due to the 1:1 transfer characteristic. a wire-break or short-circuit is signalled by an output current of 0 mA or > 22.5 mA.

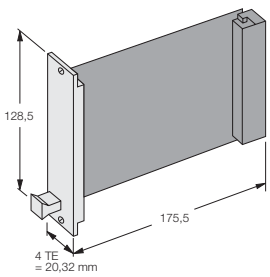
The input circuits are galvanically isolated from the output circuit and the supply voltage.

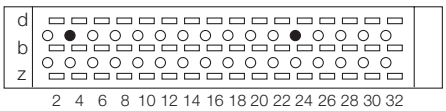
A green LED indicates that the device is powered.



HART® Measuring Isolating Transducer MC33-22AEx0-i/24VDC

Type	MC33-22AEx0-i/24VDC
Ident-no.	9043014
Supply voltage U_B	19...35 VDC
Power consumption	≤ 3.6 W
Ripple W_{PP}	≤ 10 %
Galvanic isolation	between input and output circuits and supply voltage for 250 V_{rms}, test voltage 4 kV_{rms}
Transducer circuits	intrinsically safe per EN 50020
Input resistance	91 Ω
Operating values	
– Voltage	> 17.0 V (at 20 mA)
– Current	0/4...20 mA
Short-circuit current (short-term)	60 mA (for 60 ms)
Output circuits	
Current outputs	0/4…20 mA
– Load	≤ 600 Ω
– Wire-break detected	0 mA
– Short-circuit detected	> 22.5 mA
I.S. approval acc. to Certificate of Conformity	TÜV 02 ATEX 1837
Max. values	
– No-load voltage U_0	22.1 V
– Short-circuit current I_0	79.5 mA
– Power P_0	625 mW
– Internal resistance R_i	395 Ω
Characteristic curve	trapezoidal
Internal inductances/capacitances L_i/C_i	
– L_i	negligible
– ΣC_i	5 nF
External inductances/capacitances L_0/C_0	
– [EEx ia] IIC	1 mH/63 nF
– [EEx ia] IIB	2 mH/415 nF
Marking of device	⟨Ex⟩ II (1) GD [EEx ia] IIC/IIB
Transfer characteristics	
Linearity error	≤ 0.1 % of final value
Measuring tolerance	≤ 0.2 %
Long-term error	0.1 %/year
Effect of load impedance	≤ 0.02 % of final value
Effect of supply voltage impedance	≤ 0.05 %/ of final value
Ambient temperature sensitivity	≤ 0.01 %/K of final value
Pulse rise time (10 %…90 %)	< 90 ms
Pulse release time (90 %…10 %)	< 90 ms
LED Indications	
– Power	green
Eurocard	100 x 160 mm (DIN 41494)
Base material	Epoxy-resin, glass-fibre reinforced, quality class FR4, plastic front plate, 4TE = 20,32 mm for individual interlocking
Connection	connectors according to DIN 4162 style F, 32 poles (series z+d)
Operating temperature range	-25…+60 °C
Coding (no.127)	





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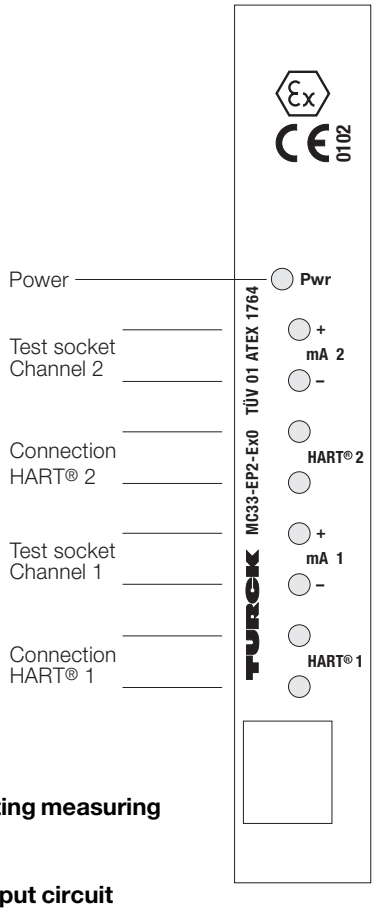
HART® Isolating Measuring Transducer MC33-EP2-Ex0 two channels



- **Two-channel isolating measuring transducer**
- **Intrinsically safe input circuit EEx ia**
- **Area of application according to ATEX: II (1) GD**
- **Supply of 2 and 3-wire measuring transducers and active 2-wire transmitters with HART® communication**
- **Complete galvanic isolation**
- **Short-circuit protected transducer circuits**
- **Two output circuits 0/4...20 mA**
- **Test sockets for analogue signals and HART® handheld on front panel**
- **Pin configuration and functions compatible with the HART® measuring transducers, type MUS 80 and MUS 925, from FOXBORO ECKHARDT**

The two-channel isolating transducer MC33-EP2-Ex0 is designed to operate intrinsically safe transducers in hazardous areas and to transfer the measuring signal to the safe area. It is possible to operate active 2-wire or passive 3-wire transmitters.

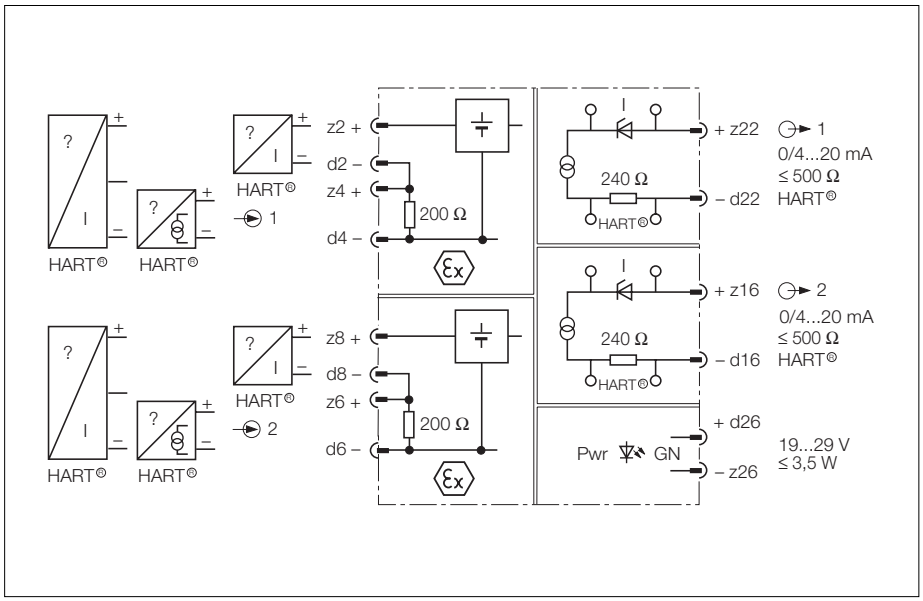
In addition to the analogue signal, digital HART® communication signals can be transferred bidirectionally.

The front panel features test sockets (Ø 2 mm) per channel for uninterrupted transfer of the analogue current output signals for measuring devices with an internal resistance of ≤ 50 Ω and for connection of a HART® handheld.

A green LED indicates that the device is powered. The input circuits are galvanically isolated from the output circuits and the supply voltage.

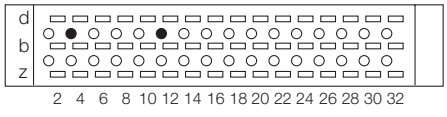
The input signasl are transferred in a 1:1 mode to the outputs in the non-explosion hazardous area.

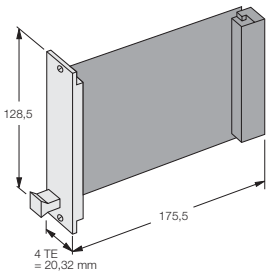
Due to the 1:1 transfer characteristic. a wire-break or short-circuit is signalled by an output current of 0 mA or > 22.5 mA.



HART® Isolating Measuring Transducer MC33-EP2-Ex0

Type	MC33-EP2-Ex0
Ident-no.	9040530
Operating voltage U_B	19...29 VDC
Internal power consumption	≤ 3.5 W
Ripple W_{pp}	≤ 10 %
Galvanic isolation	input circuit from output circuit and from power supply for 250 V_{rms} test voltage 2.5 kV_{rms}
Transducer circuits	intrinsically safe according to EN 50020
Input resistance	200 Ω
Operating values	
– Voltage	> 16.5 V (at 20 mA)
– Current	0...22 mA
Short-circuit current (short-term rating)	60 mA (for 60 ms)
Output circuits	
Current output	0/4…20 mA
– Load	≤ 500 Ω
– During wire-break detection	0 mA
– During short-circuit detection	> 22.5 mA
I.S. approval acc. to Certificate of Conformity	TÜV 01 ATEX 1764
– No-load voltage U_0	22.1 V
– Short-circuit current I_0	99 mA
– Power P_0	780 mW
– Internal resistance R	317 Ω
Charcteristic curve	trapezoidal
External inductances/capacitances L_0/C_0	
– [EEx ia] IIC	63 nF/1 mH
– [EEx ia] IIB	410 nF/2 mH
Marking of device	⟨Ex⟩ II (1) GD [EEx ia] IIC
Transfer characteristics	
Linearity error	≤ 0.1 % of final value.
Measuring tolerance	≤ 0.2 %
Long-term error	≤ 0.05 %/year
Effect of load impedance	≤ 0.02 % of final value.
Effect of supply voltage impedance	≤ 0.05 % of final value.
Ambient temperature sensitivity	≤ 0.01 %/K of final value
Pulse rise time (10 %…90 %)	< 90 ms
Pulse release time (90 %…10 %)	< 90 ms
LED Indications	
– Power	green
Eurocard	100 x 160 mm (DIN 41494)
Base material	Epoxy-resin, glass-fibre reinforced, quality class FR4, plastic front plate, 4TE = 20,32 mm for individual interlocking
Connection	connectors according to DIN 4162 style F, 32 poles (series z+d)
Operating temperature range	-25…+60 °C
Coding (no. 121)	





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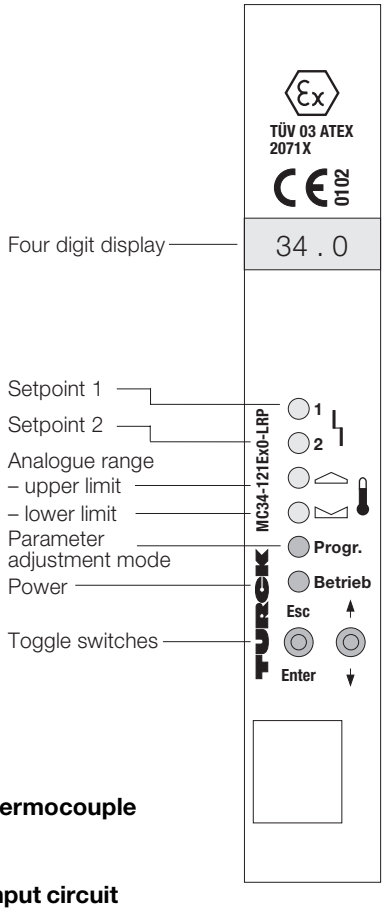
Thermocouple Transducer MC34-121Ex0-LRP/ 24VDC single-channel



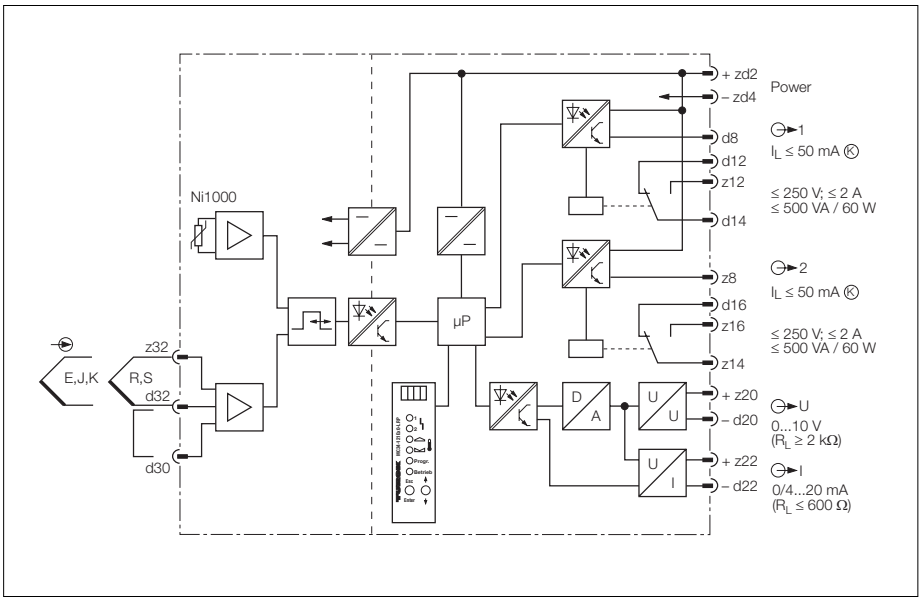
- **Single-channel thermocouple transducer**
- **Intrinsically safe input circuit EEx ia for thermocouples type E, J, K, R, S**
- **Area of Application according to ATEX: II (1) GD**
- **Reference point compensation:**
  - **internal (Ni1000),**
  - **constant (thermostat)**
- **Operating range: -270…+1700 °C (depending on thermocouple)**
- **Input circuit monitoring for wire-breakage**
- **Voltage output 0...10 V, current output 0/4...20 mA**
- **Galvanic isolation between input circuit, output curcuit and power supply**
- **One relay and transistor output each for status indication of setpoint 1 and 2**
- **Common hysteresis adjustment (in %) for both setpoints**
- **Simple calibration via**
  - **front toggle switches or**
  - **personal computer (PC)**

The thermocouple transducer type MC34-121Ex0-LRP is designed to drive thermocouple elements type E, J, K, R and S located in the hazardous area. It evaluates temperature dependent changes from the thermocouple (acc. to IEC 584) and converts them into standard current and voltage signals.

Reference point compensation is accomplished internally through a Ni1000 resistor. When it is used with a thermostat, then its nominal value is selectable at the time of programming. The input circuit and the output circuit are isolated from each other and from the power supply.

The display on the front of the device indicates the actual temperature, independent of the preset range.
The current signal output (0/4...20 mA) and the voltage signal output (0...10 V) may be used at the same time.

The two setpoint outputs, each with relay and pnp short-circuit protected transistor output, are independently adjustable. Setting of the switch-on and switch-off point determines the overrange or underrange monitoring function of the output relays.



Thermocouple Transducer MC34-121Ex0-LRP/24VDC

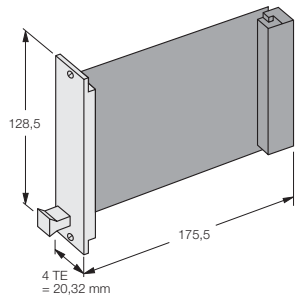
The input circuit is monitored for wire-break. The performance of both setpoint outputs can be selected to indicate faults in the input circuit (relays energised or de-energised, relays maintain the same position as before the fault occured). The display indicates "err" (Error) and the green Power LED changes to red.

The parameters for the current monitoring function during a wire-break are programmable. When a fault in the input circuit occurs, then the current output is either 0 mA or ≥ 22 mA.

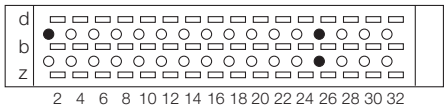
Programming
Card parameter programming is accomplished either with two front toggle switches, or with personal computer (PC). The following functions can be preselected:

- thermocouple type E, J, K, R, S
- reference point compensation internal (Ni1000), constant (thermostat)
- lower limit of analogue range, depending on the thermocouple used
- upper limit of analogue range, depending on the thermocouple used
- current output 0/4...20 mA
- analogue output characteristics during a malfunction: 0 mA/≥ 22 mA/maintain value
- setpoint 1
- setpoint 2
- setpoint function (overrange/underrange)
- thermocouple line resistance

The selected parameters are indicated by LEDs on the front of the device. The value of the parameter will be displayed on the four digit display.



Coding (no. 16)



Type	MC34-121Ex0-LRP/24 VDC
Ident-no.	9040510
Supply Voltage U_B	20.4...27.6 VDC
Ripple W_{PP}	≤ 10 %
Overvoltage release	33 V ± 1.5 V
Current consumption	≤ 200 mA
Galvanic isolation	between input circuit, output circuit and supply voltage for 250 V_{rms}, test voltage 2.5 KV_{rms}
Input Circuit	intrinsically safe per EN 50020
Transducer circuit	thermocouples type E, J, K, R and S (IEC 584)
Reference point compensation	internal (Ni1000), constant (thermostat)
Output Circuit	
Current output	0/4...20 mA (load ≤ 600 Ω)
Voltage output	0...10 V (R_L ≥ 2 kΩ)
Status outputs	2 preset outputs, each with 1 transistor and 1 relay output
Transistor output	pnp, short-circuit protected (I_L ≤ 50 mA)
Relay output	1 potential-free change-over contact
– Switching voltage	≤ 250 V
– Switching current	≤ 2 A
– Switching capacity	≤ 500 VA/60 W
– Contact material	silver-alloy + 3 µm Au
Interface	RS232 serial/V.24 via adapter MC-IM-232
I.S. approval acc. to Certificate of Conformity	TÜV 03 ATEX 2071 X
Max. values	
– No-load voltage U_0	19 V
– Short-circuit current I_0	31 mA
– Power P_0	145 mW
External Inductances/Capacitances L_0/C_0	
– [EEx ia] IIC	2 mH/187 nF (alternatively: 5 mH/177 nF)
– [EEx ia] IIB	2 mH/1.2 µF (alternatively: 5 mH/967 nF)
Marking of device	Ⓔx II (1) GD [EEx ia] IIC
Transfer Characteristics	
Effective temperature range	-270...+1700 °C (denpending on the used thermocouple)
Linearity tolerance	≤ 0.1 % of full scale (typically 0.03 %)
Effect of load impedance	≤ 0.01 % of final value
Effect of supply voltage impedance	negligible
Ambient temperature sensitivity	≤ 1.5 K (E, J, K); ≤ 3 K (R, S) maximum error in Kelvin between T_{min} and T_{max}
LED Indications	
– Power (2-colour LED)	green: power "ON" – red: fault
– Limit values (2-colour LED)	green: program. mode – yellow: at preset value
Display	red (4 digits)
Eurocard	100 x 160 mm (DIN 41494)
Material	glass-fiber reinforced epoxy resin, quality class FR4
Front panel	plastic, 4TE = 20.32 mm individually interlocking
Connection	connector per DIN 41612, type F, 32-pole (series z+d)
Operating temperature	-25…+60 °C

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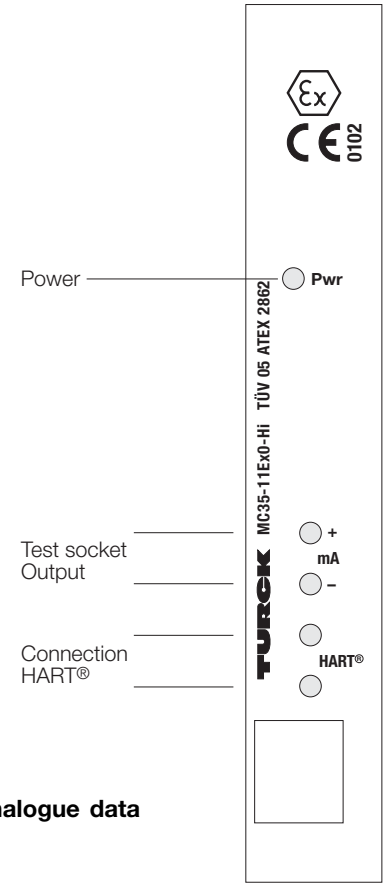
Analogue Data Transmitter MC35-11Ex0-Hi/24VDC single-channel



- **Single-channel analogue data transmitter**
- **Intrinsically safe output circuits EEx ia**
- **Area of application according to ATEX: II (1) GD**
- **One input circuit 0/4...20 mA**
- **One output circuit 0/4..20 mA**
- **Complete galvanic isolation**
- **Linearity ≤ 0.1 %**
- **Load < 600 Ω**
- **HART® transparent**
- **Test sockets for analogue signals and HART® handheld on front panel**

The analogue data transmitter, type MC35-11Ex0-Hi, is designed to transfer standard analogue signals from the safe to the explosion hazardous area. The device features a single channel and output circuits from 0/4...20 mA. A green LED indicates that the device is powered.

