

1 Operating instructions/system description

1.1 Operating instructions WE-/K-system

Types:

KFA6(5)... Ex ...	with 230 (115) V AC power supply, intrinsically safe control circuit
KFA6(5)...	with 230 (115) V AC power supply, no explosion protection
KFD2 ... Ex ...	with 24 V DC power supply, intrinsically safe control circuit
KFD2 ...	with 24 V DC power supply, no explosion protection
KFD2-EB ...	with 24 V DC power supply
KFD0 ... Ex ...	no separate power supply, intrinsically safe control circuit
KFD0 ...	no separate power supply, no explosion protection
WE ... Ex ...	230 (115) V AC power supply, intrinsically safe control circuit

Application

- These devices are used in C&I technology for the galvanic isolation of C&I signals, such as 20 mA and 10 V unit signals, and also for the adaptation and/or standardisation of signals. Devices which have intrinsically safe control circuits are used to operate field devices within hazardous areas.
- The data sheets of the individual devices contain the electrical data stated in the EC-Type Examination Certificate and are a valid part of the instruction.
- WE-/K-system devices are not suitable for the isolation of signals in power engineering, unless this is specifically referred to in the respective data sheet.
- The respective statutory regulations and directives governing the application or intended use should be observed.
- Devices that were operated in general electric installations must not be used afterwards in electric installations that are in connection to explosive hazardous areas.
- Intrinsic safe circuits that were operated with circuits of other types of protection may not be used as intrinsic safe circuits afterwards.
- Circuits in type of protection "nL" that were operated with circuits of other types of protection (except intrinsic safe circuits) must not be used in type of protection "nL" afterwards.

Installation and commissioning in the safe area

(Commissioning and installation must be carried out by specially trained qualified personnel only.)

Installation of the interface devices in the safe area

- The devices are constructed to satisfy the IP20 protection classification and must be protected accordingly from adverse environmental conditions such as water spray or dirt exceeding the pollution severity level 2.
- The devices must be installed outside the hazardous area!
- For devices with intrinsically safe circuits, the protected circuit (light blue identification on the device) can be located in the hazardous area. It is especially important to ensure that all non-intrinsically safe circuits are safely isolated.
- The installation of the intrinsically safe circuits is to be conducted in accordance with the relevant installation regulations.

- The respective peak values of the field device and the associated device with regard to explosion protection should be considered when connecting intrinsically safe field devices with the intrinsically safe circuits of WE-/K-system devices (demonstration of intrinsic safety). Here EN 60079-14/IEC60079-14 is to be observed.
- If more channels of one device are to be connected parallel it must be ensured that the parallel connection is made directly at the terminals. For the demonstration of intrinsic safety the maximum values of the parallel connection are to be regarded.
- When intrinsically safe circuits are used in areas made hazardous by dust (Ex zone "D") only appropriately certificated field devices must be used.
- The EU certificates of conformity or EC-Type Examination Certificates should be observed. It is especially important to observe the "special conditions" where these are contained in the certificates.

Installation and commissioning of the interface devices within zone 2 of the hazardous area:

- Only devices with the relevant statement of conformity from an approved test centre or covered by the manufacturer's declaration of conformity can be installed in zone 2.
- The individual data sheets indicate whether these conditions are met.
- The devices should be installed in a switch or junction box, which:
 - corresponds at least IP54 in accordance to EN 60529.
 - is confirm to the requirements of resistance to light and resistance to impact corresponding to EN 50014/IEC 60079-0.
 - is confirm to the requirements of thermal endurance corresponding to EN 50014/IEC 60079-15.
 - must not cause ignition danger by electrostatic charge during intended use, maintenance and cleaning.
- For devices with intrinsically safe circuits, the protected circuit (light blue identification on the device) can be located in the hazardous area. It is especially important to ensure that all non-intrinsically safe circuits are safely isolated.
- The installation of the intrinsically safe circuits is to be conducted in accordance with the relevant installation regulations.
- The respective peak values of the field device and the associated device with regard to explosion protection should be considered when connecting intrinsically safe field devices with the intrinsically safe circuits of WE-/K-system devices (demonstration of intrinsic safety). Here EN 60079-14/IEC60079-14 is to be observed.
- If more channels of one device are to be connected parallel it must be ensured that the parallel connection is made directly at the terminals. For the demonstration of intrinsic safety the maximum values of the parallel connection are to be regarded.
- When intrinsically safe circuits are used in areas made hazardous by dust (Ex zone "D"), only appropriately certificated field devices must be used.
- The EU certificate of conformity, the EC-Type Examination Certificate, the EU statement on conformity or the manufacturer's declaration of conformity should be observed. It is especially important to observe the "Special Conditions" where these are contained in the certificates.