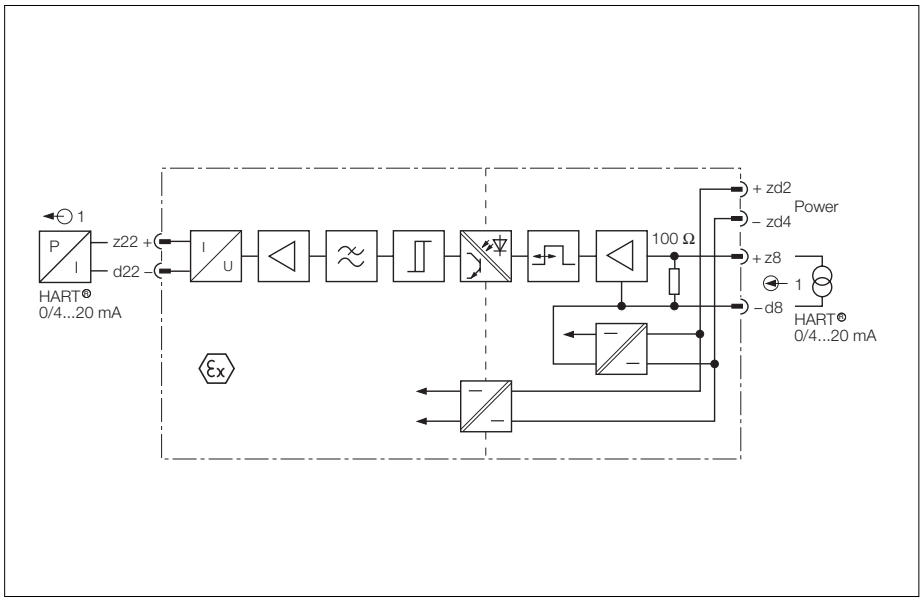
In addition to the analogue signals, digital HART® communication signals can be transferred bi-directionally. The front panel contains test sockets (Ø 2 mm).

These are suited for connection of a HART® handheld or a measuring device with an internal resistance of ≤ 50 Ω to verify the analogue current outputs.

The output circuits are galvanically isolated from each other, as well as from the supply voltage and the input circuits.

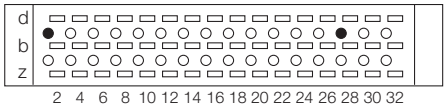
This card is suited for connection of intrinsically safe actuators or process indicators in the explosion hazardous area.

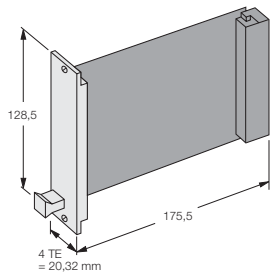
The signals are transferred in a 1 : 1 mode; signal adaptation from 0...20 mA to 4...20 mA is not possible.



Analogue Data Transmitter MC35-11Ex0-Hi/24VDC

Type	MC35-11Ex0-Hi/24VDC
Ident-no.	9043031
Operating voltage U_B	19...35 VDC
Ripple W_{pp}	≤ 10 %
Overvoltage threshold	39 V ± 1 V
Current consumption	< 2.2 W
Galvanic isolation	between input and output circuit and supply voltage for 250 V_{rms}, test voltage 4 kV_{rms}
Input circuits	
Current input	0/4…20 mA
Input resistance	110 Ω
Current limitation	60 mA
Output circuits	intrinsically safe to EN 50020
Current output	0/4…20 mA
– Load	≤ 600 Ω
Ex approval acc. to conformity certificate	TÜV 05 ATEX 2862
Max. values	
– No-load voltage U_0	19.1 V
– Short-circuit current I_0	59 mA
– Internal resistance R_i	528 Ω (trapezoidal curve)
Internal inductance	negligible
Internal capacitance	≤ 6.3 nF
External inductance/capacitance	
– [EEx ia] IIC	3.7/0,5/0,1 mH / 94/134/214 nF
– [EEx ia] IIB	35/5/1 mH / 294/780/990 nF
Marking of device	⟨Ex⟩ II (1) GD [EEx ia] IIC
Transfer characteristics	
Linearity error	≤ 0.1 % of final value
Measuring tolerance	≤ 0.2 % of final value
Long-term error	≤ 0.2 % / year
Effect of load impedance	≤ 0.02 % of final value
Supply voltage impedance	≤ 0.05 % of final value
Temperature coefficient	≤ 0.1 % of final value/K°
Pulse rise time (10 %…90 %)	≤ 90 ms
Pulse release time (90 %…10 %)	≤ 90 ms
LED indications	
– Power	green
Eurocard	100 x 160 mm (DIN 41494)
Base material	epoxy resin, glass fibre reinforced, quality class FR4
Front panel	plastic, 4TE = 20,32 mm for individual interlocking
Connection	connectors to DIN 41612, type F, 32-pole (series z+d)
Operating temperature range	-25…+60 °C
Coding (no. 115)	





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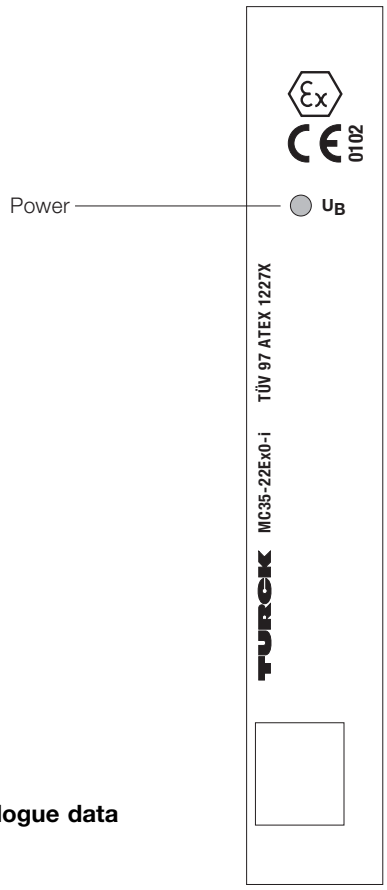


Analogue Data Transmitter MC35-22Ex0-i/24VDC two channels

- **Two-channel analogue data transmitter**
- **Intrinsically safe output circuits EEx ia**
- **Area of application according to ATEX: II (1) GD**
- **Two input circuits 0/4…20 mA**
- **Two output circuits 0/4…20 mA**
- **Galvanic isolation between input circuit, output curcuit and power supply**
- **Linearity ≤ 0.1 %**
- **Temperature drift ≤ 0.005 %/K of full scale output**
- **Load < 600 Ω**

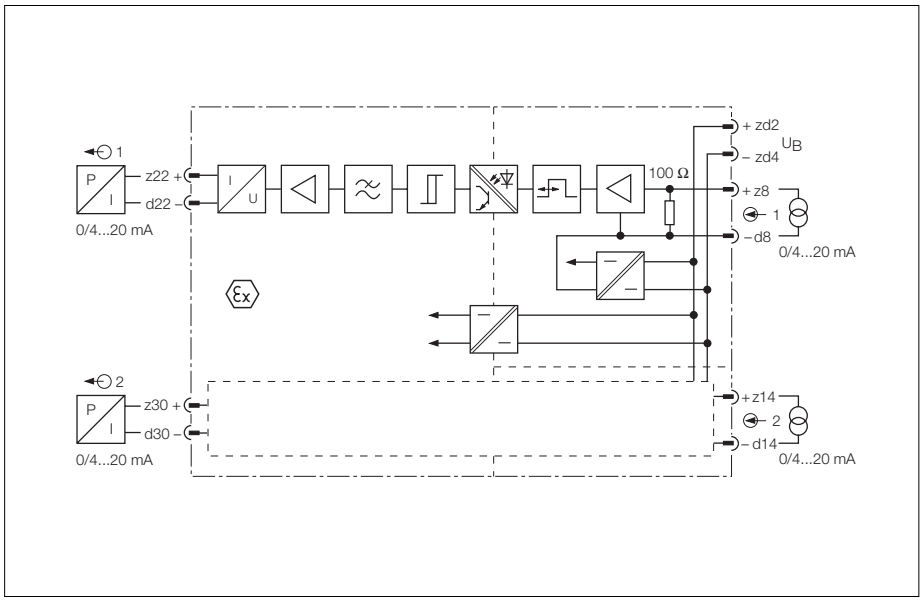
The MC35-22Ex0-i is an analogue data driver which transfers standard analogue signals from the safe area to the explosion hazardous area.

The dual channel device provides input and output signals of 0/4...20 mA. A green LED indicates that the device is powered.

The input and output circuits are galvanically isolated from each other and from the supply voltage.

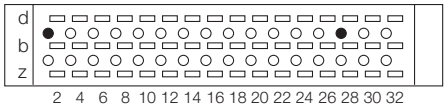
The device is used to modulate intrinsically safe control valves or indicators located in the hazardous area. The input signals are usually provided by regulators or process control systems.

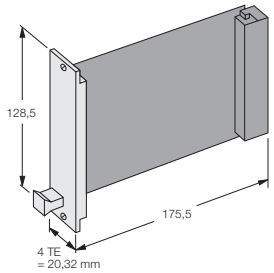
The signals are transferred in a 1 : 1 mode; signal adaptation from 0...20 mA to 4...20 mA is not possible.



Analogue Data Transmitter MC35-22Ex0-i/24VDC

Type	MC35-22Ex0-i/24 VDC
Ident-no.	9043102
Supply Voltage U_B	18...35 VDC
Ripple W_{PP}	≤ 10 %
Overvoltage release	39 V ± 1 V
Power/Current consumption	≤ 4 W
Galvanic isolation	between input circuit, output circuit and supply voltage for 250 V_{rms}, test voltage 2.5 kV_{rms}
Input Circuits	
Current	0/4…20 mA
Input resistance	100 Ω
Current limitation	60 mA
Input voltage	≤ 15 V
Output Circuits	intrinsically safe per DIN EN 50020
Current output	0/4…20 mA
– Load	≤ 600 Ω
I.S. approval acc. to Certificate of Conformity	TÜV 97 ATEX 1227X
Maximum values	
– No-load voltage U_0	18.9 V
– Short-circuit current I_0	65 mA
– Internal resistance R_i	550 Ω (trapezoidal impedance characteristics)
– Output power P_0	0.5 W
External inductances/capacitances	
– [EEx ia/ib] IIB	5 mH/500 nF
– [EEx ia/ib] IIC	0.75 mH/110 nF
Marking of device	⟨Ex⟩ II (1) G [EEx ia] IIC
Transfer Characteristics	
Linearity tolerance	≤ 0.1 % of full scale (typically 0.03 %)
Effect of load impedance	negligible
Effect of supply voltage impedance	negligible
Ambient temperature sensitivity	≤ 0.005 % / K of final value
Pulse rise time (10 %…90 %)	< 60 ms
Pulse release time (90 %…10 %)	< 60 ms
LED Indications	
– Power	green
Eurocard	100 x 160 mm (DIN 41494)
Material	glass-fiber reinforced epoxy resin, quality class FR4
Front panel	plastic, 4TE = 20.32 mm
	individually interlocking
Connection	connector per DIN 41612,
	type F, 32-pole (series z+d)
Operating temperature	-25…+60 °C
Coding (no. 115)	





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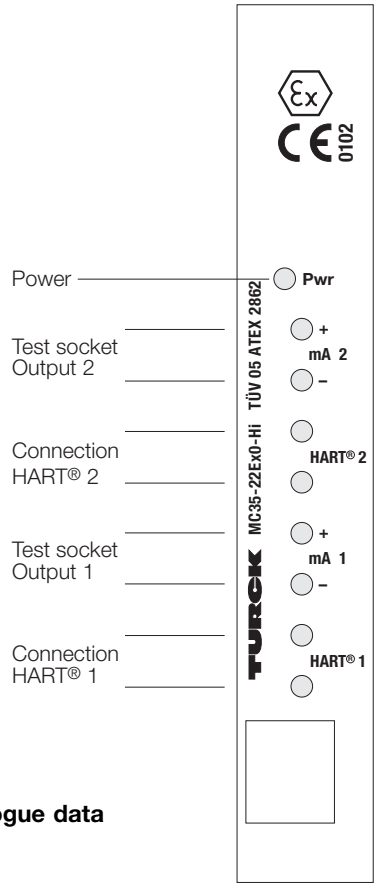
Analogue Data Transmitter MC35-22Ex0-Hi/24VDC two channels



- **Two-channel analogue data transmitter**
- **Intrinsically safe output circuits EEx ia**
- **Area of application according to ATEX: II (1) GD**
- **Two input circuits 0/4…20 mA**
- **Two output circuits 0/4…20 mA**
- **Complete galvanic isolation**
- **Linearity ≤ 0.1 %**
- **Load < 600 Ω**
- **HART® transparent**
- **Test sockets for analogue signals and HART® handheld on front panel**

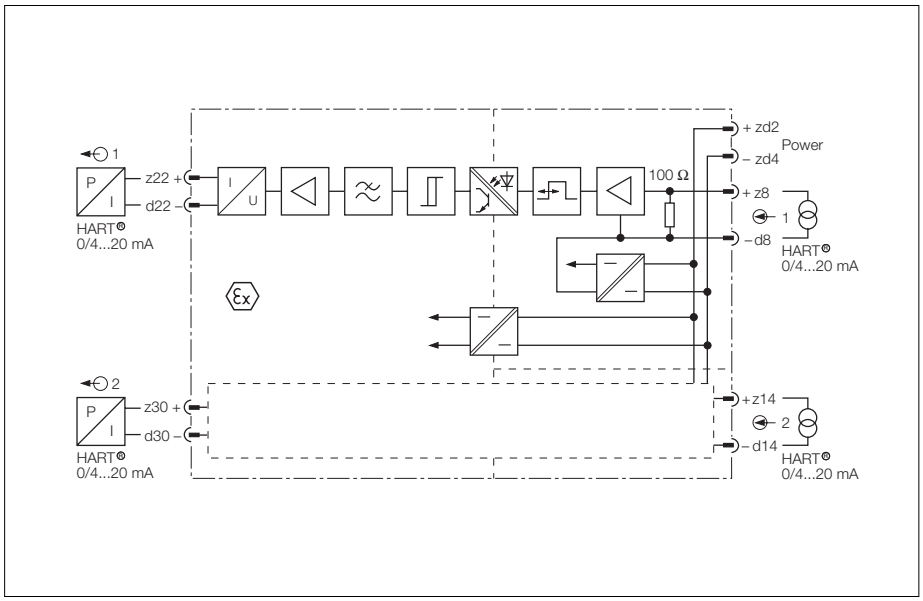
The analogue data transmitter, type MC35-22Ex0-Hi, is designed to transfer standard analogue signals from the safe to the explosion hazardous area. The device features two channels and output circuits from 0/4...20 mA. A green LED indicates that the device is powered.

The output circuits feature galvanic isolation from each other, as well as from the supply voltage and the input circuits. In addition to the analogue signals, digital HART® communication signals can be transferred bi-directionally.

The front panel contains test sockets (∅ 2 mm). These are suited for connection of a HART® handheld or a measuring device with an internal resistance of ≤ 50 Ω to test the analogue current outputs.

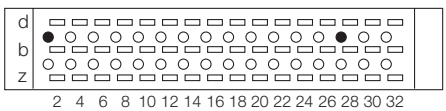
This card is suited for connection of intrinsically safe actuators or process indicators in the explosion hazardous area.

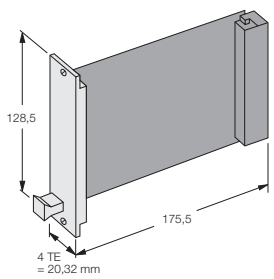
The signals are transferred in a 1 : 1 mode; signal adaptation from 0...20 mA to 4...20 mA is not possible.



Analogue Data Transmitter MC35-22Ex0-Hi/24VDC

Type	MC35-22Ex0-Hi/24VDC
Ident-no.	9043032
Operating voltage U_B	19...35 VDC
Ripple W_{PP}	≤ 10 %
Overvoltage threshold	39 V ± 1 V
Current consumption	< 2.2 W
Galvanic isolation	between input and output circuits and supply voltage for 250 V_{rms}, test voltage 4 kV_{rms}
Input circuits	
Current input	0/4…20 mA
Input resistance	110 Ω
Current limitation	60 mA
Output circuits	intrinsically safe to EN 50020
Current output	0/4…20 mA
– Load	≤ 600 Ω
Ex approval acc. to conformity certificate	TÜV 05 ATEX 2862
Max. values	
– No-load voltage U_0	19.1 V
– Short-circuit current I_0	59 mA
– Internal resistance R_i	594 Ω (trapezoidal curve)
– Power P_0	0.5 W
Internal inductance	negligible
Internal capacitance	≤ 6.3 nF
External inductance/capacitance	
– [EEx ia] IIC	3.7/0,5/0,1 mH / 94/134/214 nF
– [EEx ia] IIB	35/5/1 mH / 294/780/990 nF
Marking of device	Ⓔx II (1) GD [EEx ia] IIC
Transfer characteristics	
Linearity error	≤ 0.1 % of final value
Measuring tolerance	≤ 0.2 % of final value
Long-term error	≤ 0.2 % / year
Effect of load impedance	≤ 0.02 % of final value
Supply voltage influence	≤ 0.05 % of final value
Temperature coefficient	≤ 0.0005 % of final value/K°
Pulse rise time (10 %…90 %)	≤ 90 ms
Pulse release time (90 %…10 %)	≤ 90 ms
LED indications	
– Power	green
Eurocard	100 x 160 mm (DIN 41494)
Base material	epoxy resin, glass fibre reinforced, quality class FR4
Front panel	plastic, 4TE = 20,32 mm for individual interlocking
Connection	connectors to DIN 41612, type F, 32-pole (series z+d)
Operating temperature range	-25…+60 °C
Coding (no. 128)	





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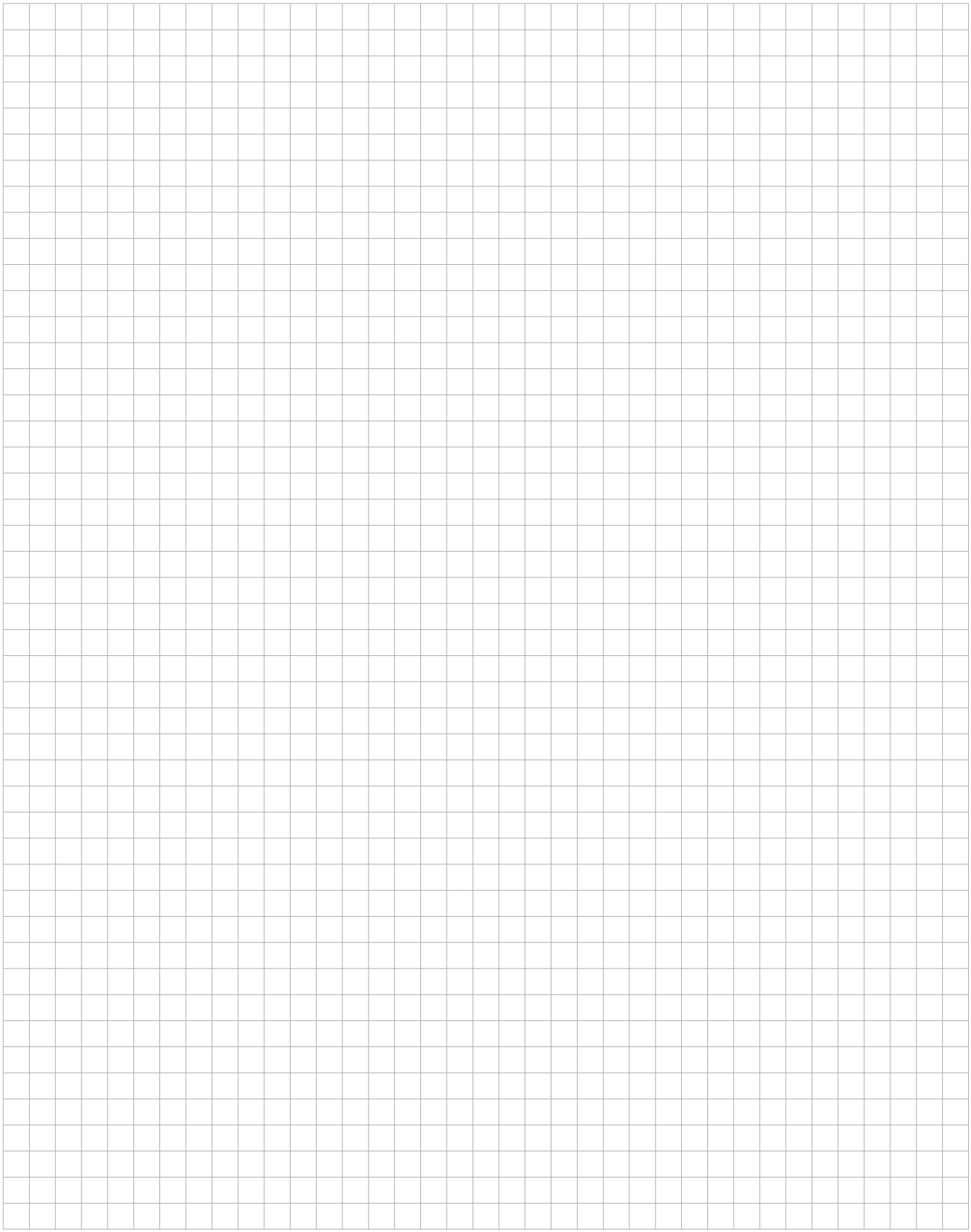
DIGITAL TIME CARDS

Digital Time Cards	Page
MC62-44-RP/24VDC	4-3
MC62-48-RP/24VDC	4-3

4



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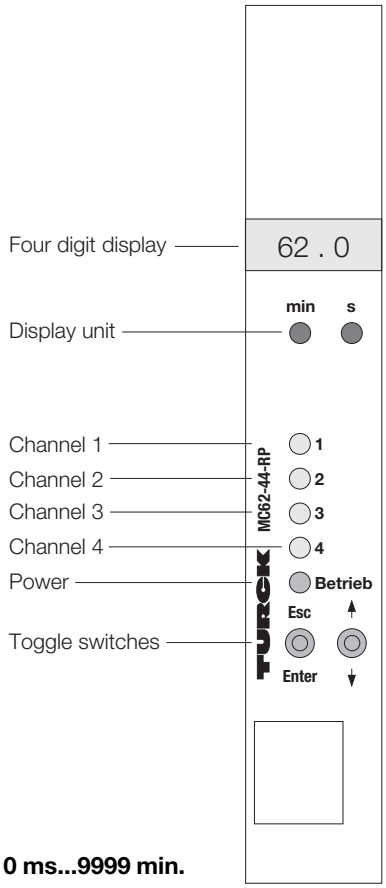
Time Based Controller Card
MC62-44-RP/24VDC
MC62-48-RP/24VDC



- **Quartz controlled**
- **Operating range 10 ms...9999 min.**
- **Residual time indication via 4 digit character display**
- **Programmable card functions:**
  - **Time range**
  - **Time function**
  - **Time unit (sec./min.)**
  - **Display function**
- **Parameter programming via 4 front toggle switches or personal computer (PC)**

The MC62-44-RP and MC62-48-RP digital timer cards provide four quartz controlled timing circuits that are independent from each other. These modules can perform the following timing functions:

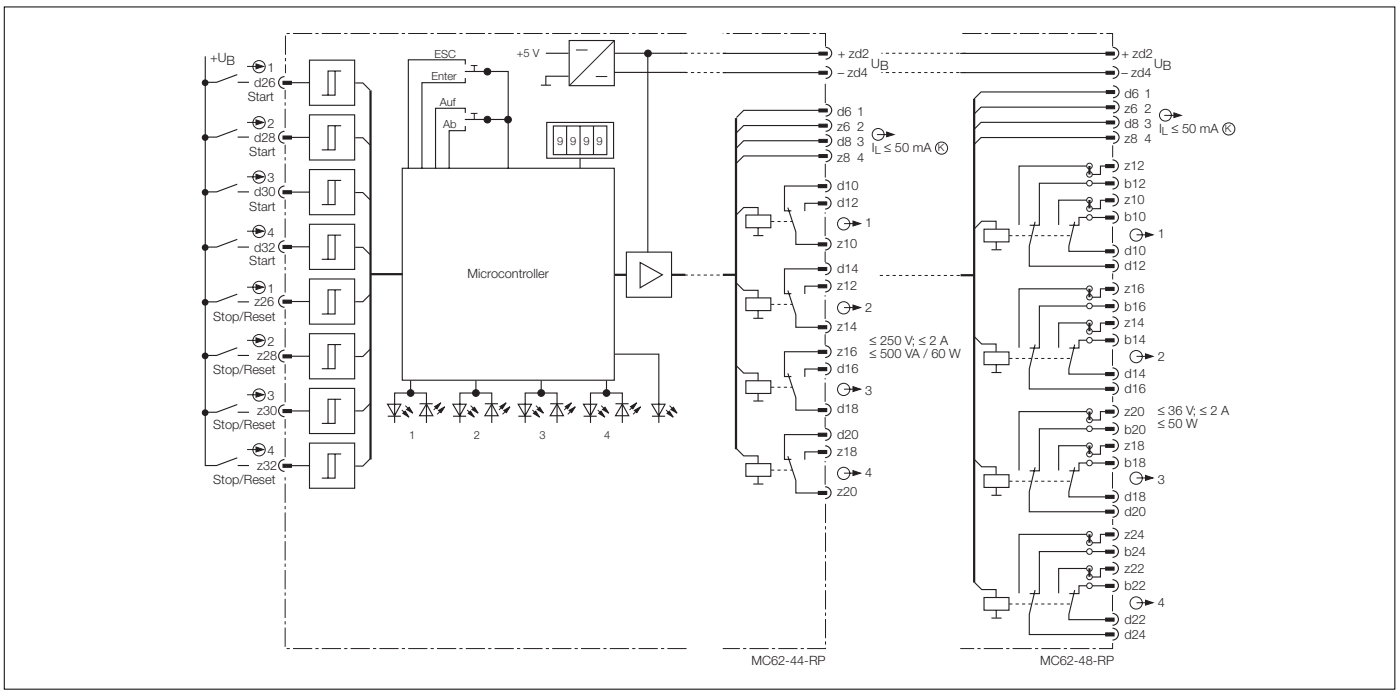
E = Switch ON delay
A = Switch OFF delay
K = One shot leading edge (true one shot)
W = One shot leading edge (pulse width limited)
M = Watchdog
N = One shot trailing edge
S = ON delay with one step leading edge contact
T = Clock pulse generator

Parameters are programmed either via two toggle switches on the front panel, or via personal computer (PC). The following configuration options are available:

– Time range (10 ms...9999 min.)
– Time unit (min./sec)
– Time function (mode)
– RESET or INHIBIT input
– Display function

A four digit character display in the front of the device provides readout of one of the following preset parameters:

– Time range
– Status indication of all four channels
– Display OFF



Time Based Controller Card MC62-44-RP/24VDC/MC62-48-RP/24VDC

Residual Time Indication

The preset time range is indicated via LEDs on the front of the device, the residual time indication is given by the display.

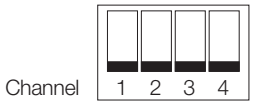
Status Indication of All Four Channels

The four digit display indicates the status of all four time ranges using the following symbols:

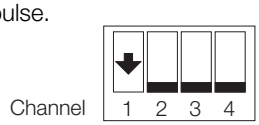
- time is running
- time cycle not activated
no time elapsed
- input activated
time elapsed
- R reset input activated
- S time inhibit input activated

Examples of status indication on display:

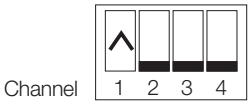
– No signal, no activated timing cycle



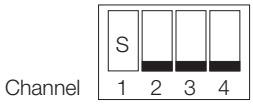
– Timing cycle 1 is active, time is running. Timing cycles 2...4 not active, no trigger pulse.



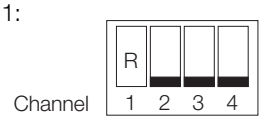
– Timing cycle 1 activated, time has run out, time cycles 2...4 not active, no trigger pulse.



– Time inhibit pulse activated on auxiliary input channel 1:



– Reset activated on auxiliary input channel 1:



Display Off

In this mode, the display is not illuminated to reduce the current consumption of the card to a minimum.

Outputs

Each channel has one relay output and one pnp short-circuit protected transistor output.

The output status is indicated via a two-colour LED:
yellow: output activated (relay energised, transistor conducting).
If the display shows the time of one channel only, then the active channel has an illuminated green LED.

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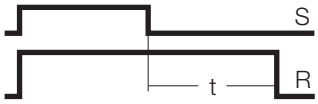
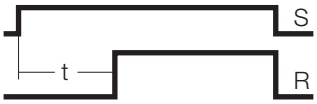
Timing Functions (S = control contact; R = relay/transistor output)

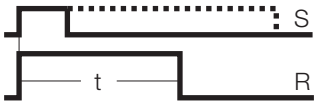
A OFF Delay
After closing contact S, the output relay R energises immediately. After opening control contact S, the output relay drops out according to the set time delay



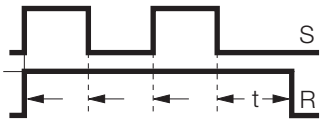
E ON Delay
After closing contact S, the output relay R energises according to the set time delay and remains so until control contact S opens.



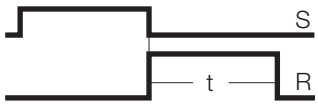
K One-shot Leading Edge
(True Leading Edge)
After closing control contact S, (pulse or constant contact), the output relay R energises immediately and drops out at the end of the set time delay.
S OFF has no influence on R



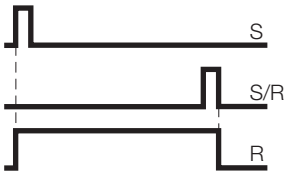
M Watchdog
The output relay R energises; the set timer resets with rising and falling edges of S. R de-energises when the set time has elapsed without a change of state in S.



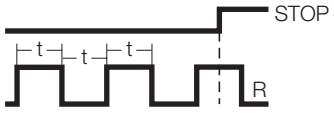
N One-shot Trailing Edge
After driving and falling out of S, the output relay R energises for the set time t.



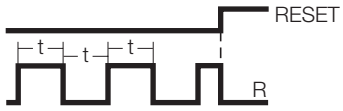
S ON Delay with one shot leading edge contact
After driving by S, S/R and R energise for the set times. S/R and R fall back when S switches out prematurely.



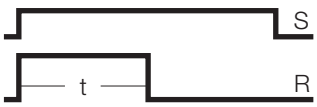
T Pulser/Counter
A: STOP/OFF
R pulses until STOP/ON and the pulse cycle time is over.



B: RESET OFF
R pulses until RESET/ON;
The pulse cycle time is then reset.



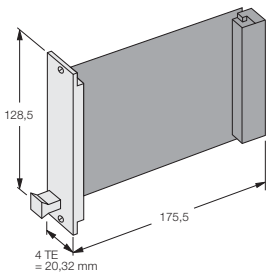
W One-Shot leading edge
(Pulse Width Limited)
S ON energises R for the duration of t.



4

Time Based Controller Card MC62-44-RP/24VDC/MC62-48-RP/24VDC

Type	MC62-44-RP/24VDC	MC62-48-RP/24VDC
Ident-no.	9057300	9057303
Supply Voltage U_B	20.4...27.6 VDC	20.4...27.6 VDC
Ripple W_{PP}	≤ 10 %	≤ 10 %
Power/Current consumption	< 200 mA	< 200 mA
Input Circuit	24 VDC input for 3-wire inputs, mechanical contacts	24 VDC input for 3-wire inputs, mechanical contacts
Input current	approx. 4 mA/channel	approx. 4 mA/channel
0 signal / 1 signal	0...5 VDC/18...30 VDC	0...5 VDC/18...30 VDC
Output Circuits	1 relay and 1 transistor output/channel	1 relay and 1 transistor output/channel
Transistor output	pnp, short-circuit protected (I_L ≤ 50 mA)	pnp, short-circuit protected (I_L ≤ 50 mA)
Relay output	1 potential-free SPDT contact	2 potential-free SPDT contacts
– Switching voltage	≤ 250 V	≤ 36 V
– Switching current	≤ 2 A	≤ 2 A
– Switching capacity	≤ 500 VA/60 W	≤ 50 W
– Contact material	silver-alloy + 3 µm Au	silver-alloy + 3 µm Au
Time Cycles		
Time range	10 ms...9999 min. (adjustable on front of device)	10 ms...9999 min. (adjustable on front of device)
Repeat accuracy		
– Electronic output	1 ms	1 ms
– Relay output	10 ms	10 ms
Voltage stability	(negligible)	(negligible)
Temperature stability	100 ppm	100 ppm
Max. range tolerance	1 ms	1 ms
Trigger duration	< 1 ms	< 1 ms
Time delay before availability	≤ 1 ms	≤ 1 ms
Reset time during time cycle	1 ms	1 ms
Interface	RS232, serial, V.24 with MC-IM-232 adapter. This MC-IM-232 adapter must be installed for parameter programming via the PC. This adapter is used to connect the card with the V.24/RS232 interface. The adapter has a built-in power supply so the card can be programmed without any auxiliary power. The adapter comes with the necessary software. For documentation purposes all data can be stored in a Personal Computer.	
LED Indications		
– Power	green	green
– Status indication for each channel	programming: green output energised: yellow	programming: green output energised: yellow
– Unit of measure (sec/min)	red	red
Display	red (4 digits)	red (4 digits)
Eurocard	100 x 160 mm (DIN 41494)	
Material	glass-fiber reinforced epoxy resin, quality class FR4	
Front panel	plastic, 4TE = 20.32 mm individually interlocking	
Connection	connector per DIN 41612, type F, 32-pole (series z+d)	
Operating temperature	-25…+60 °C	



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SOLENOID DRIVERS/ INTRINSICALLY SAFE POWER SUPPLIES

5

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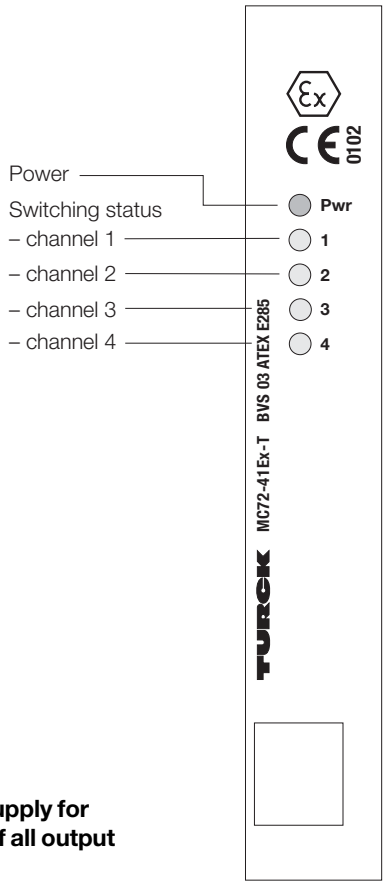


Solenoid Drivers MC72-41Ex-T/24VDC MC72-42Ex-T/24VDC four channels

- **Auxiliary power supply for common supply of all output circuits**
- **Intrinsically safe output circuits EEx ib**
- **Area of application according to ATEX: II (2) GD**
- **Galvanic isolation of input circuits from power supply**
- **Galvanic isolation of output circuits from each other and from and power supply**
- **3 selectable fixed output voltages or freely adjustable output voltage**

The MC72-41/42Ex-T solenoid drivers are 4-channel devices with intrinsically safe output circuits. Each output provides an isolated supply voltage with limited voltage and current approved to protection class [EEx ib] IIC. This device is typically used in valve control applications and to actuate transmitters, indicators or displays installed in explosion hazardous areas.

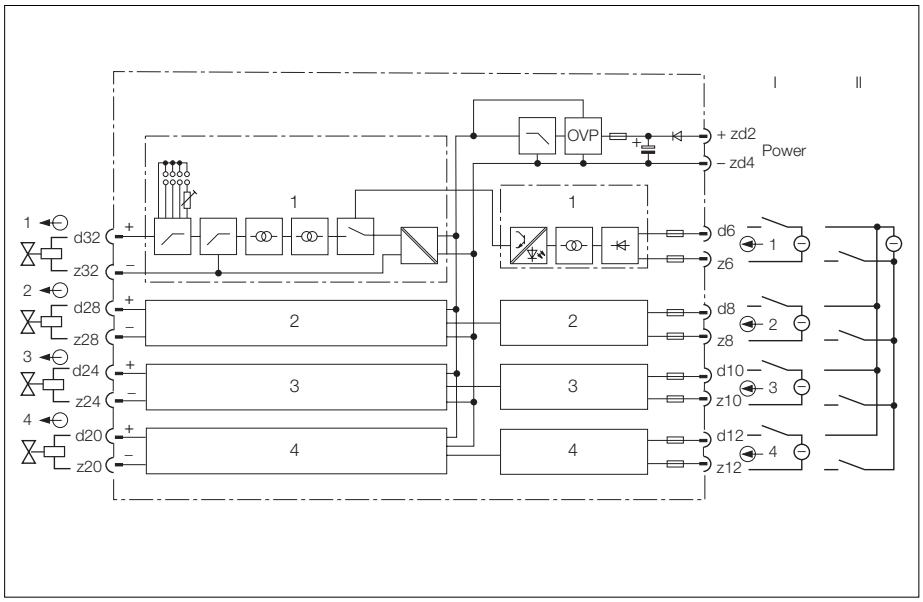
The control circuits are galvanically isolated from each other and from the supply voltage. The input load is very low due to the auxiliary power supply of the solenoid driver. The input current is limited to typ. 4.5 mA.

The output voltage for each channel is jumper programmable:

– MC72-41: 2.5...13.5 V/5 V/12 V/15 V
– MC72-42: 2.5...20 V/5 V/12 V/24 V

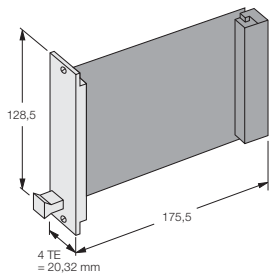
In range 1 (2.5…13.5 V or 2.5…20 V) the voltage can be adjusted between the lowest output voltage (2.5 V left end stop) and the highest output voltage (13.5 V/ 20 V right end stop) by means of a potentiometer. This allows accurate selection of the output voltage to fit each application.

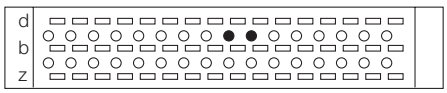
The intrinsically safe output circuits may not be connected together.

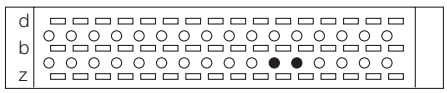


Solenoid Drivers MC72-41Ex-T/24VDC/MC72-42Ex-T/24VDC

Type	MC72-41Ex-T/24VDC	MC72-42Ex-T/24VDC
Ident-no.	9071101	90734
Supply Voltage U_B	18...35 VDC	18...35 VDC
Ripple W_{PP}	≤ 10 %	≤ 10 %
Overvoltage release	39 V ± 1.5 V	39 V ± 1.5 V
Power/Current consumption	≤ 9 W	≤ 7 W
Galvanic isolation	between input circuit, output circuit and supply voltage for 250 V_{rms}, test voltage 2.5 kV_{rms}	between input circuit, output circuit and supply voltage for 250 V_{rms}, test voltage 2.5 kV_{rms}
Input Circuits	10...35 VDC	10...35 VDC
"OFF" signal level	≤ 5 V	≤ 5 V
"ON" signal level	≥ 10 V	≥ 10 V
Input current	4 mA	4 mA
Output Circuits	intrinsically safe per EN 50020	intrinsically safe per EN 50020
Voltage	2.5…13.5 V/5 V/12 V/15 V (programmable)	2.5…20 V/5 V/12 V/24 V (programmable)
Current	≤ 60 mA, short-circuit protected	≤ 25 mA, short-circuit protected
Switching frequency	≤ 250 Hz	≤ 250 Hz
Ex-Approval acc. to Certification of Conformity	BVS 03 ATEX E285	BVS 03 ATEX E285
Maximum nominal values		
– No-load voltage U_0	≤ 15.6 V	≤ 25.3 V
– Short-circuit current I_0	≤ 66.5 mA	≤ 28.5 mA
– Power P_0	≤ 1.04 W	≤ 0.72 W
External Inductances/Capacitances	[EEx ib] IIC	[EEx ib] IIC
– [EEx ib] IIC	1 mH/120 nF	1 mH/30 nF
– [EEx ib] IIB	1 mH/450 nF	1 mH/150 nF
LED Indications		
– Status indication	yellow	yellow
– Power	green	green
Eurocard	100 x 160 mm (DIN 41494)	100 x 160 mm (DIN 41494)
Material	glass-fiber reinforced epoxy resin, quality class FR4	glass-fiber reinforced epoxy resin, quality class FR4
Front panel	plastic, 4TE = 20.32 mm individually interlocking	plastic, 4TE = 20.32 mm individually interlocking
Connection	connector per DIN 41612, type F, 32-pole (series z + d)	connector per DIN 41612, type F, 32-pole (series z + d)
Operating temperature	-25…+60 °C	-25…+60
Coding	No. 6	No. 5







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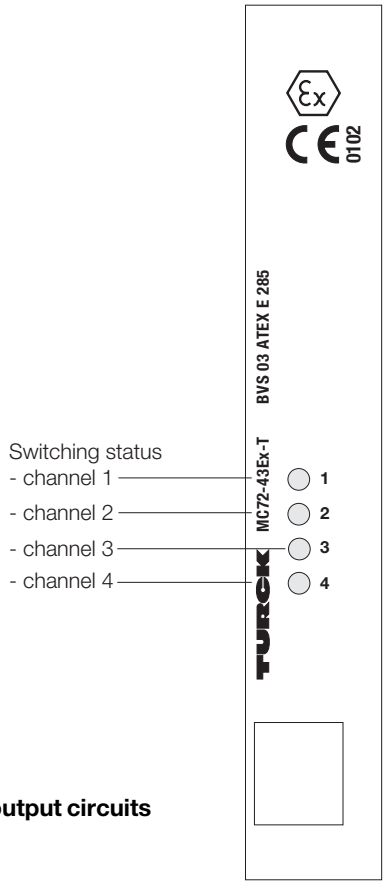
Solenoid Drivers
MC72-43Ex-T
MC72-44Ex-T
four channels



- **Intrinsically safe output circuits EEx ib**
- **Area of application according to ATEX: II (2) GD**
- **Galvanic isolation of all channels**
- **Four independently operating channels without auxiliary power**
- **3 selectable fixed output voltages or freely adjustable output voltage**

The MC72-43/44 solenoid driver is a 4 channel device with intrinsically safe output circuits. Each output provides an isolated supply voltage with limited voltage and current approved to protection class [EEx ib] II C. This device is typically used in valve control applications and to actuate transmitters, indicators or displays installed in explosion hazardous areas.