Repair and maintenance

The transfer characteristics of the devices remain stable, even over long periods of time, thus eliminating the need for regular adjustment. Maintenance is therefore not required.

Fault elimination

No changes can be made to devices which are operated in hazardous areas. Repairs on the device are also not allowed.

Isolation coordinates for devices with Ex-certificate according to EN 50020

The devices are assessed for pollution degree 2 and overvoltage category II according to EN 50178.

Isolation coordinates for installations for galvanic isolation according to EN 50178 and EN 61140

The devices of the WE-/K-system are installation devices respectively electronic equipment for the use in secluded electrical operating sites where only skilled personnel or electrically instructed personnel must have admission or access to.

The devices are assessed for pollution degree 2 and overvoltage category II according to EN 50178.

Ambient conditions

Ambient temperature: see data sheet

Storage temperature: -40 °C ... +90 °C (233 K ... 363 K)

Humidity: max. 75 % rel. humidity without moisture condensation.

Construction and installation (K-system)

Basically, the K-series can be mounted in two ways:

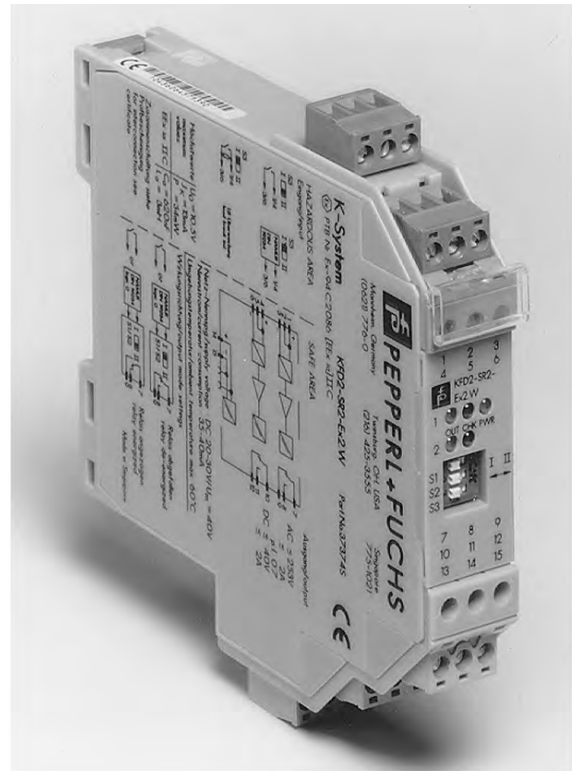
1. Panel/wall mounting (K-system only)
2. Mounting on a 35 mm standard DIN rail to EN 50022

Panel mounting is only recommended if a very small number of isolating modules are involved.

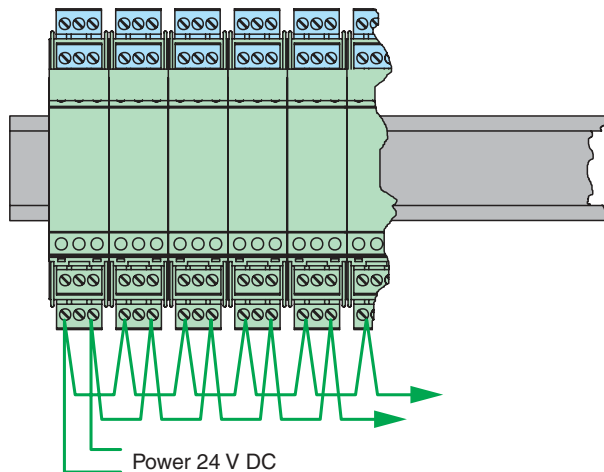
When mounting on the DIN rail, the units are simply snapped on. The expenditure on wiring for the power supply is significantly reduced by using Pepperl+Fuchs's "Power Rail" for the KF-series.