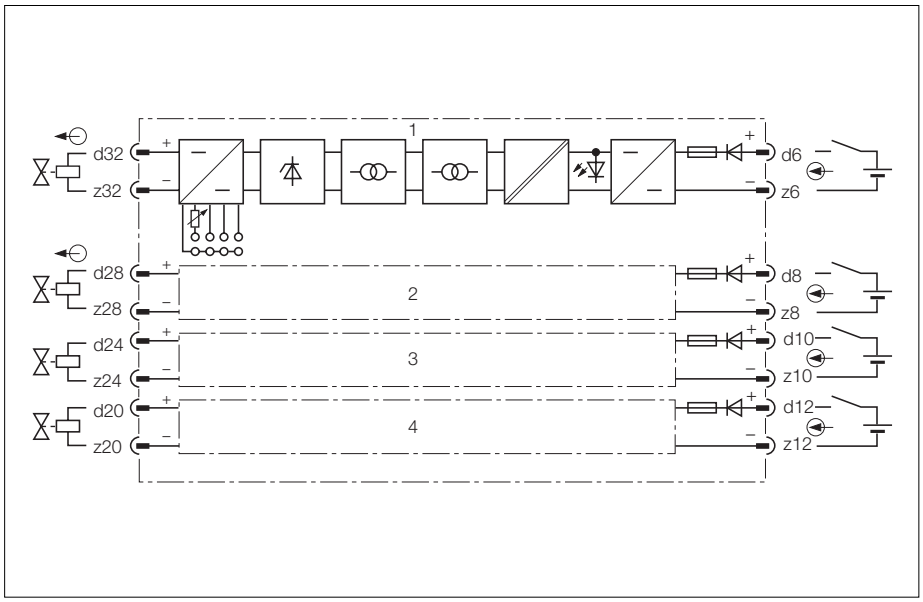
As this card requires no auxiliary power, it can be used in safety relevant applications. The direct control ensures that no voltage is present at the output when the input voltage is turned off.

The output voltage for each channel is jumper programmable:

– MC72-43: 3...14 V/5 V/12 V/15 V
– MC72-44: 5...23 V/5 V/12 V/24 V

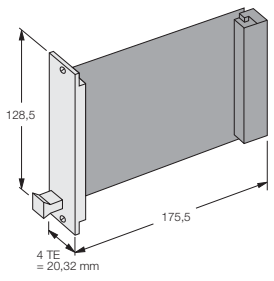
In range 1 (3...14 V or 5...23 V), the voltage can be adjusted between the lowest output voltage (left end stop) and the highest output voltage (right end stop) by means of a potentiometer. This allows accurate selection of the output voltage to fit each application.

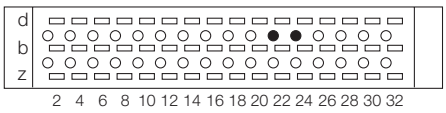
The intrinsically safe output circuits may not be connected together.

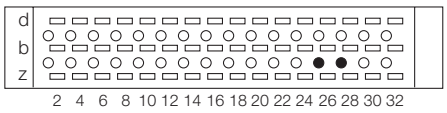


Solenoid Drivers MC72-43Ex-T/MC72-44Ex-T

Type	MC72-43Ex-T	MC72-44Ex-T
Ident-no.	90 713	90 714
Galvanic isolation	output circuit from input circuit 250 V_{rms} test voltage 2.5kV_{rms}	output circuit from input circuit 250 V_{rms} test voltage 2.5kV_{rms}
Input Circuit		
"OFF" signal level	≤ 2 V	≤ 2 V
"ON" signal level	20…30 VDC	20…30 VDC
Input current	≤ 100 mA	≤ 100 mA
Overvoltage release	33 V ± 1.5 V	33 V ± 1.5 V
Output Circuit	transistor output intrinsically safe (DIN EN 50020)	transistor output intrinsically safe (DIN EN 50020)
Output voltage	3…14 V/5 V/12 V/15 V (programmable)	5…23 V/5 V/12 V/24 V (programmable)
Output current	≤ 60 mA, short-circuit protected	≤ 25 mA, short-circuit protected
Switching frequency	≤ 10 Hz	≤ 10 Hz
Ex-Approval acc. to Certification of Conformity	BVS 03 ATEX E285	BVS 03 ATEX E285
Maximum nomial values		
– No-load voltage U_0	≤ 15.6 V	≤ 25.3 V
– Short-circuit current I_0	≤ 66.5 mA	≤ 28.5 mA
– Power P_0	≤ 1.04 W	≤ 0.72 W
External Inductances/Capacitances		
– [EEx ib] IIC	1 mH/120 nF	1 mH/30 nF
– [EEx ib] IIB	1 mH/450 nF	1 mH/150 nF
LED Indications		
– Status indication	yellow	yellow
Eurocard	100 x 160 mm (DIN 41494)	100 x 160 mm (DIN 41494)
Material	glass-fiber reinforced epoxy resin, quality class FR4	glass-fiber reinforced epoxy resin, quality class FR4
Front panel	plastic, 4TE = 20.32 mm individually interlocking	plastic, 4TE = 20.32 mm individually interlocking
Connection	connector per DIN 41612, type F, 32-pole (series z + d)	connector per DIN 41612, type F, 32-pole (series z + d)
Operating temperature	-25…+60 °C	-25…+60 °C
Coding	No. 4	No. 3







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COUPLERS

6

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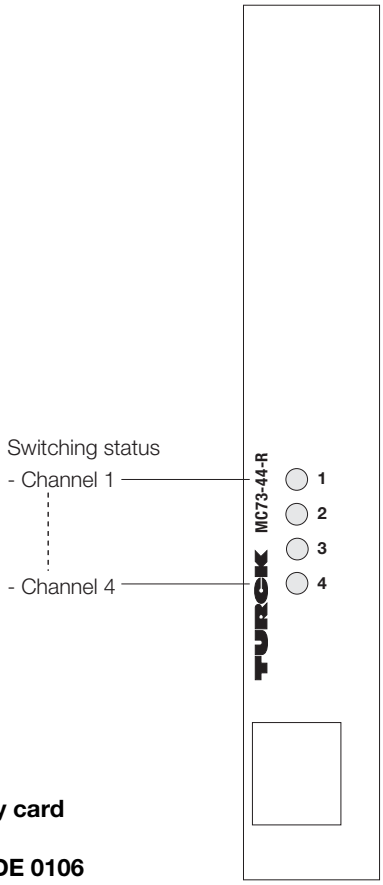
Relay Card MC73-44-R/24VUC four channels



- **Four-channel relay card**
- **Isolation as per VDE 0106 between control and output circuits**
- **Bridge rectifier to accept npn, pnp or AC inputs**
- **Relay as per VDE 0435**
- **Printed circuit boards and connectors as per VDE 0110**
- **8 mm clearances and creepage distances between contacts and input circuits**
- **Output contacts protected by RC snubber**
- **Sealed relays with hard gold-plated contacts**

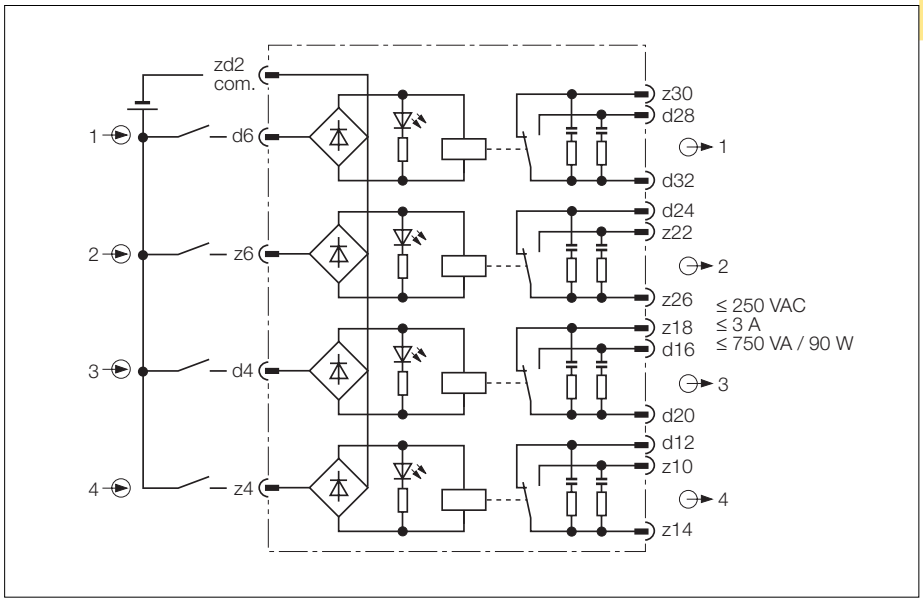
The MC73-44-R is a 4 channel relay card which provides isolation between contacts and input circuits (8 mm/4 kV).

A carefully arranged layout of the printed circuit board ensures maximum clearances and creepage distances. A bridge rectifier connected to the relay coils allows the card to operate with either pnp (current sinking), npn (current sourcing) or AC input devices.

The status of each output relay is indicated by an associated LED on the front panel of the card.

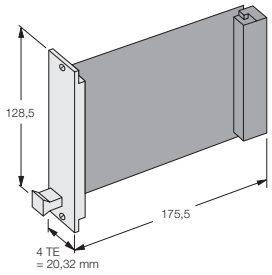
The relay card features output contacts protected by an RC snubber. This enables switching of large inductive loads.

In addition, the use of hard gold-plated contacts enables the card to be used for general control task.



Relay Card MC73-44-R/24VUC

Type	MC73-44-R/24VUC
Ident-no.	90770
Clearances and Creepage Distances	
between control circuit and contacts	8 mm/4 kV
Input Circuits	
Input current	20.4...27.6 VUC
Power/current consumption	≤ 30 mA per channel
Output Circuits	relay output
Contacts	1 change-over contact, silver-alloy + 3 µm Au, with RC snubber circuit
Switching voltage	≤ 250 V
Switching current/continuous current	≤ 3 A
Switching capacity	≤ 750 VA/90 W
Switching frequency	≤ 10 Hz
LED Indications	
– Status indication	yellow
Eurocard	100 x 160 mm (DIN 41494)
Material	glass-fiber reinforced epoxy resin, quality class FR4
Front panel	plastic, 4TE = 20.32 mm individually interlocking
Connection	connector per DIN 41612, type F, 32-pole
Operating temperature	-25…+60 °C



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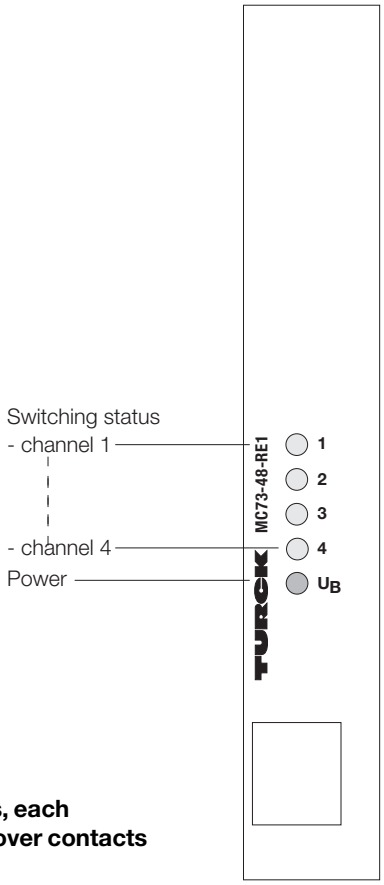
Relay Card MC73-48-RE3/24VDC four channels



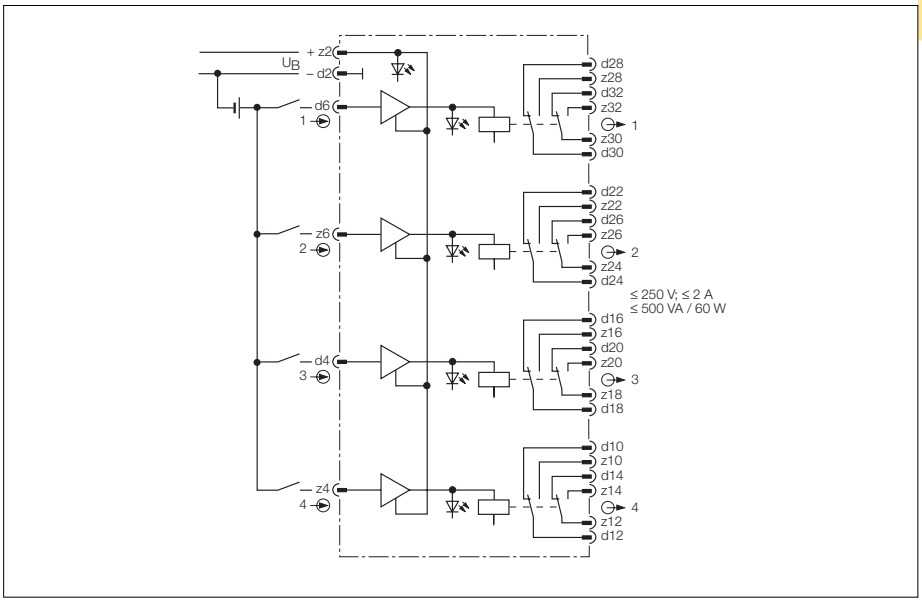
- **Four relay outputs, each with two change-over contacts**
- **Isolation as per VDE 0106 between control and output circuit**
- **Amplifier input**
- **Relay as per VDE 0435**
- **Printed circuit boards and connectors as per VDE 0110**

The MC73-48-R is a 4 channel relay card which provides isolation between output contacts and input circuits (8 mm/4 kV).

A carefully arranged layout of the printed circuit board ensures maximum clearances and creepage distances. A bridge rectifier connected to the relay coils allows the card to operate with either pnp (current sinking), npn (current sourcing) or AC input devices.

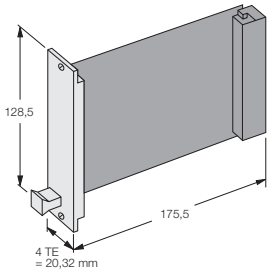
The use of silver-alloy and 3 µm Au contacts enables the cards to be used for large loads as well as general control tasks.

The relay cards are equipped with input signal amplifiers. This makes them suitable for low power input signal processing. At a typical current consumption of 2 mA, the input voltage for the relay card is 17...30 VDC.



Relay Card MC73-48-RE3/24VDC

Type	MC73-48-RE3/24VDC
Ident-no.	90791
Clearances and Creepage Distances	
between control circuit and contacts	8 mm/4 kV
Supply Voltage U_B	20.4...27.6 VDC
Ripple W_{PP}	≤ 10 %
Current consumption	≤ 120 mA
Input Circuits	
Input voltage	17…30 VDC
Power/Current consumption	≤ 2 mA per channel
Output Circuits	relay output
Contacts	2 change-over contacts, silver-alloy + 3 µm Au
Switching voltage	≤ 250 V
Switching current/Continuous current	≤ 2 A
Switching capacity	≤ 500 VA/60 W
Switching frequency	≤ 10 Hz
LED Indications	
– Power	green
– Status indication	yellow
Eurocard	100 x 160 mm (DIN 41494)
Material	glass-fiber reinforced epoxy resin, quality class FR4
Front panel	plastic, 4TE = 20.32 mm individually interlocking
Connection	connector per DIN 41612, type F, 32-pole
Operating temperature	-25…+60 °C



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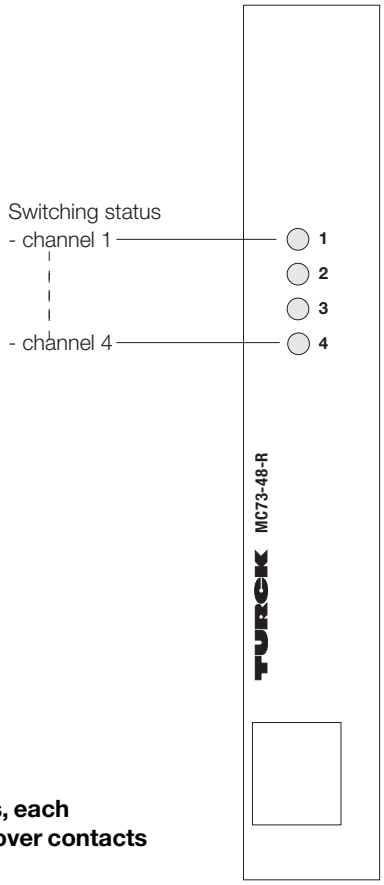
Relay Card MC73-48-R/24VUC four channels

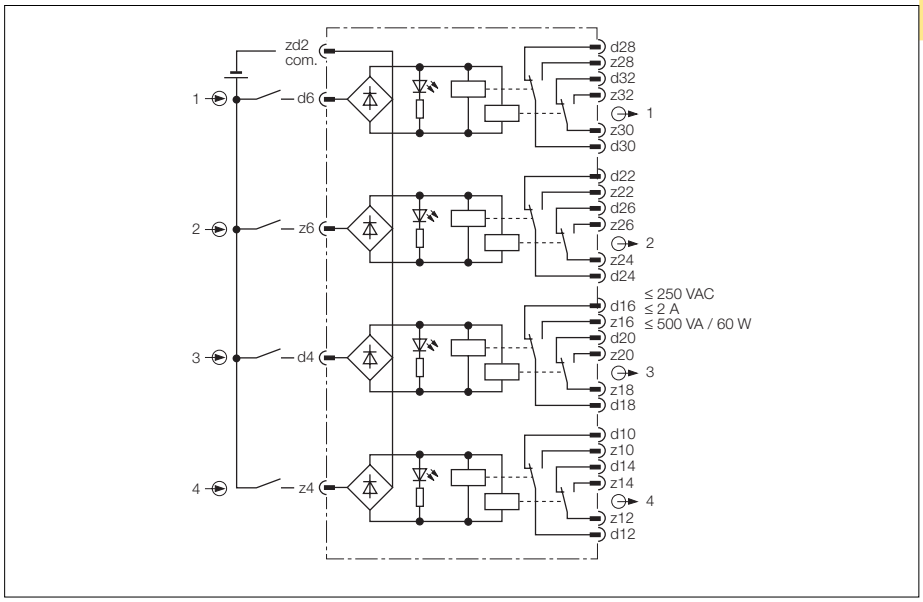


- **Four relay outputs, each with two change-over contacts**
- **Isolation as per VDE 0106 between control and output circuit**
- **Relay as per VDE 0435**
- **Non-polarised control circuits**

The MC73-48-R is a 4 channel relay card which provides isolation between output contacts and input circuits (8 mm/4 kV).

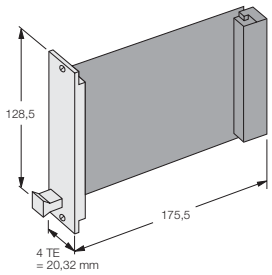
A carefully arranged layout of the printed circuit board ensures maximum clearances and creepage distances. A bridge rectifier connected to the relay coils allows the card to operate with either pnp (current sinking), npn (current sourcing) or AC input devices.

The use of silver-alloy and 3 µm Au contacts enables the cards to be used for large loads as well as general control tasks.