KF-series with removable terminals.

The removable terminals simplify control cabinet construction and allow the units to be replaced while under power. **These screwed, self-opening terminals allow space for the connection of leads with core cross-sections of up to 2.5 mm².** The connectors are coded, so that it is not possible to make an incorrect connection. With the KF-CP coding profile, separately available connectors with test sockets or cage spring release terminals can be easily coded.

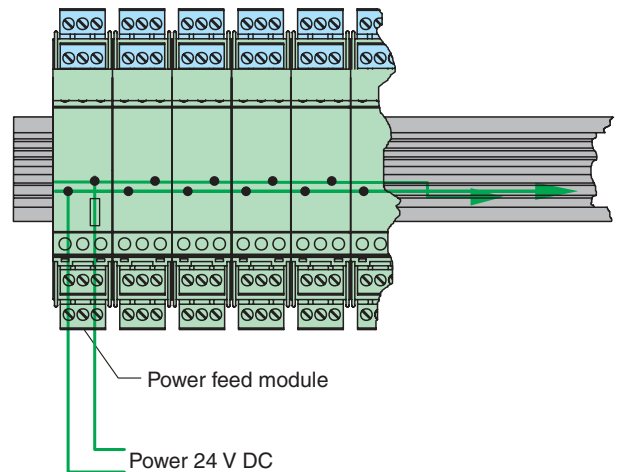


Power supply without Power Rail



The expense on wiring is higher with conventional power supplies for isolation modules.

Power supply with Power Rail



Wiring costs are significantly lower when supplying power via the Power Rail. It is also possible to take advantage of centralised error messages and redundant power supply. A power failure is indicated via the power supply module signal contacts. The power supply for the Remote Process Interface is only possible using the Power Rail via a power supply module.

In conjunction with Power Rail the power supply to the interface modules is only permissible via a power feed module!

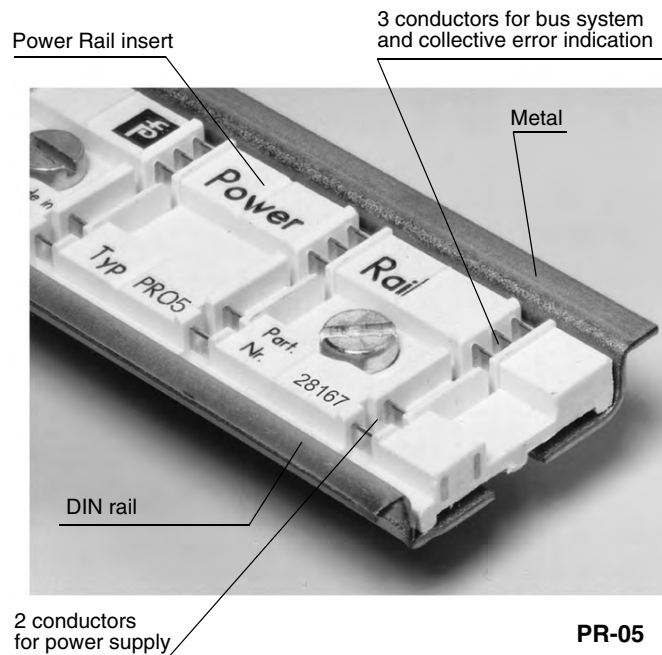
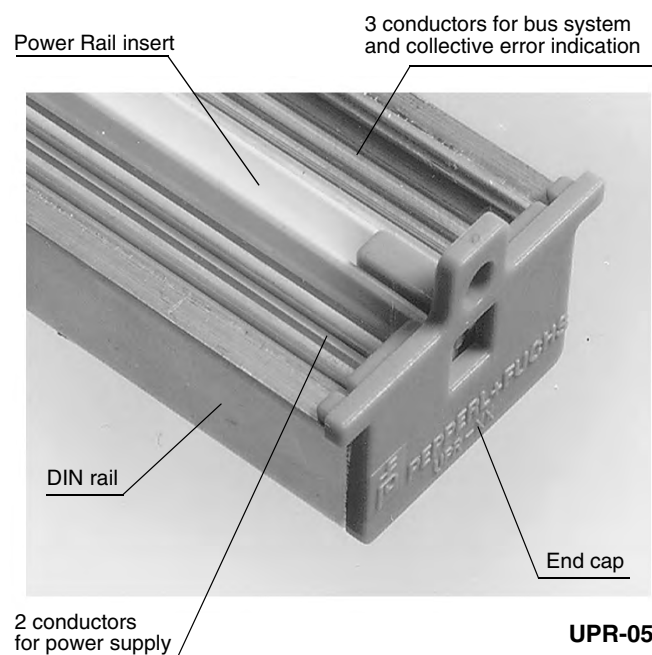
Operating instructions/system description

Power Rail (K-system)

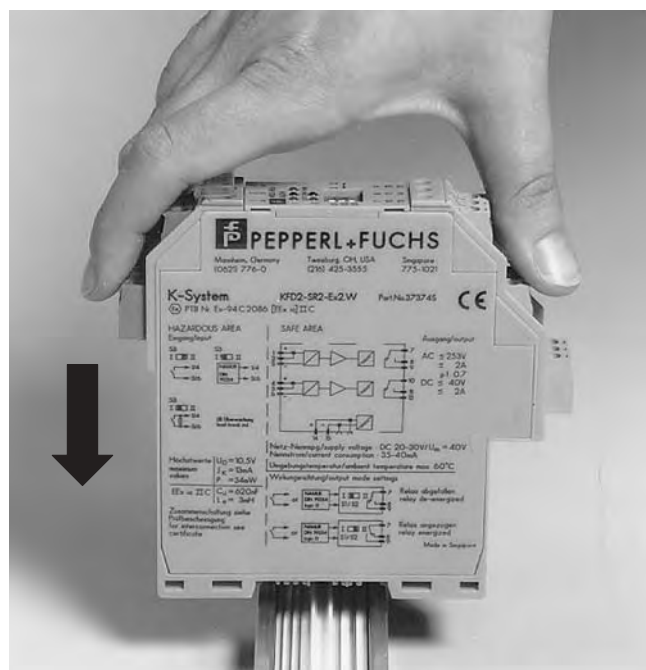
The universal Power Rail is an insert for the standard 35 mm DIN rail. Power is supplied by a 24 V DC power supply module via 2 heavy duty conductors. The following variations of the Power Rail are available:

- Three leads for power supply (UPR-03) and centralised error messages
- Five leads for power supply and serial data transfer for special functions or centralised error messages (UPR-05).

In contrast to the PR- the new UPR-** does not have a mounting grid and should be used in new systems.**



As shown in the figure, the isolaton modules are snapped onto the Power Rail in a vertical downward movement.



CORRECT: Unit snapped on vertically.