Relay Card MC73-48-R/24VUC

Type	MC73-48-R/24VUC
Ident-no.	90790
Clearances and Creepage Distances	
between control circuit and contacts	8 mm/4 kV
Supply Voltage U_B	
Ripple W_{PP}	–
Power/Current consumption	–
Input Circuits	
Input voltage	20.4...27.6 VUC
Power/current consumption	≤ 30 mA per channel
Output Circuits	relay output
Contacts	2 change-over contacts, silver-alloy + 3 µm Au
Switching voltage	≤ 250 V
Switching current /continuous current	≤ 2 A
Switching capacity	≤ 500 VA/60 W
Switching frequency	≤ 10 Hz
LED Indications	
– Power	–
– Status indication	yellow
Eurocard	100 x 160 mm (DIN 41494)
Material	glass-fiber reinforced epoxy resin, quality class FR4
Front panel	plastic, 4TE = 20.32 mm individually interlocking
Connection	connector per DIN 41612, type F, 32-pole
Operating temperature	-25…+60 °C



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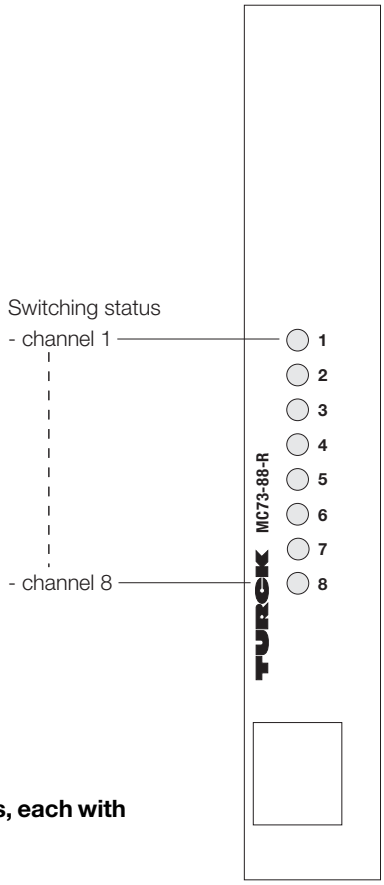
Relay Card MC73-88-R/24VUC eight channels



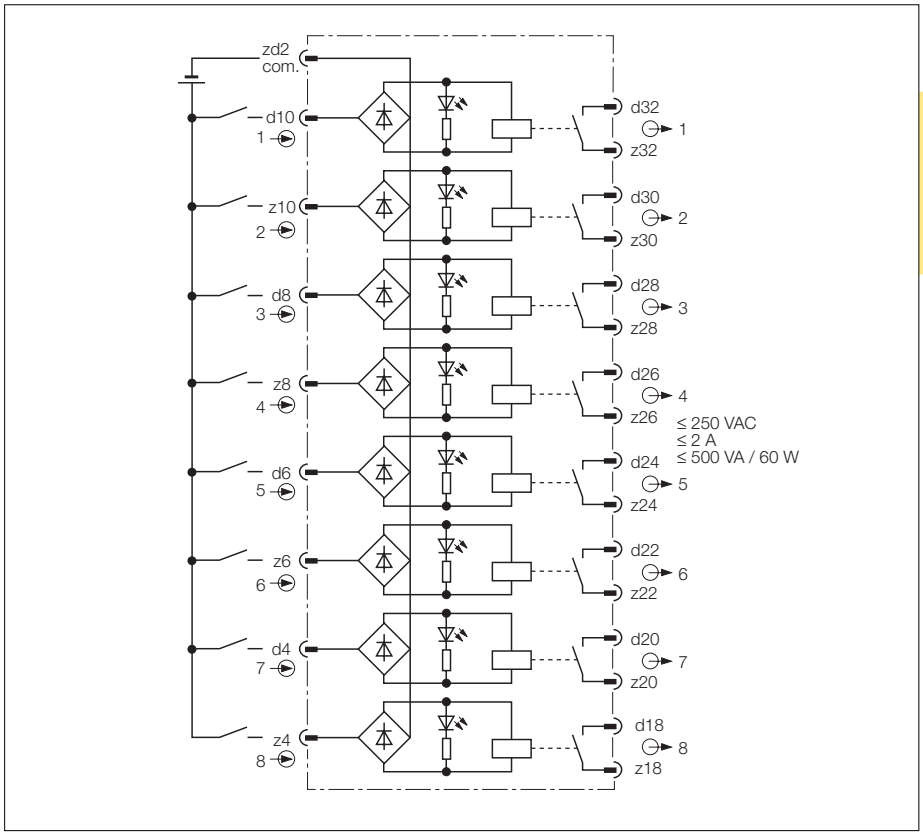
- **Eight relay outputs, each with one N.O. contact**
- **Isolation of input circuits from output circuits as per VDE 0106**
- **With bridge rectifier input**
- **Relay as per VDE 0435**
- **8 mm clearances and creepage distances between contacts and input circuit**
- **Printed circuit boards and connectors as per VDE 0110**
- **Sealed relays with hard gold-plated contacts**

The MC73-88-R is an 8 channel relay card that provides isolation between the contact and input circuit (8 mm/4 kV).

Eight N.O. contacts on the outputs can switch 250 V/2 A each.

A carefully arranged layout of the printed circuit board ensures maximum clearances and creepage distances. A bridge rectifier is wired to the relay coils so the cards can work with either pnp (current sourcing), npn (current sinking) or with AC input devices. As contact material silver-alloy + 3 µm Au is used.

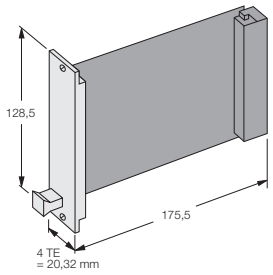
Eight LEDs located on the front cover indicate the status of the respective output relay.



6

Relay Card MC73-88-R/24VUC

Type	MC73-88-R/24VUC
Ident-no.	90792
Clearances and Creepage Distances	
between control circuit and contacts	8 mm/4 kV
Input Circuits	
Input voltage	20.4...27.6 VUC
Power/Current consumption	≤ 30 mA per channel
Output Circuits	relay output
Contacts	1 N.O. contact, silver-alloy + 3 µm Au
Switching voltage	≤ 250 V
Switching current/continuous current	≤ 2 A
Switching capacity	≤ 500 VA/60 W
Switching frequency	≤ 10 Hz
LED Indications	
– Status indication	yellow
Eurocard	100 x 160 mm (DIN 41494)
Material	glass-fiber reinforced epoxy resin, quality class FR4
Front panel	plastic, 4TE = 20.32 mm individually interlocking
Connection	connector per DIN 41612, type F, 32-pole
Operating temperature	-25…+60 °C



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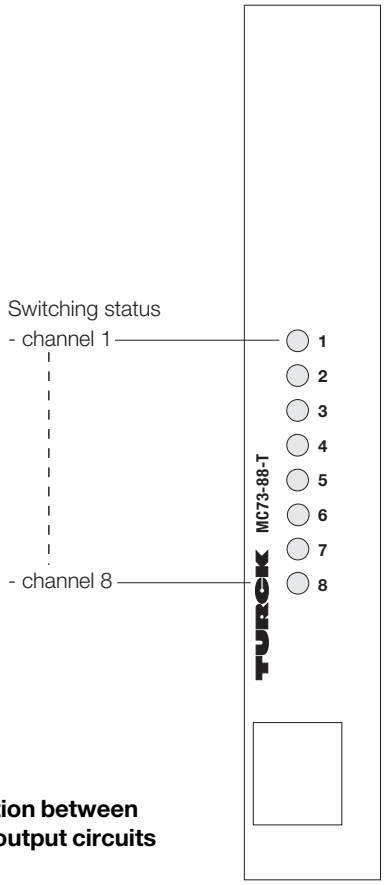
Optocoupler Card with Electronic Output MC73-88-T/24VDC eight channels



- **Full galvanic isolation between input circuits and output circuits**
- **Up to 5 kHz switching frequency**
- **High switching reliability**
- **Low input power**
- **Wide input voltage range**
- **Non-polarised input and output circuits**
- **Short-circuit and overload protected output circuits**
- **Low power load signal amplification**
- **Galvanically isolated input signals for different signal levels**
- **Adaptation of different signal levels**
- **For switching and amplification of control circuits**
- **Complementary input signal**

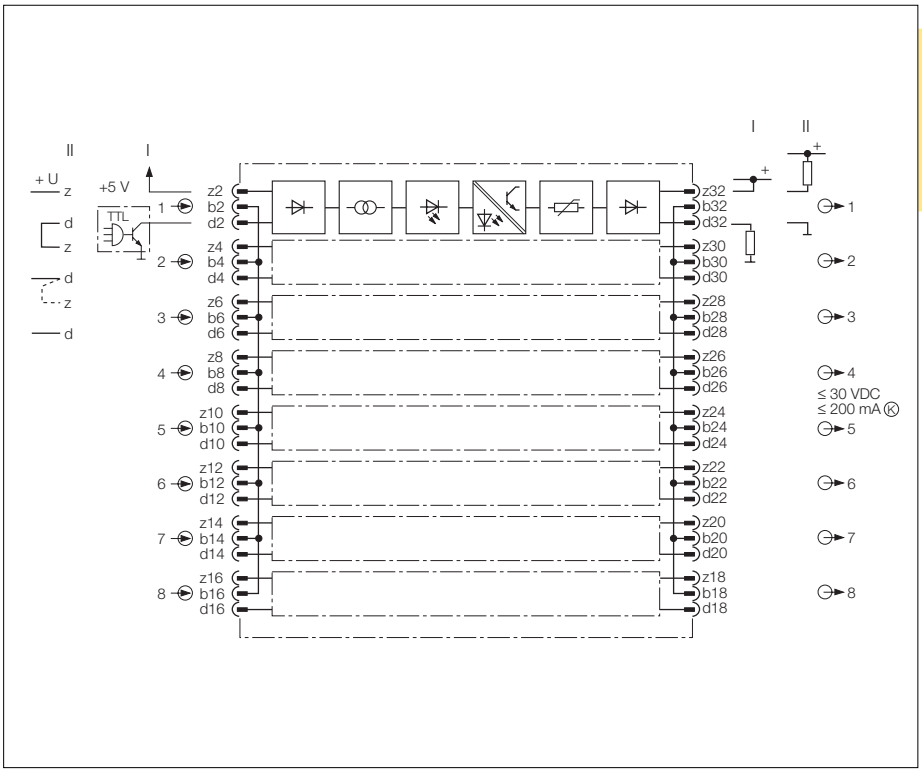
The MC73-88-T relay card provides 8 channels with electronic output circuits for applications where conventional relay cards cannot be used reliably due to their specific contact limitations.

The card is specifically suitable for applications involving:

– high switching frequencies
– low input currents
– minimal load currents

The non-polarised input circuits provide constant current characteristics. This allows a wide range of input voltages for control operations. The output stages are also non-polarised and have short-circuit protection. Yellow LEDs located on the front cover indicate the output status.

The cards are connected via a 32-pole or 48-pole edge connector (type F – DIN 41612). The 48-pole edge connector provides a centre row with grounding terminals mounted on busbars, one for connection of the input and one for the output.



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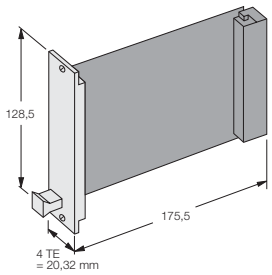
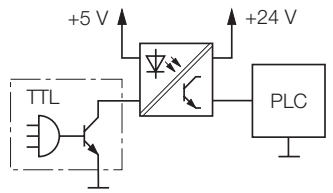
Optocoupler Card with Electronic Output MC73-88-T/24VDC

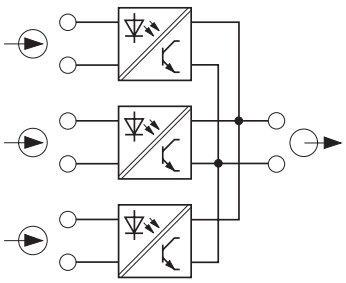
Type	MC73-88-T/24VDC	
Ident-no.	90802	
Galvanic Isolation	input circuits and output circuits from and to each other	
Input Circuits	non polarised	Considering the internal voltage drop up to 4 channels can be connected in series.
Input voltage	5…30 VDC	
Input current	≤ 10 mA (typically 8.5 mA)	
Minimum input pulse	≥ 50 µs	
Minimum off-time	≥ 100 µs	
Output Circuits	transistor isolating transformer, short-circuit prot.	The short-circuit protection characteristics allow inductive and capacitive loads as well as light bulbs to be directly connected to the output circuits. Interconnection of the output circuits poses no problems. For series connection of several output circuits, the sum of all voltage drops must be considered.
Switching voltage	≤ 30 VDC	
Switching current	≤ 200 mA	
Voltage drop	≤ 3 VDC (50 mA) ≤ 4.2 VDC (200 mA)	
Leakage current	≤ 50 µA	
Switching frequency	5 kHz	
Pulse rise time t_{on}	10 µs	
Pulse release time t_{off}	50 µs	
LED Indications		
– Status indication	yellow	
Eurocard	100 x 160 mm (DIN 41494)	
Material	glass-fiber reinforced epoxy resin, quality class FR4	
Front panel	plastic, 4TE = 20.32 m individually interlocking	
Connection	connector per DIN 41612, type F, 32-pole (series z + d) or 48-pole	
Operating temperature	-25…+60 °C	



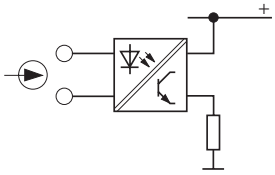
Typical Applications



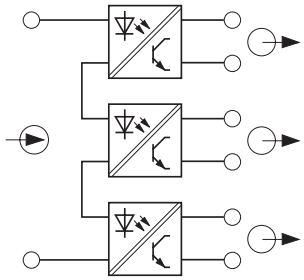
Interface of TTL-output (open collector) with one PLC-input



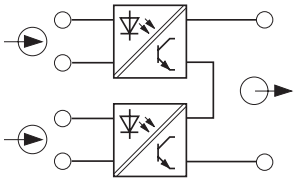
OR-combination



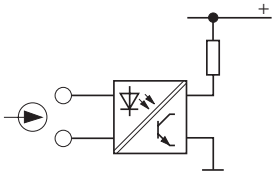
pnp output



Multiplication of an output circuit



AND-combination



npn output

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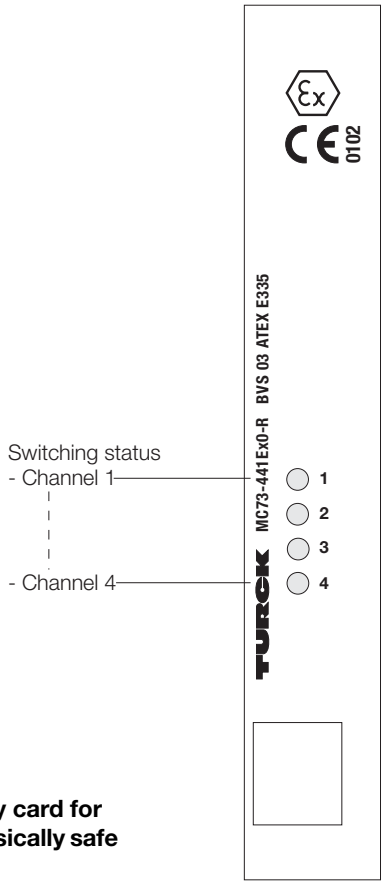
Relay Cards
MC73-441Ex0-R/24VDC
MC73-442Ex0-R/24VDC
four channels



- **Four-channel relay card for switching of intrinsically safe current circuits**
- **Galvanic isolation of input and output circuits according to EN 50020**
- **Printed circuit boards and connectors according to VDE 0110**
- **High quality Reed relays with**

The 4 channel relay cards MC73-441Ex0-R and MC73-442Ex0-R are used to switch intrinsically safe current circuits. They provide isolation between output and control circuit (per EN 50020).

Four LEDs in the front of the device indicate the status of the respective output relay.

The relay cards are available with the following output configurations:

– MC73-441Ex0-R:
four relays with one change-over contact

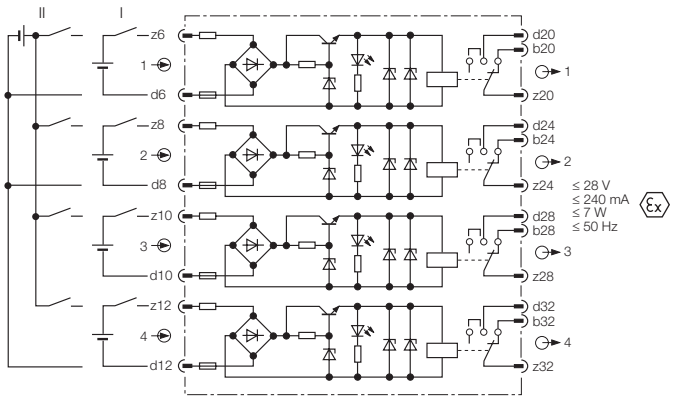
– MC73-442Ex0-R:
four relays with one N.O. contact

At 50 Hz, the switching frequency of the Reed relay is considerably higher than that of standard relays.

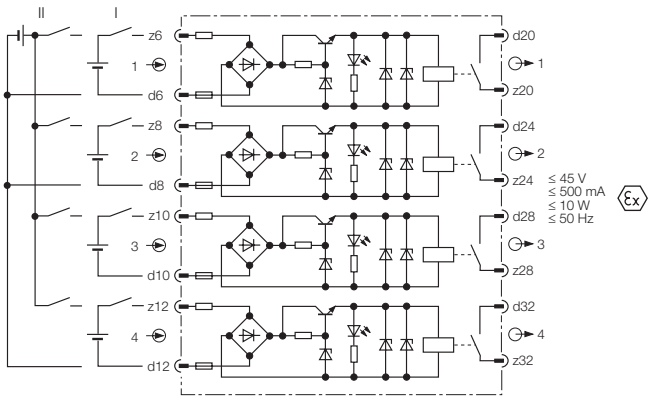
The Reed relay with rhodium contacts can be used for applications where conventional relay cards cannot be used due to their contact limitations.

6

MC73-441Ex0-R/24VDC

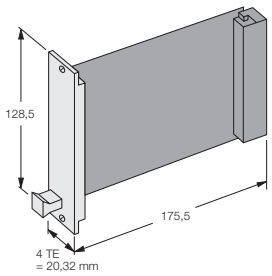


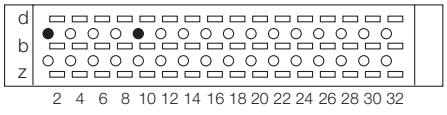
MC73-442Ex0-R/24VDC

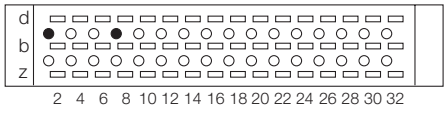


Relay Cards MC73-441Ex0-R/MC73-442Ex0-R

Type	MC73-441Ex0-R/24VDC	MC73-442Ex0-R/24VDC
Ident-no.	9077006	9077007
Galvanic Isolation	galvanic isolation according to EN 50020;	galvanic isolation according to EN 50020;
– between control circuit and contacts	≤ 375 V peak value	≤ 375 V peak value
– between two contact circuits	≤ 90 V peak value	≤ 90 V peak value
Input Circuits		
Input voltage	10...30 VDC	10...30 VDC
Current consumption	≤ 20 mA per channel	≤ 20 mA per channel
Secure switch-off voltage	< 3 V	< 3 V
Output Circuits	Reed relay output for switching of intrinsically safe current circuits EEx ia IIC	Reed relay output for switching of intrinsically safe current circuits EEx ia IIC
Contact material	rhodium	rhodium
Number of contacts	1 change-over contact	1 N.O. contact
Switiching voltage	≤ 28 V	≤ 45 V
Switching current/continuous current	≤ 240 mA	≤ 500 mA
Switching capacity	≤ 7 W	≤ 10 W
Switching frequency	≤ 50 Hz	≤ 50 Hz
Ex-Approvals acc. to Certification of Conformity	BVS 03 ATEX E335	BVS 03 ATEX E335
– Li, Ci	negligible	negligible
LED Indications		
– Status indication	yellow	yellow
Eurocard	100 x 160 mm (DIN 41494)	100 x 160 mm (DIN 41494)
Material	glass-fiber reinforced epoxy resin, quality class FR4	glass-fiber reinforced epoxy resin, quality class FR4
Front panel	plastic, 4TE = 20.32 mm individually interlocking	plastic, 4TE = 20.32 mm individually interlocking
Connection	connector per DIN 41612, type F, 48-pole	connector per DIN 41612, type F, 32-pole
Operating temperature	-25...+60 °C	-25...+60 °C
Coding	No. 104	No. 103







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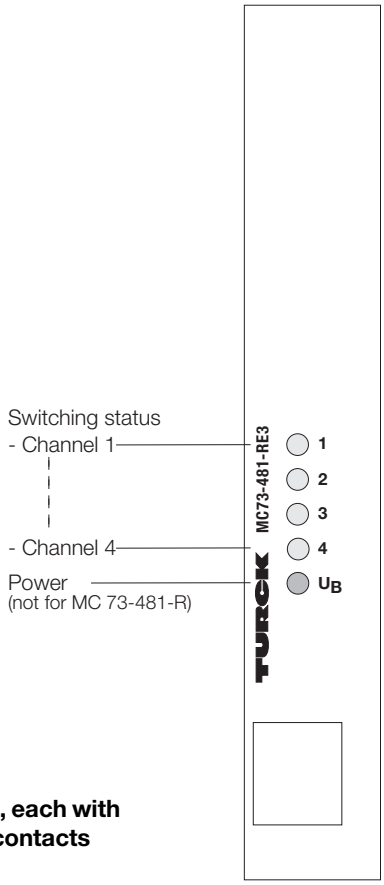
Relay Cards
MC73-481-R/24VUC
MC73-481-RE.../24VDC
four channels



- **Four relay outputs, each with two change-over contacts**
- **Galvanic isolation of input and output circuits**
- **For low switching frequencies**
- **Safe contact switching also for low level signal input**
- **Bridge rectifier or input signal amplifier**
- **Relay according to VDE 0435**

The 4 channel relay card MC73-481-R can be used to switch loads located in low voltage environments. The relays are gas tight. The use of silver cadmium oxide with hard gold-plated contacts makes the card suitable for low level switching.