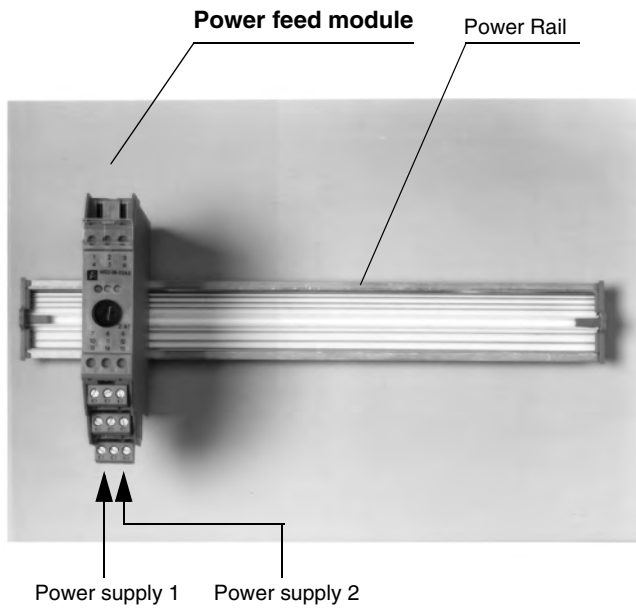


INCORRECT: Unit snapped on at an angle

Power supply concepts with Power Rail

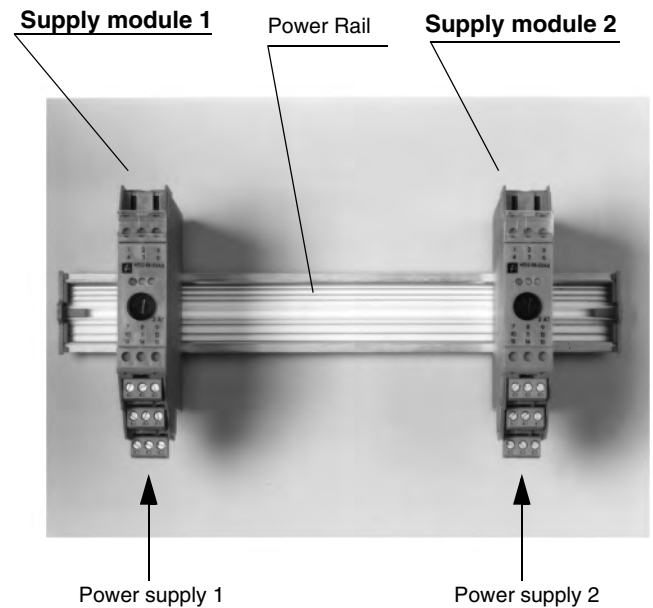
Redundant power supply

KFD2-EB.D2A.B power supply module for redundant power supply



Two power supplies with one power supply module can be used as a redundant power supply for a Power Rail.

Power supply module KFD2-EB.R2A.B for redundant power supply of the Power Rail.

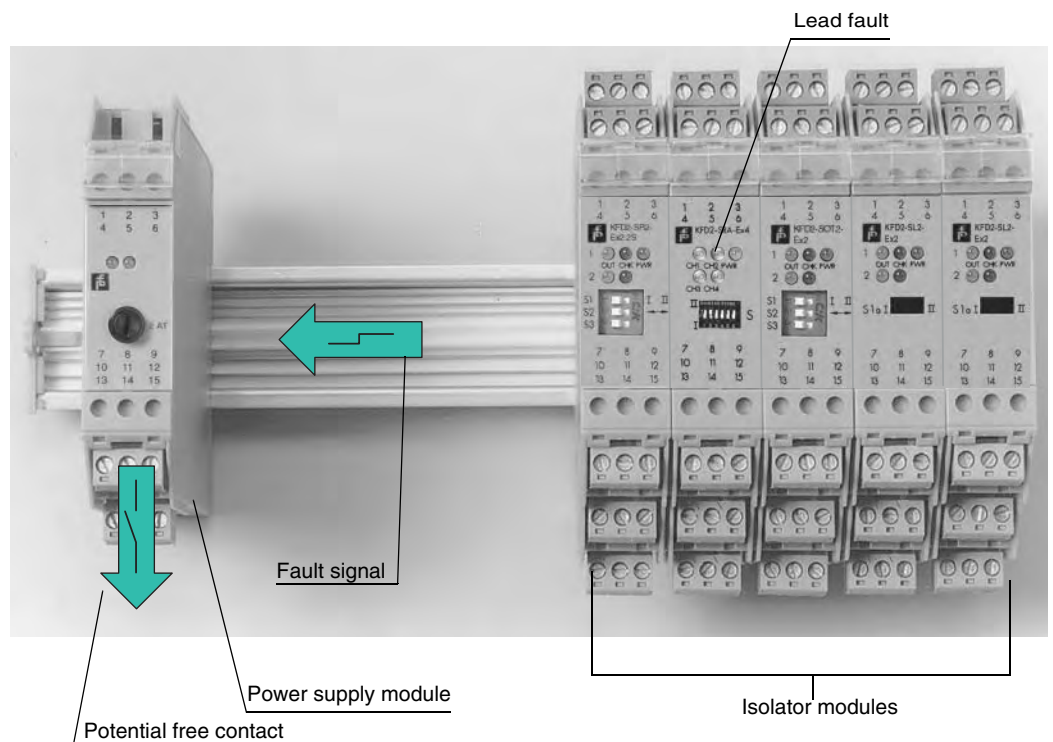


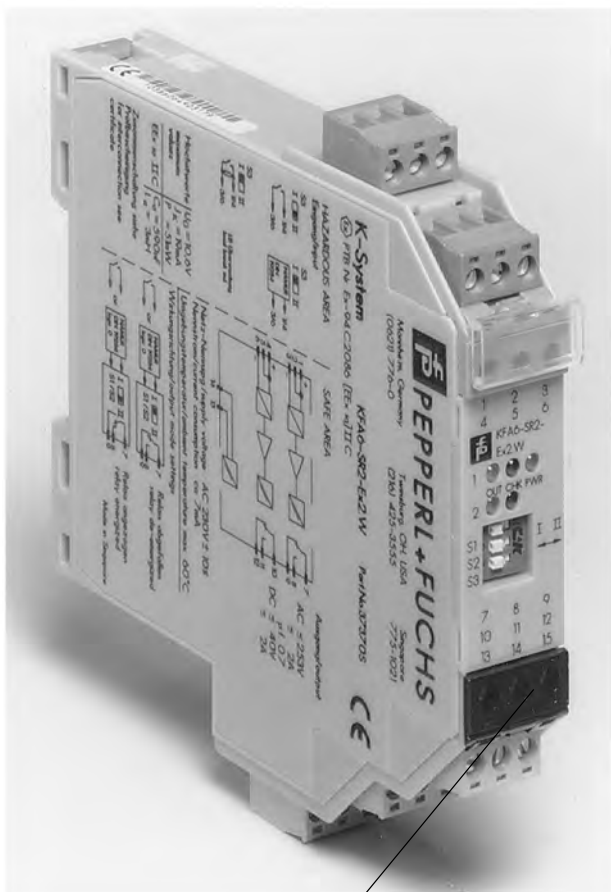
A redundant power supply to the Power Rail, with two supply modules, provides increased safety. If the fuse in one power supply module operates, the power supply is obtained via the second power supply module. Each power supply circuit is connected via its own Power Rail contact.

Collective fault indication (K-system only)

Collective fault indication enables lead breakage monitoring to be provided for many isolator modules without additional wiring costs.

In fault conditions, an interrupt signal from the isolator module (i. e. KFD2-SR2.Ex2.2S) is transferred to the Power Rail. The power supply module evaluates the signal and passes the fault information to the PLC/control system using a potential-free contact.





Black indicates units with AC power supply, grey colour code for devices suitable for the range 24 V DC ... 230 V AC

AC powered devices with removable terminals (KFA*)

Electrical standards for the K-system

Ex-signals/field circuit

Transmitter power supply up to 17 V DC
 Current input max. 200 Ω
 Pt100, in 2-, 3-, (4-)wire technology
 Resistor 0 Ω ... 400 Ω , with freely definable characteristic
 Potentiometer
 Thermocouples of all types, internal cold junction, external reference
 Current output min. 600 Ω
 Binary input NAMUR EN 60947-5-6
 Binary output for Ex-i valves, short circuit protected
 (For details, see data sheet)

Mechanical data for the K-series and Remote Process Interface

Mounting

1. Screwed fixing (K-system only):
 The lugs on the base of the modules must be extended and used for fixing purposes with 4 mm screws.
2. K-MS mounting base for screw attachment (K-system only).
3. Snap-on 35 mm standard DIN rail to EN 50022. Can be mounted horizontally or vertically, side by side.

Housing material

Makrolon

Flammability classification

UL 94: V - 0

Connection options

KH*-series:
 self-opening connection terminals for max. core diameter of 1 x 2.5 mm²

KF*-series:
 removable connector with integrated self opening device terminals for leads of up to a max. of 1 x 2.5 mm²

Other items

KF-series: coded connectors

Reference conditions for adjustment

22.5 °C $\pm$ 2.5 °C

Ambient conditions

Climatic conditions

in accordance with IEC 60721, Class 3K3

Ambient temperature

see data sheet

Storage temperature

-40 °C ... 90 °C

protection class acc. to EN 60529 IP20

Humidity

max. 75 % rel. humidity, 95 % for many modules

Safe area signals and control circuit

0/4 mA ... 20 mA signal level in accordance with NE43
 Current output min. 550 Ω
 Current input max. 200 Ω
 Binary output (active, passive electronic output) 100 mA/30 V, short circuit protected
 Relay output 2 A, minimum load 1 mA/24 V
 Logic level 24 V in accordance with IEC 60946
 Function isolation or safe isolation in accordance with EN 50178 and NAMUR NE23
 (For details, see data sheet)