The MC73-48-R is available for the switching of power supplies.

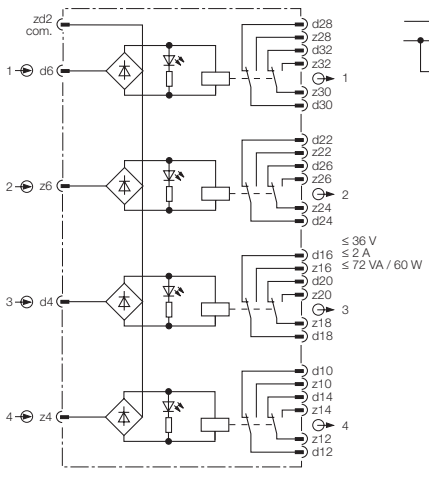
A bridge rectifier connected to the relay coils allows the card to operate with either pnp (current sinking) or npn (current sourcing), or AC input devices.

The relay cards are also available with input signal amplifier (type: MC73-481-RE...). This makes them suitable for low power input signal processing.

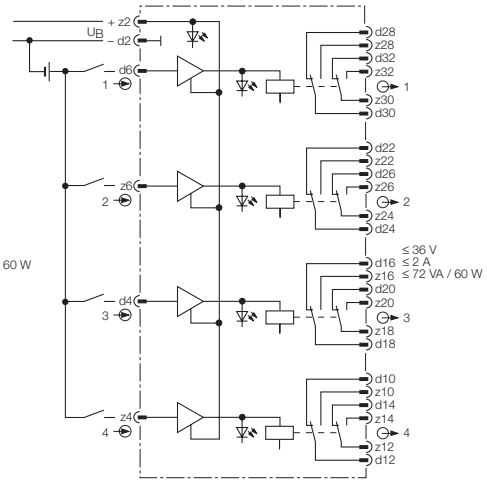
At a typical current consumption of 2 mA, the input voltage ranges for these relays are:
– 3...8 VDC (MC73-481-RE1)
– 7...18 VDC (MC73-481-RE2)
– 17...30 VDC (MC73-481-RE3).

6

MC73-481-R

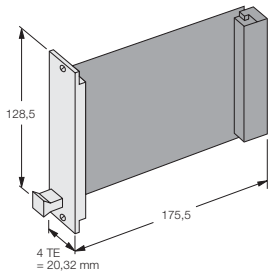


MC73-481-RE...



Relay Cards MC73-481-R/24VUC/MC73-481-RE.../24VDC

Type	MC73-481-R/24VUC	MC73-481-RE1/24VDC
Ident-no.	9079440	9079453
Clearances and Creepage Distances		
between control circuit and contacts	4 mm/1 kV	4 mm/1 kV
Supply Voltage U_B	–	20.4...27.6 VDC
Ripple W_{PP}	–	≤ 10 %
Current consumption	–	≤ 80 mA
Input Circuits		
Input voltage	20.4...27.6 VUC	3...8 VDC
Current consumption	≤ 20 mA per channel	≤ 2 mA per channel
Output Circuits	relay output	relay output
Contacts	2 change-over contacts, silver-alloy + 3 µm Au	2 change-over contacts, silver-alloy + 3 µm Au
Switching voltage	≤ 36 V	≤ 36 V
Switching current/continuous current	≤ 2 A	≤ 2 A
Switching capacity	≤ 72 VA/60 W	≤ 72 VA/60 W
Switching frequency	≤ 10 Hz	≤ 10 Hz
Minimum load	0.05 mA at 50 mVDC	0.05 mA at 50 mVDC
LED Indications		
– Power	–	green
– Status indication	yellow	yellow
Eurocard	100 x 160 mm (DIN 41494)	
Material	glass-fiber reinforced epoxy resin, quality class FR4	
Front panel	plastic, 4TE = 20.32 mm individually interlocking	
Connection	connector per DIN 41612, type F, 32-pole	
Operating temperature	-25...+60 °C	



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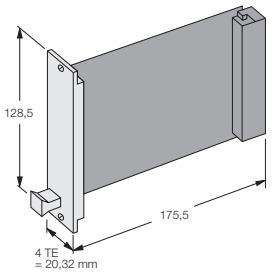
Relay Cards MC73-481-RE...

Type	MC73-481-RE2/24VDC	MC73-481-RE3/24VDC
Ident-no.	9079452	9079450
Clearances and Creepage Distances		
between control circuit and contacts	4 mm/1 kV	4 mm/1 kV
Supply Voltage U_B	20.4...27.6 VDC	20.4...27.6 VDC
Ripple W_{PP}	≤ 10 %	≤ 10 %
Current consumption	≤ 80 mA	≤ 80 mA
Input Circuits		
Input voltage	7...18 VDC	17...30 VDC
Current consumption	≤ 2 mA per channel	≤ 2 mA per channel
Output Circuits	relay output	relay output
Contacts	2 change-over contacts, silver-alloy + 3 µm Au	2 change-over contacts, silver-alloy + 3 µm Au
Switching voltage	≤ 36 V	≤ 36 V
Switching current/continuous current	≤ 2 A	≤ 2 A
Switching capacity	≤ 72 VA/60 W	≤ 72 VA/60 W
Switching frequency	≤ 10 Hz	≤ 10 Hz
Minimum load	0.05 mA at 50 mVDC	0.05 mA at 50 mVDC
LED Indications		
– Power	green	green
– Status indication	yellow	yellow
Eurocard	100 x 160 mm (DIN 41494)	
Material	glass-fiber reinforced epoxy resin, quality class FR4	
Front panel	plastic, 4TE = 20.32 mm individually interlocking	
Connection	connector per DIN 41612, type F, 32-pole	
Operating temperature	-25...+60 °C	



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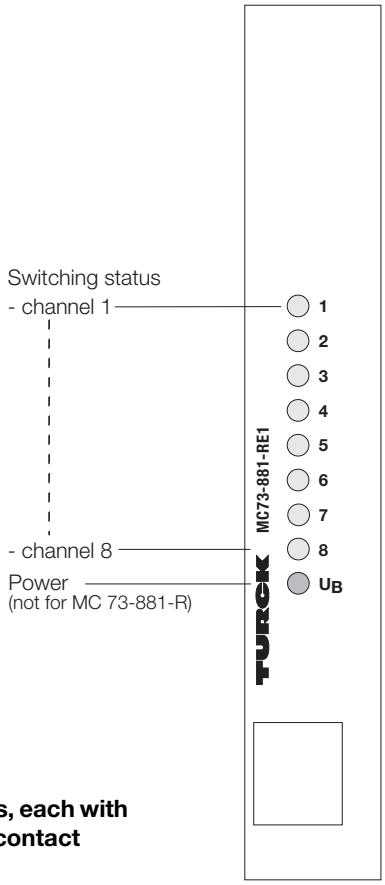
Relay Cards
MC73-881-R/24VUC
MC73-881-RE3/24VDC
four channels



- **Eight relay outputs, each with one change-over contact**
- **Contact material silver-alloy + 3 µm Au**
- **Reliable isolation of input circuits from output circuits per VDE 0106**
- **Bridge rectifier or amplifier input**
- **Relay according to VDE 0435**
- **Printed circuit boards and connectors according to VDE 0110**
- **8 mm clearances and creepage distances between control circuit and contacts**

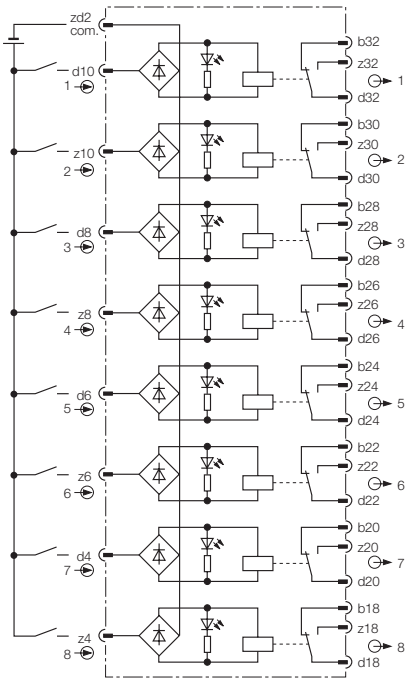
The 8 channel MC73-881-R relay provides isolation between contact and control circuits (8 mm/4 kV).

A carefully arranged layout of the printed circuit board ensures maximum clearances and creepage distances. A bridge rectifier is wired to the relay coils so the card can work with either pnp (current sourcing), npn (current sinking) or with AC input devices.

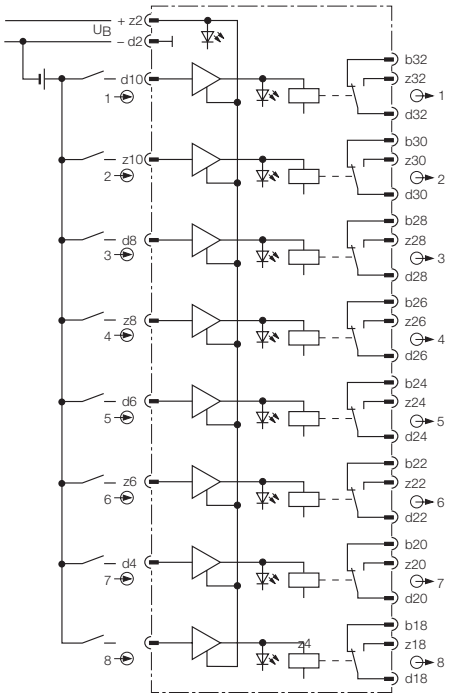
8 LEDs located on the front panel indicate the status of the respective output relay.

The relay cards are also available with input signal amplifiers for low power input signal processing (type MC73-881-RE...).
At a typical current consumption of 2 mA, the input voltage range for these relays is 17…30 VDC.

MC73-881-R



MC73-881-RE3



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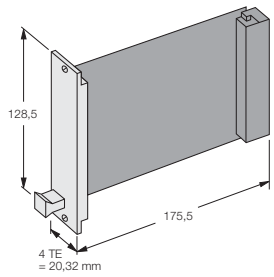
Relay Cards MC73-881-R/24VUC/MC73-881-RE3/24VDC

Type	MC73-881-R/24VUC	MC73-881-RE3/24VDC
Ident-no.	90793	90794
Clearances and Creepage Distances		
between control circuit and contacts	8 mm/4 kV	8 mm/4 kV
Supply Voltage U_B	–	18...35 VDC
Ripple W_{PP}	–	≤ 10 %
Current consumption	–	≤ 200 mA
Input Circuits		
Input voltage	20.4...27.6 VUC	17…30 VDC
Current consumption	≤ 25 mA per channel	≤ 2 mA per channel
Output Circuits	relay output	relay output
Contacts	1 change-over contact, silver-alloy + 3 µm Au	1 change-over contact, silver-alloy + 3 µm Au
Switching voltage	≤ 36 V	≤ 36 V
Switching current/continuous current	≤ 2 A	≤ 2 A
Switching capacity	≤ 72 VA/60 W	≤ 72 VA/72 W
Switching frequency	≤ 10 Hz	≤ 10 Hz
LED Indications		
– Power	–	green
– Status indication	yellow	yellow
Eurocard	100 x 160 mm (DIN 41494)	100 x 160 mm (DIN 41494)
Material	glass-fiber reinforced epoxy resin, quality class FR4	glass-fiber reinforced epoxy resin, quality class FR4
Front panel	plastic, 4TE = 20.32 mm individually interlocking	plastic, 4TE = 20.32 mm individually interlocking
Connection	connector per DIN 41612, type F, 48-pole	connector per DIN 41612, type F, 48-pole
Operating temperature	-25…+60 °C	-25…+60 °C



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Industrial Automation

POWER SUPPLIES/ FUSE CARDS

7

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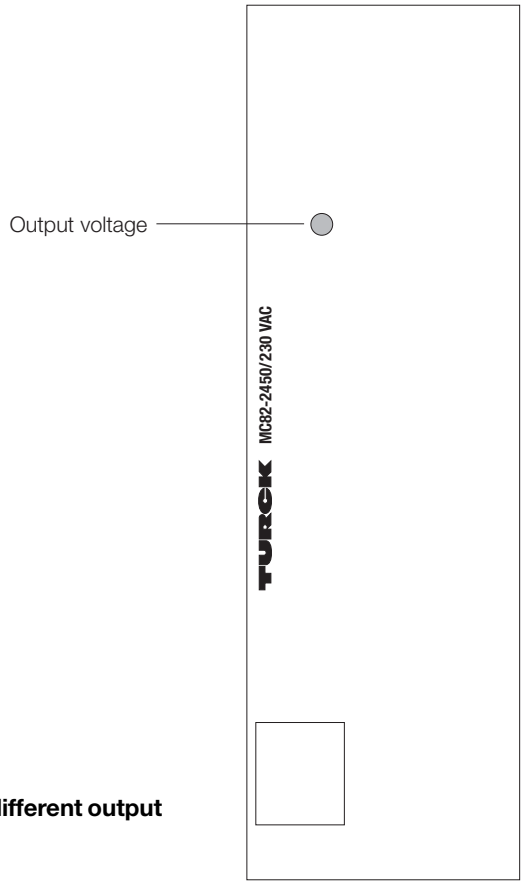
Power Supplies
MC82-2425/230VAC
MC82-2450/230VAC



- **Two versions for different output currents**
- **Short-circuit and overload protected**
- **Selectable primary voltages 100...127 VAC/ 220...240 VAC**
- **Output voltage indication via LED**
- **Ideal extension of the *multicart*® product range**

The current supplies, type MC82-24... are designed for the supply of DC loads, especially for supply of switching and monitoring devices of the *multicart*® series.

There are two versions with different output specifications:

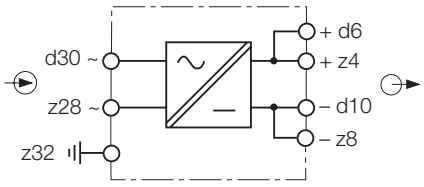
– 24 VDC/2.5 A/60 W (MC82-2425)
– 24 VDC/5.0 A/120 W (MC82-2450)

The outputs are short-circuit and overload protected.

By connecting several MC82... power supplies of the same type in parallel, it is possible to increase the system's power capacity. In this case, the power is automatically distributed symmetrically.

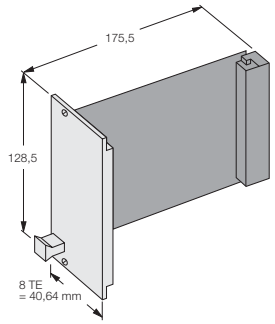
The devices withstand interferences as set forth in IEC 1000-4 (IEC 801) and VDE 0160 class 2, even under full load conditions. Construction and design accord to EN 60950, VDE 0805 and VBG 4.

If the green output voltage LED illuminates, the load supply of > 20.4 V is assured.



Power Supplies MC82-2425/MC82-2450

Type	MC82-2425/230VAC	MC82-2450/230VAC
Ident-no.	9087210	9087220
Galvanic isolation	according to EN 60950, VDE 0805	according to EN 60950, VDE 0805
Load rating	2.5 A ($T_u \leq 55$ °C)	5.0 A ($T_u \leq 55$ °C)
Derating	1 W/K from +55 °C up to +70 °C	1 W/K from +55 °C up to +70 °C
Supply voltage U_B	100...127 VAC/220...240 VAC selectable	100...127 VAC/220...240 VAC selectable
Line frequency	47…63 Hz	47...63 Hz
Current consumption	max. 1.3 A_{eff}/0,7 A_{eff} at 115/230 VAC	max. 3 A_{eff}/1.4 A_{eff} at 115/230 VAC
Output voltage	24 VDC ± 2 %	24 VDC ± 2 %
Start-up delay	typ. 5 ms	typ. 5 ms
Ripple W_{pp}	≤ 30 mV_{pp} (20 Hz...200 kHz)	≤ 30 mV_{pp} (20 Hz...200 kHz)
LED indications		
– output voltage	green	green
Eurocard	100 x 160 mm (DIN 41494)	100 x 160 mm (DIN 41494)
Material	glass-fibre reinforced epoxy resin quality class FR4	glass-fibre reinforced epoxy resin quality class FR4
Front panel	plastic, 8 TE = 40.64 mm for individual interlocking	plastic, 8 TE = 40.64 mm for individual interlocking
Connection	connectors as per DIN 41612, type H15, 15-pole (series z+d) (included in delivery)	connectors as per DIN 41612, type H15, 15-pole (series z+d) (included in delivery)
Ultilisation category	KSF (DIN 40040)	KSF (DIN 40040)
Pollution degree	max. 2 (VDE 0110 part 1)	max. 2 (VDE 0110 part 1)
Operating temperature	0…+70 °C	0…+70 °C
Storage temperature	-20...+100 °C	-20...+100 °C



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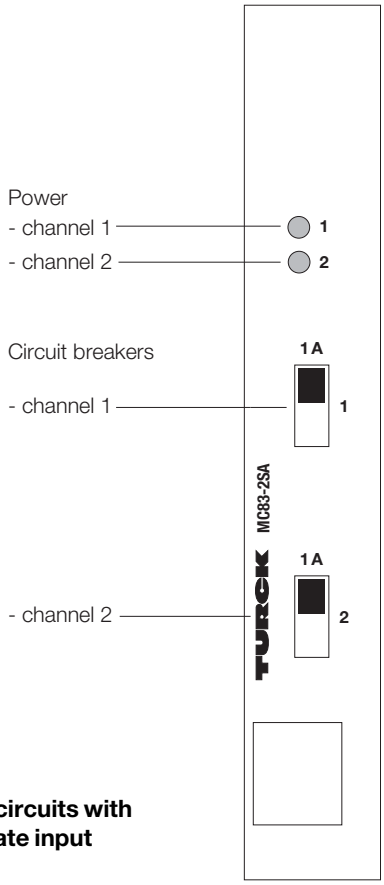
Circuit-Breaker Card MC83-2SA... two channels



- **Protection of two circuits with common or separate input**
- **Primary protection up to 250 VAC/5 A or secondary protection up to 28 VDC/5 A**
- **Fault indication via alarm contacts (change-over) and LED indication**
- **Current rating up to 2 x 5 A**

The circuit-breaker card MC83-2SA is equipped with two thermally activated circuit-breakers. Two circuits with common or separate input and a common earth can be connected.

The unit is suitable for protection up to 250 VAC/5 A (primary side) and 28 VDC/ 5 A (secondary side). Combined operation of primary and secondary side is **not permissible**.

The tripping of a circuit-breaker will be monitored and fed to the output terminals (one change-over contact output per channel).

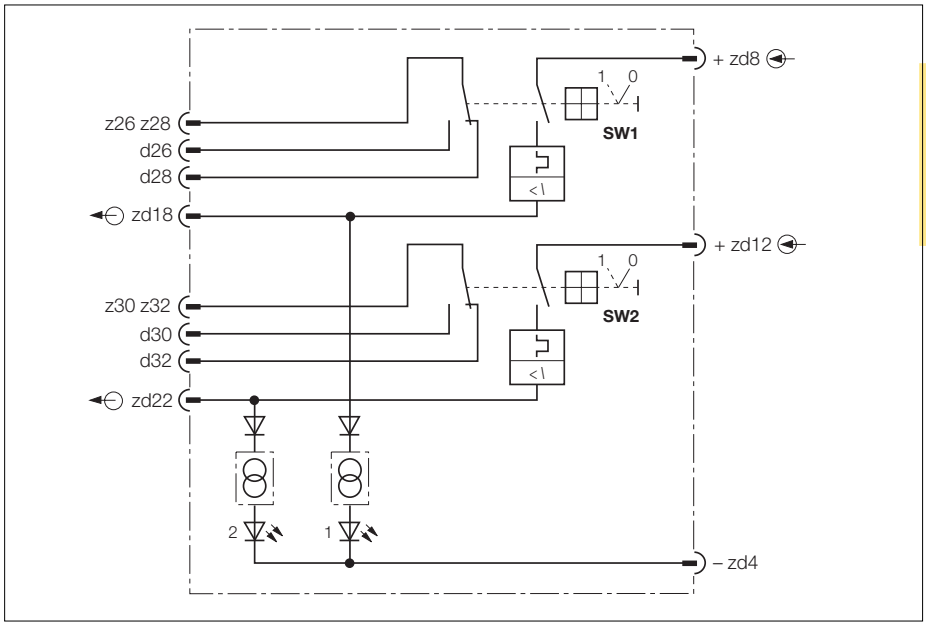
Two green LEDs on the front panel of the card indicate when voltage is applied and fed to the output terminals.

A toggle switch is provided for manual interruption of the circuits.

The fuse monitor has options for nominal currents of 0.1...5 A (as indicated in the suffix of the type designation).
Standard types are:

– MC83-2SA/1A for 1 A
– MC83-2SA/2A for 2 A
– MC83-2SA/4A for 4 A

Other versions available upon request.



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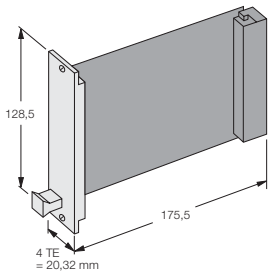
Circuit-Breaker Card MC83-2SA...

Type (Standard types)	MC83-2SA/1A	MC83-2SA/2A	MC83-2SA/4A
Ident-no.	9089010	9089020	9089040
Circuit breakers			
Nominal current	1 A	2 A	4 A
Voltage	≤ 250 VAC/≤ 28 VDC	≤ 250 VAC/≤ 28 VDC	≤ 250 VAC/≤ 28 VDC
Alarm circuits	1 change-over contact/channel	1 change-over contact/channel	1 change-over contact/channel
Switching voltage	≤ 250 VAC/≤ 36 VDC	≤ 250 VAC/≤ 36 VDC	≤ 250 VAC/≤ 36 VDC
Switching current	≤ 1 A	≤ 1 A	≤ 1 A
LED indications			
– Power	green (2 x)	green (2 x)	green (2 x)
Eurocard	100 x 160 mm (DIN 41494)	100 x 160 mm (DIN 41494)	100 x 160 mm (DIN 41494)
Material	glass-fiber reinforced epoxy resin, quality class FR4	glass-fiber reinforced epoxy resin, quality class FR4	glass-fiber reinforced epoxy resin, quality class FR4
Front panel	plastic, 4TE = 20.32 mm individually interlocking	plastic, 4TE = 20.32 mm individually interlocking	plastic, 4TE = 20.32 mm individually interlocking
Connection	connector per DIN 41612, type F, 32-pole (series z+d)	connector per DIN 41612, type F, 32-pole (series z+d)	connector per DIN 41612, type F, 32-pole (series z+d)
Operating temperature	-25...+60 °C	-25...+60 °C	-25...+60 °C



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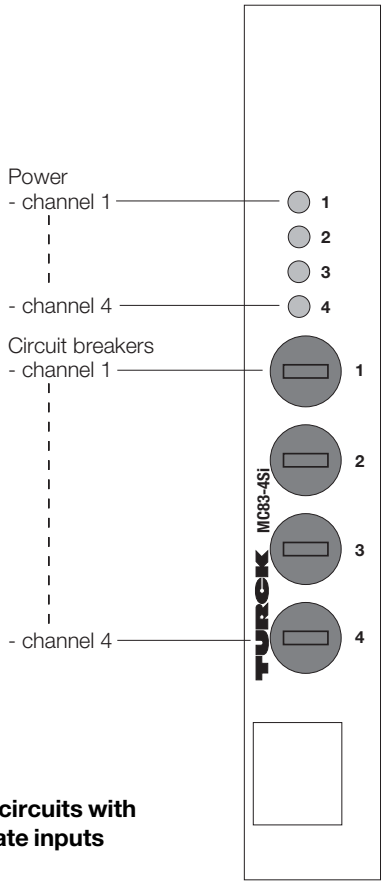
Fuse Card MC83-4Si/24VDC four channels



- **Protection of four circuits with common or separate inputs**
- **Relay and transistor output for fuse failure indication**
- **Front panel LED indications**
- **Current rating 4 x 5 A**
- **Relay with hard gold-plated contact**

The fuse card MC83-4Si is used to protect modules in 19" racks and to identify possible fuse failure conditions.

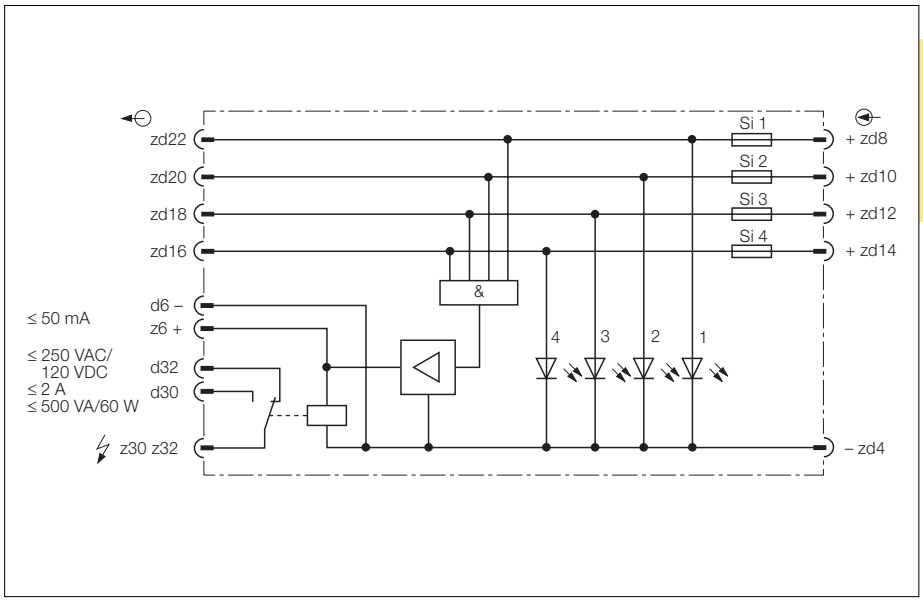
The card has four channels. It can be used for one single 19” rack holding 21 plug-in terminals divided into four groups of five cards each.

The card will protect four different current circuits having a common potential.

The fuse holders are built into the front panel to allow for fuse replacement without removing the card from the rack.

An alarm message will be given when a fuse blows. This is achieved by using a relay and a pnp transistor output.

A front-cover LED is assigned to each channel. An illuminated LED indicates power "ON". If a fuse is blown, the LED turns off.



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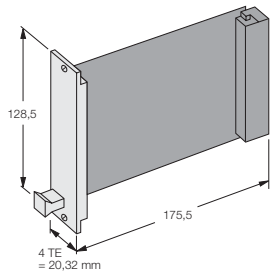
Fuse Card MC83-4Si/24VDC

Type	MC83-4Si/24VDC
Ident-No.	90894
Fuse Circuits	
Voltage	19.2...28.8 VDC
Maximum load current	≤ 5 A per channel
Fuse	glass fuse 5 x 20
Output Circuits	common alarm
Transistor output	pnp, short-circuit protected
– Switching voltage	voltage in fuse circuit
– Switching current	≤ 50 mA
– Voltage drop	≤ 3 VDC (50 mA)
Relay output	
– Number of contacts	one change-overcontact, silver-alloy + 3 µm Au
– Switching voltage	≤ 250 V
– Swiching current	≤ 2 A
– Switching capacity	≤ 500 VA/60 W
LED Indications	
– Power	green (4 x)
Eurocard	100 x 160 mm (DIN 41494)
Material	glass-fiber reinforced epoxy resin, quality class FR4
Front panel	plastic, 4TE = 20.32 mm individually interlocking
Connection	connector per DIN 41612, type F, 32-pole (series z+d)
Operating temperature	-25…+60 °C



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Industrial Automation

ACCESSORIES

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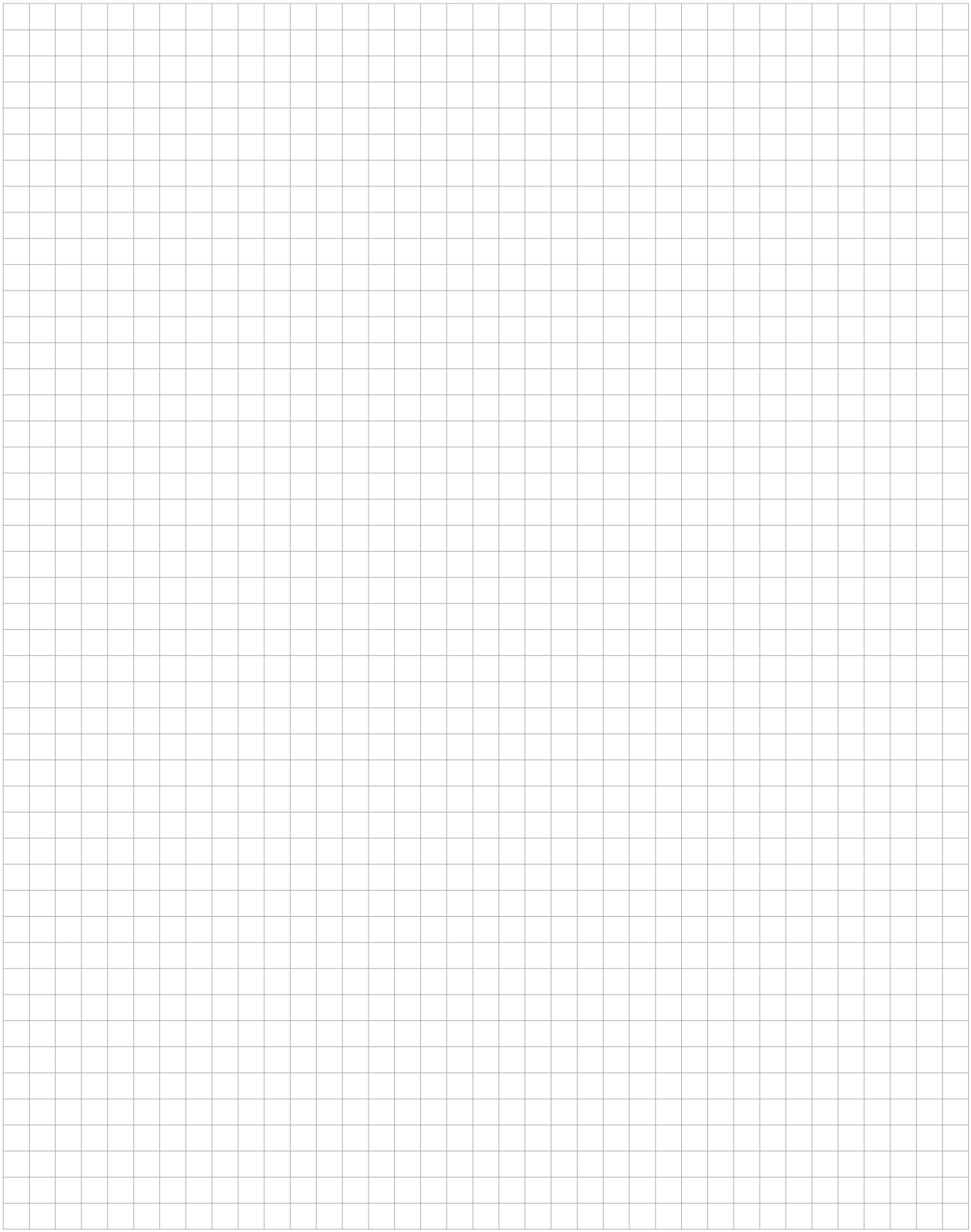

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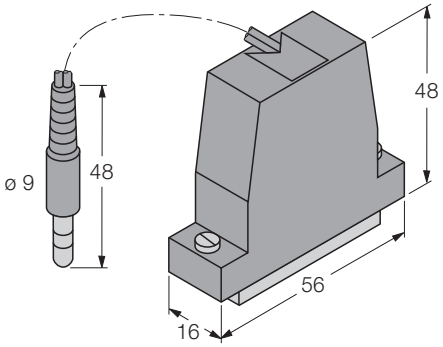


IM-PROG Programming Adapter for Parameterisation of TURCK Devices via FDT

- **Adapter for parameterisation of TURCK devices via the serial PC interface and FDT**
- **FDT frame application PACT*ware*™ is downloadable free of charge from www. TURCK.com**
- **Galvanically isolated signal transmission**

The IM-PROG adapter is used for FDT parameterisation of TURCK devices with FDT compatibility via the serial interface of a PC.

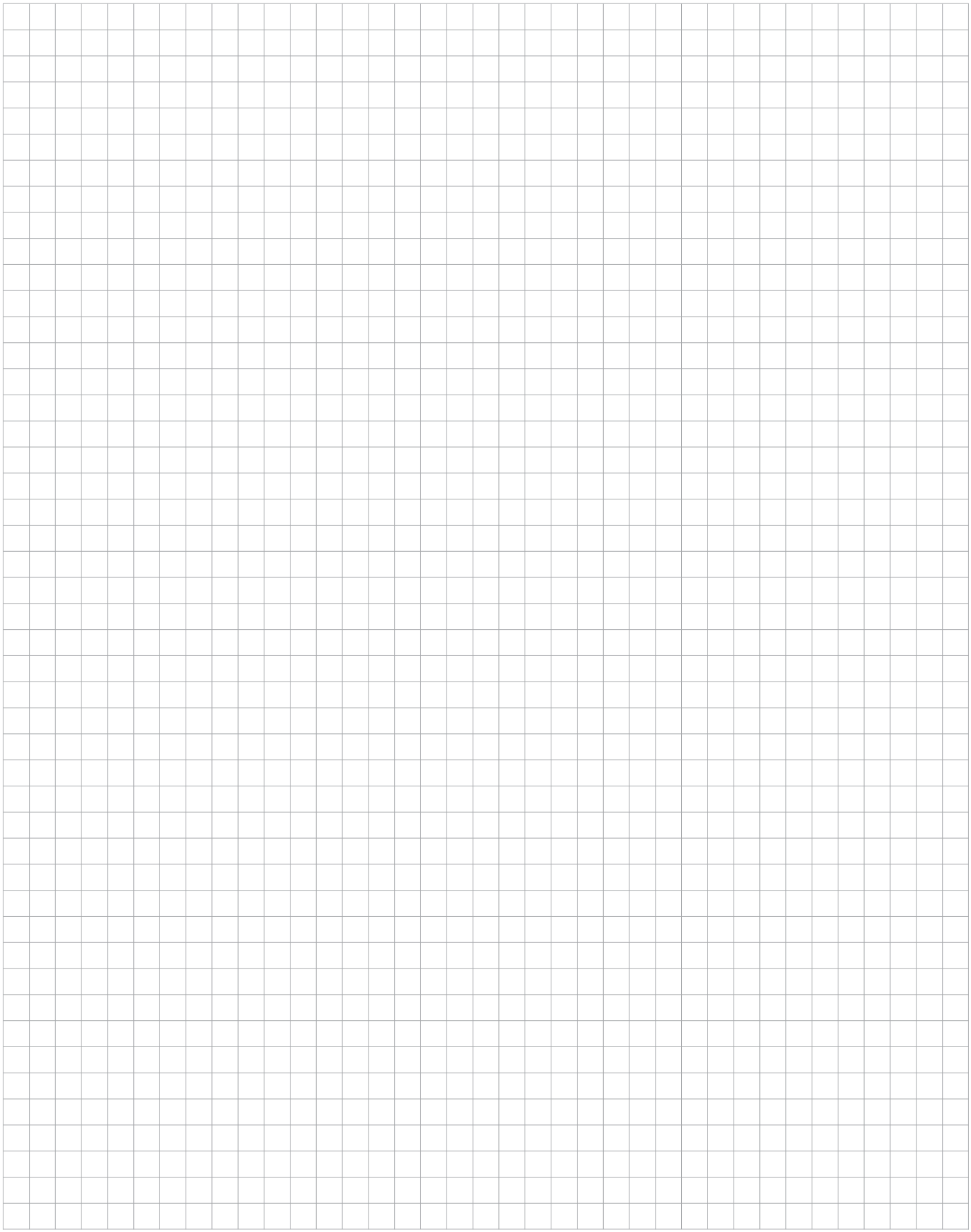
The interface device to be parameterised is connected to the serial interface of the PC via the IM-PROG adapter using the included connection cable.

The interface device must be connected to the voltage supply for parameterisation.

The IM-PROG converts the signal level and implements galvanic isolation between PC and interface device.

Additionally, the parameters may be stored in the computer or printed on a connected printer.

Type	IM-PROG
Ident-no.	6890422
Connection	
– *interfacemodul*	3.5 mm jack
– PC	25-pole RS232 interface or via supplied adapter on the 9-pole RS232 interface
Cable length	1.0 m
Galvanic isolation	60 V



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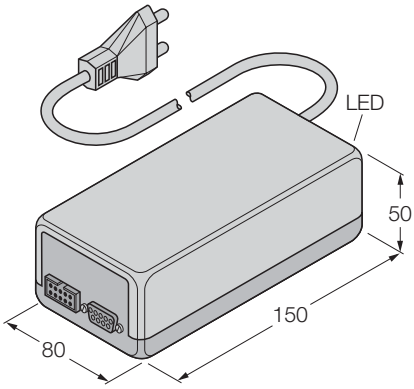
Interface module MC-IM-232



- **Signal level converter for the connection of TURCK processor cards to the serial interface of a PC**
- **Built-in power supply for connected cards**
- **With DOS programming disk for card parameter programming**
- **Not suited for PACT*ware*™ devices**

For parameter programming via PC, the MC-IM-232 interface module is required. The interface module performs an inter-face function between TURCK processor cards and the serial inter-face of a PC.

The MC-IM-232 interface module connects the card to the interface of the PC via the connection cable provided with the module.

The interface module has an integrated 230 VAC power supply. It is not permitted to use an auxiliary power supply with the card.

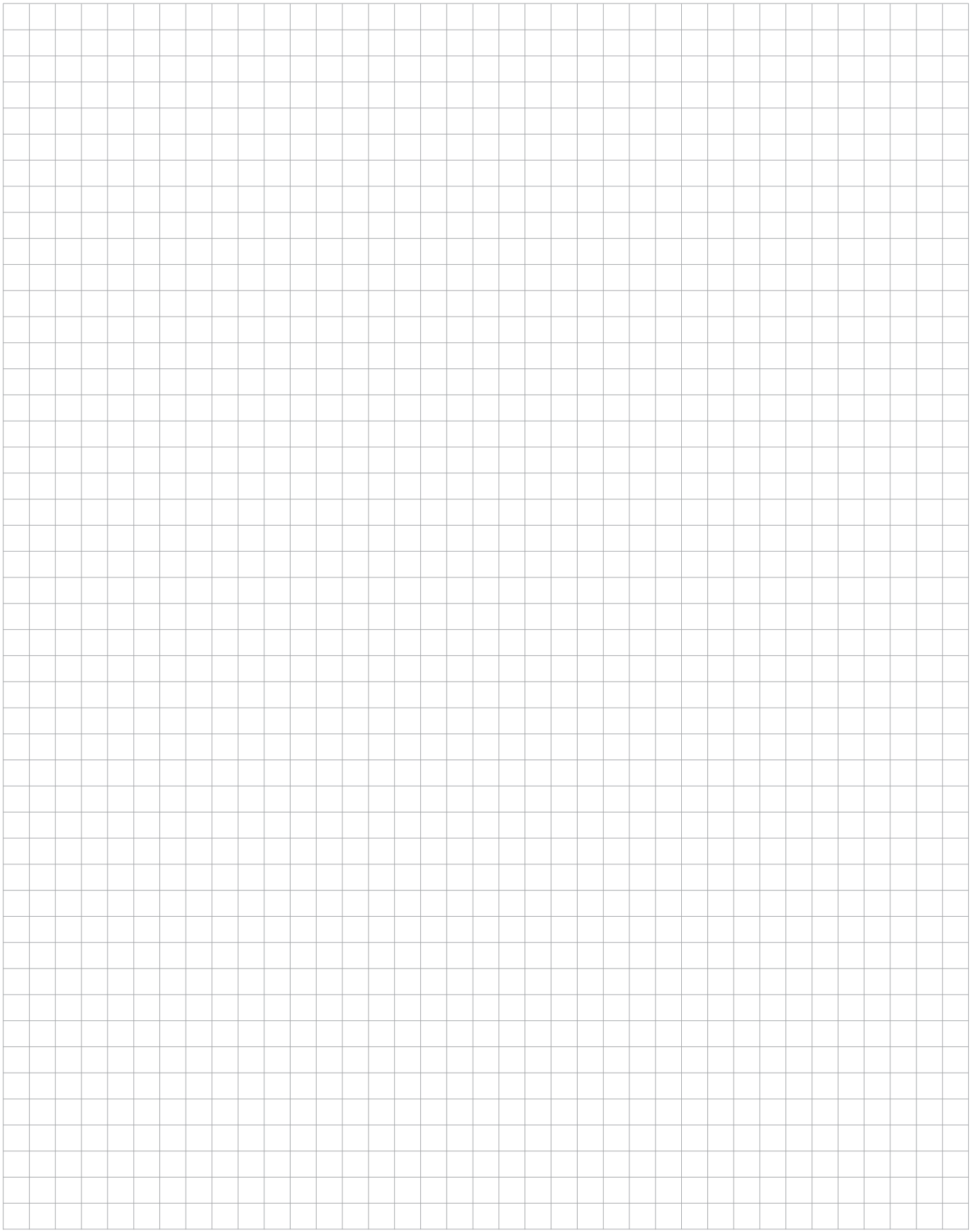
The interface module converts signals from the RS232 card interface into PC signals.
The parameter setting software for the processor card (except for cards with PACT*ware*™ parameterisation) is included. All card parameters can be stored in the PC and printed on a connected printer.

ESC Lockout on the Front Panel

The left toggle switch on the front panel (ESC) can be controlled by PC to inhibit parameter adjustments during operation. The ESC function can only be enabled via PC.

The parameter scan during system operation ist not affected by the ESC lockout.

Type	MC-IM-232
Ident-no.	9909602
Supply voltage	196...253 VAC
Line frequency	48...62 Hz
Galvanic isolation	between input circuits, output circuits and supply voltage for 250 V_{rms}, test voltage 2.5 kV_{rms}
Interface	
To card	RS232serial/V.24 with + 5 V signal levels
To PC	RS232serial/V.24 with ± 12 V signal levels
Compact housing	150 x 50 x 80 mm (l x w x h)
Connection	connection cables (included)



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PACT*ware*™ DTM Professional License

- **License key for activation of special functions:**
  - **Monitoring function**
  - **Print function**
  - **Trend viewer**
  - **Storage function**

PACT*ware*™ stands for “Process Automation Configuration Tool” and is an open-source configuration software via which any manufacturer can operate his field devices. Optimisation of device operation is the key objective of the PACT*ware*™ concept.

Contrary to the concept of describing devices via a text file (Device Description = DD), PACT*ware*™ uses a universal interface (Field Device Tool = FDT) between the frame program PACT*ware*™ and the individual software modules (DTM = Device Type Manager) for device operation. As a result, modern and user-friendly operating concepts can be implemented. FDT provides a universal interface in order to enable usage of the software modules in combination with the field devices of different manufacturers and under different application conditions.

The DTMs required for this purpose are available in a basic version (with limited functions) as well as in a professional version.

The PACT*ware* ™ frame program and the basic DTMs can be downloaded free of charge from the Internet under www.turck.de.

The professional version including special functions is activated by a license key, which must be purchased separately.

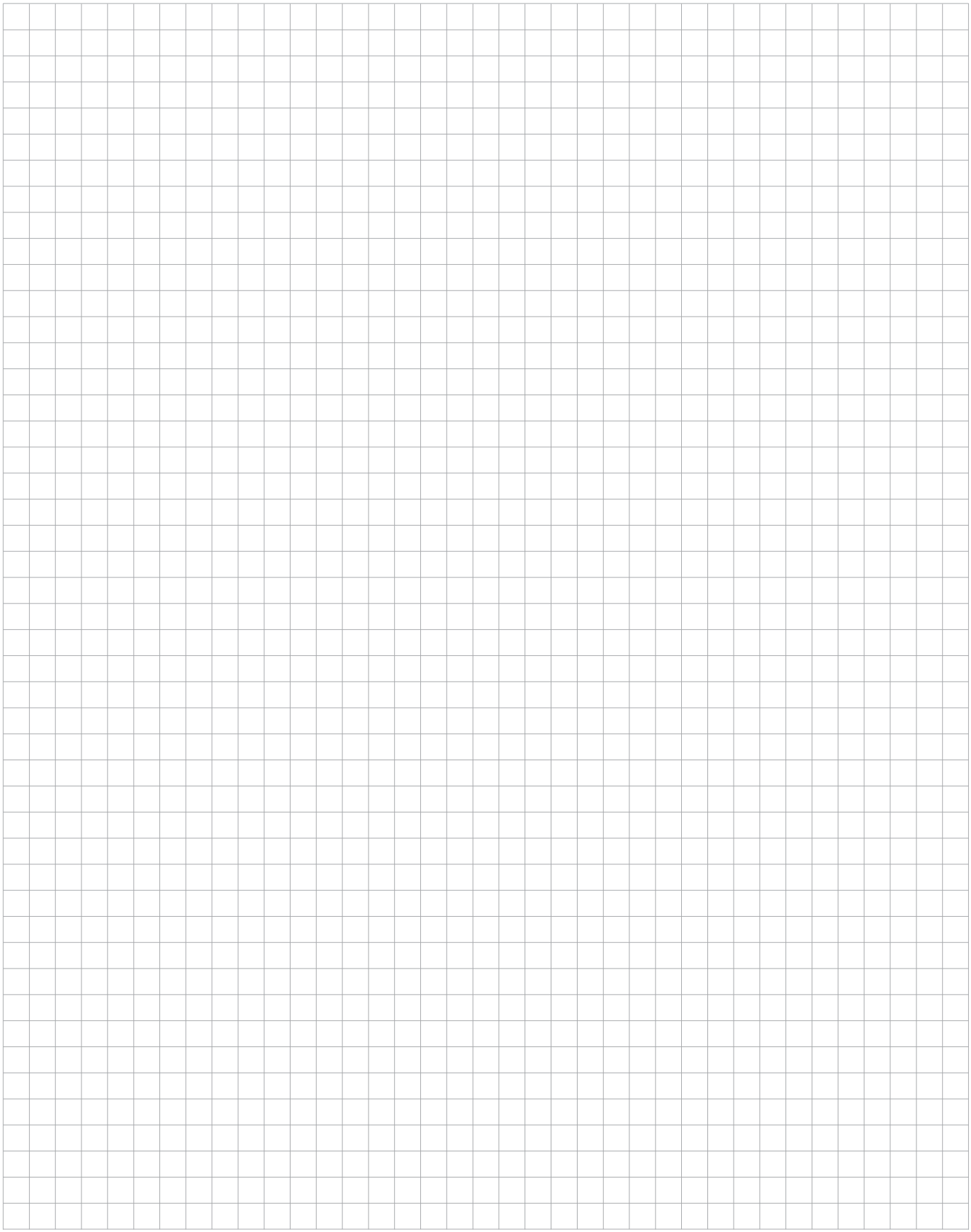
The special functions are:

- **Monitoring function:** The actual measuring value and the input and output status can be viewed via a monitor window. The cyclic update function can be de-activated.
- **Print function:** The parameters can be printed in three categories:
  - Off-line parameterisation (all parameters)
  - Measuring values (frequency/rotary speed, output current, measuring span of the output current in %, output voltage, measuring span of the output voltage in %)
  - Diagnostics (all diagnostics bits)
- **Trend viewer:** A selection of the measuring values can be recorded cyclically. The value variations can be viewed online. Recorded value curves can be saved in a special text file format.
- **Storage function:** Parameters are stored with this function.

The professional version is activated by a double click on the licence file stored on the CD.

DTM Professional License for:

IM34...	Ident.-no.: 6900404
MC25...	Ident.-no.: 6900405



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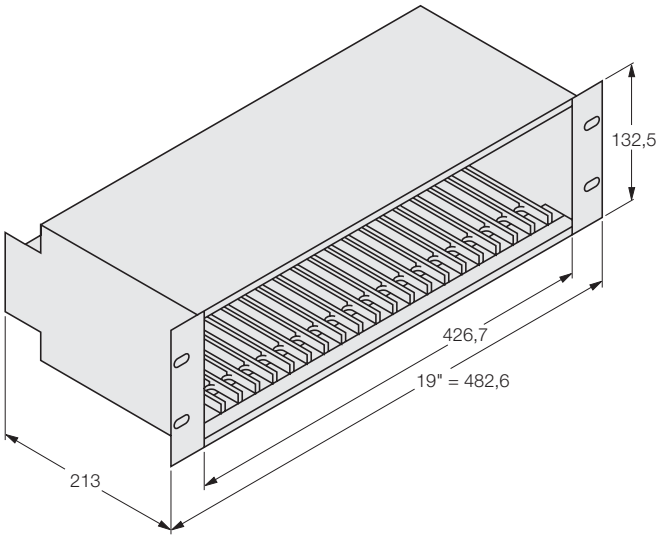
19“ Card Rack



19“ Card Rack
MCE
MCE 21-32 FL

	19" Card Rack for self-assembly (84 TE/3 HE)	**19" Card Rack, assembled** for edge connectors with solder terminations
Type	MCE (kit)	MCE 21-32 FL
Ident-no.	99017	91050
Dimensions		
Height	3 HE (132.5 mm)	3 HE (132.5 mm)
Width	84 TE (483 mm)	84 TE (483 mm)
Depth	211 mm	211 mm
Contents	2 side panels 2 Z-rails (rear) for edge connectors per DIN 41612 2 mounting rails (front) 1 set of screws	2 side panels 2 Z-rails (rear) for edge connector per DIN 41612 2 mounting rails (front) 1 set of screws, 21 edge connectors 32 FL 2 guide rail assemblies 21 x 4 TE
Capacity		
Eurocards 100 x 160, per DIN 41494)	–	21 Eurocards , 4 TE each

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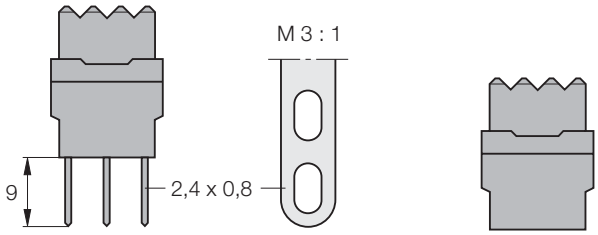
Edge Connector 48 FL/Isolation Body 48 FC

Type	48 FL	48 FC
Ident-no.	99 067	99 064
Type of connection	soldering	crimp snap-in
Type of construction (per DIN 41 612)	F	F
Number of contact rows	3	3
Allocated rows	z, b, d	z, b, d
Standard number of contacts	48	48
Terminal grid	5.08 mm	5.08 mm
Dielectric strength		
– Contact to chassis	2500 V_{rms}	2500 V_{rms}
– Contact to contact	1550 V_{rms}	1550 V_{rms}
Initial breakdown resistance	≥ 10^{11} Ω	≥ 10^{11} Ω
Contact resistance	≤ 15 mΩ	≤ 15 mΩ
Current rating at 70 °C	4 A	4 A
Plating		
– Contact area	Au	Au
– Terminal area	Sn	Sn
Isolation material	Polyamide 6.6	Polyamide 6.6
Coding	on site to coding plan	on site to coding plan
Ident-No. coding	99100	99100
Ident-No. coding pin (1 pc.)	99075	99075

Contact springs CF size III available as accessories (Ident-No. 99071), lot size 200



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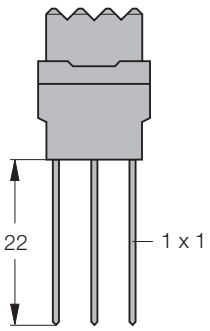
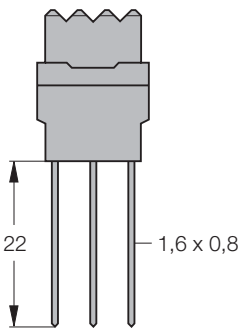
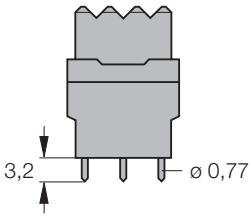
Edge Connectors 48 FW/48 FT/48 FS

Type	48 FW	48 FT	48 FS
Ident-no.	99068	99066	99065
Type of connection	Wire-wrap	crimp-on (termi-point)	PC board (solder pins)
(per DIN 41 612)	F	F	F
No. of contact rows	3	3	3
Allocated rows	z, b, d	z, b, d	z, b, d
No. of contacts	48	48	48
Terminal grid	5.08 mm	5.08 mm	5.08 mm
Dielectric strength			
– Contact to chassis	2500 V_{rms}	2500 V_{rms}	2500 V_{rms}
– Contact to contact	1550 V_{rms}	1550 V_{rms}	1550 V_{rms}
Initial breakdown resistance	≥ 10^{11} Ω	≥ 10^{11} Ω≥	10^{11} Ω
Contact resistance	≤ 15 mΩ	≤ 15 mΩ	≤ 15 mΩ
Current rating at 70 °C	4 A	4 A	4 A
Plating			
– Contact area	Au	Au	Au
– Terminal area	Sn	Sn	Sn
Isolation material	Polyamide 6.6	Polyamide 6.6	Polyamide 6.6
Coding	on site to coding plan	on site to coding plan	on site to coding plan
Ident-no. coding	99100	99100	99100
Ident-no. conding pin (1 pc.)	99075	99075	99075







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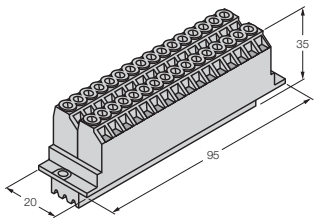
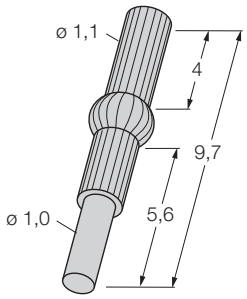
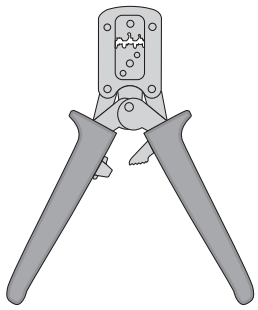
Type	LMIDIN-F32ZD-SFL32-2,5LMI	coding pins	crimping tool, size 1-3
Ident-No.	9906304	99075	99030
Type of connection	screw connection	coding pins for	crimping tool for attaching
Base material	Polyamide 6GF	coding of	the contact springs
		edge connector	(crimp contacts), size1-3
Construction (to DIN 41 612)	F		
No. of contact rows	3		
Allocated contact rows	z, b, d		
Standard no. of contacts	48		
Terminal grid	5.08 mm		
Dielectric strength			
– Contact to chassis	2500 V_{rms}		
– Contact to contact	1550 V_{rms}		
Initial breakdown resistance	≥ 10^{11} Ω		
Contact resistance	≤ 15 mΩ		
Current rating at 70 °C	4 A		
Plating			
– Contact area	Au		
– Terminal area	Sn		
Isolation material	Polyamide 6.6		
Coding	ex factory according to customer specs possible		
ID Coding	99100		
Connection	screw terminals		
Connection profile	≤ 2 x 1.5 mm^2 or 1 x 2.5 mm^2 with wire-sleeves		

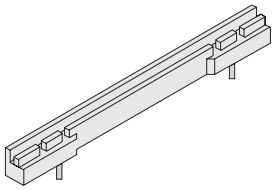


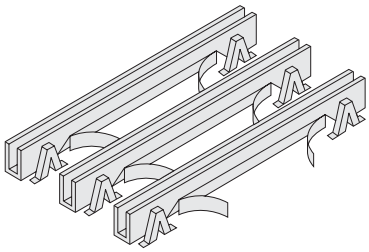




Guide Rail/Guide Rail Assembly

Type	guide rail F	guide rail assembly FM 21
Ident-no.	99076	99054
Applications	1 pair of guide rails for 19” racks	1 pair of guide rails for 19” racks
	guide rail for quick and easy mounting	for complete fitting of 19” racks with 4 TE slots
	for complete fitting of 19” racks with 4 TE slots, guide rail assembly FM 21 is recommended (Ident-No. 99054)	block guides are easy to mount due to their snap-on design





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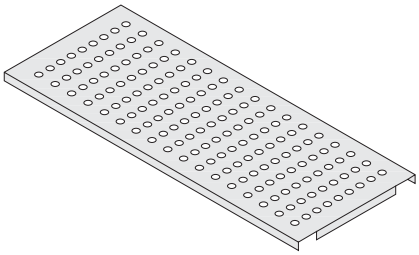
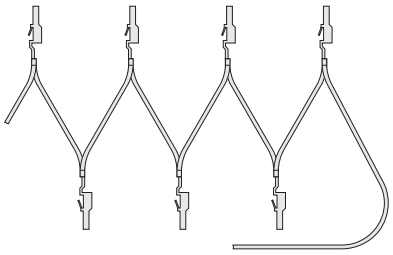
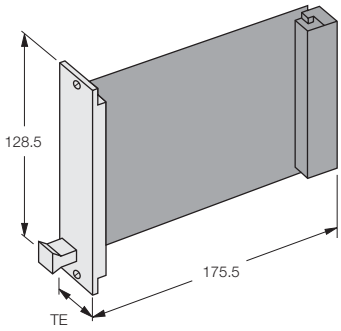
Barrier Plate/Bus Connections/Isolation Cards

Barrier plate SB 99056	Types availabe: shown below	MC TR 1/4TE 90951
IP20 type of protection is achieved by covering the top and bottom of the rack with the barrier plate If Eurocards with intrinsically safe circuits are to be installed, then the module racks must feature protection class IP20	Pre-assembled cables for fast installation of bus connections with crimp terminals The bus line consists of 22 crimp contacts, size III, with a loopped 0.5 mm² wire. The line length between contacts is suitable for a 4 TE installation schematic, The line length of the incoming cable is 500 mm. Available types: – crimp bus connection blue (Ident-No. 99034) – crimp bus connection red (Ident-No. 99035) – crimp bus connection grey (Ident-No. 99033)	Isolator card for physical separation of Eurocards with intrinsically safe circuits from Eurocards with non-intrinsically safe circuits The appearance and technology of the isolation card is identical to a standard Eurocard with a 4 TE plastic front cover for individual interlocking The isolator card takes up 1 position in the 19" rack - other front panel widths are available on request Other isolation cards available on request







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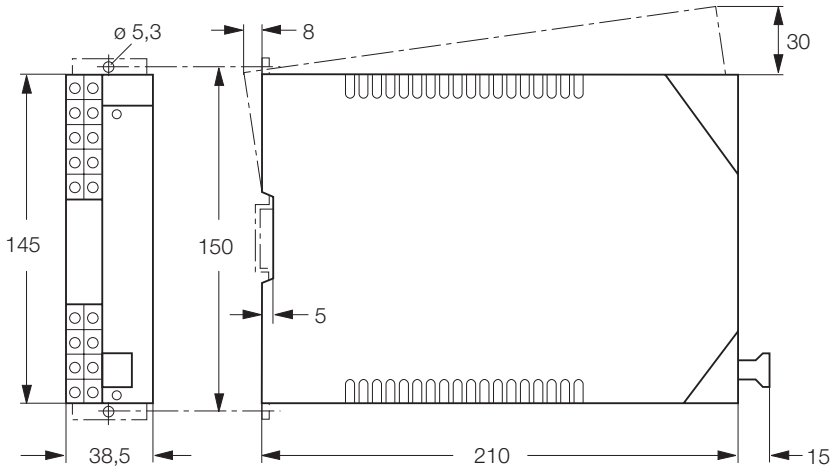
multicart® – Modular Housing MCA1



- **For mounting of one 100 x 160 mm Eurocard (DIN 41494)**
- **Front plate width up to 4 TE (20.32 mm)**
- **With connectors to DIN 41612, type F**
- **Wiring according to device specification**
- **Also suited for intrinsically safe cards**
- **Protection class IP20**
- **Individual mounting on DIN rail or panel (surface) mounting**
- **Optional customer-specific coding and/or wiring**

The MCA1 *multicart*® modular housing is designed for individual mounting of Eurocards, which are usually inserted in 19“ racks, as stand-alone devices in mounting cabinets.

The housing is suited for mounting of a 100 x 160 mm Eurocard with a front panel of max. 4 TE for individual interlocking.

It can be snapped on 35 mm DIN rail or mounted directly on the panel.

The edge connector (per DIN 41612, type F) is internally wired to screw terminals that are accessible from the front of the unit. 10 screw terminal connections are available for non-intrinsically safe circuits and 8 screw terminals allow for connection of intrinsically safe circuits.

A label with part number, internal wiring and hook-up details is attached to the side of the housing.

The housing can be equipped with a 230 VAC power supply.

Type	MCA1-BV...
Ident-no.	9 900 1...
Housing	
Base Material	Polyamide 6GF
Weight	approx. 300 g
Protection degree (DIN 40050)	IP20
Connection	18 screw terminals 0.25...1.5 mm²
Connector	crimp-snap-on insulating base, 48-pole to DIN 41 612, type F
Coding of edge connector	to device specification
Storage temperature	-25...+60 °C

Housing, without wiring	
Type	**Ident-No.**
MCA1 basic housing	9900100

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- ❑ CD-ROM Sensortechnik

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Feldbustechnik
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TURCK

Industrial Automation

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