K-system electrical standards

General

- Isolator modules with and without explosion protection, mostly with EEx ia IIC, international approvals
- EMC in accordance with NAMUR NE21 and EN 50081-2, EN 61326
- LEDs satisfying NAMUR NE44
- Software in accordance with NAMUR NE53 (K-system only)
- Switch-on pulse suppression
- Supply voltage min. 20 V ... 30 V DC
DC: Power Rail
Supply terminals (K-system only)
- Fault signals via Power Rail
- Supply voltage 115/230 V AC $\pm 10\%$ (K-system only)
- Man/machine interface software to VDE/VDI 2187
- Safety devices in accordance with VDE 0660 T.209, AK's to DIN 19250 (K-system only)

Binary inputs/outputs in accordance with NAMUR

The standards references for this interface have changed many times:

German standard (old): **DIN 19234**: Electrical distance sensors - DC interface for distance sensors and switch amplifiers; 1990-06

European standard (old): **EN 50227**: Low voltage switch gear and control gear - control devices and switching elements - proximity switches, DC interface for proximity sensors and switch amplifiers (NAMUR), 1996-10

German version (old): **DIN EN 50227**: Low voltage switchgear - control devices and switching elements - proximity switches, DC interface for proximity sensors and switch amplifiers (NAMUR), 1997, German nomenclature VDE 0660, part 212

Current designation: DIN EN 60947-5-6: Low voltage switchgear - control devices and switching elements - proximity switches, DC interface for proximity sensors and switch amplifiers (NAMUR), 2000, German nomenclature. VDE 0660 part 212

Current IEC designation: IEC 60947-5-6: Low voltage switchgear and controlgear - part 5-6: Control circuit devices and switching elements - DC interface for proximity sensors and switching amplifiers (NAMUR), 1999

Isolation coordinates for devices with Ex-certificate according to EN 50020

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Isolation coordinates for installations for galvanic isolation according to EN 50178 and EN 61140

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1.2 Housing types (K-system)

Housing type A1

Height: 93 mm (3.7 in)
(without K1 and K4 terminals)

Housing type A2

Height: 100 mm (3.9 in)
(without K1 terminal)

Housing type A3

Height: 100 mm (3.9 in)
(without K4 terminal)

Housing type A4

Height: 107 mm (4.2 in)
* The unit is 102.5 mm ... 112 mm (4 in ... 4.4 in) in height when using the KF-STP-** connector.

Housing type B1

Height: 93 mm (3.7 in)
(without K1 and K4 terminals)

Housing type B2

Height: 100 mm (3.9 in)
(without K1 terminal)

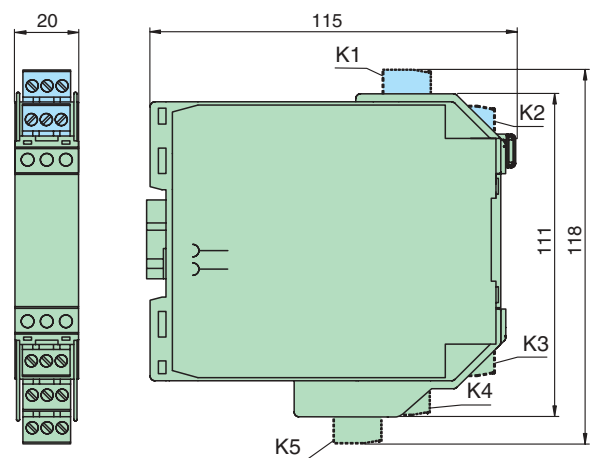
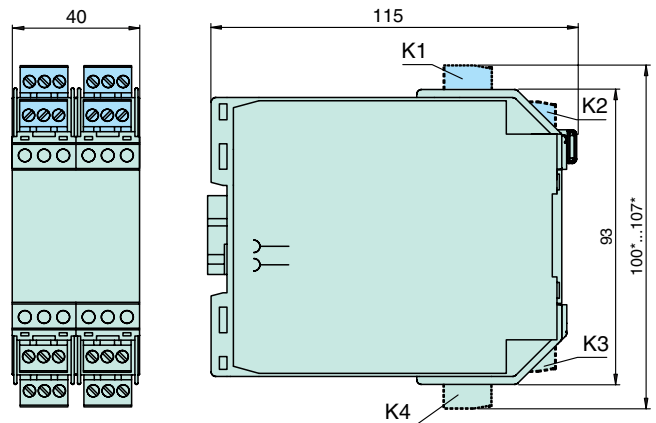
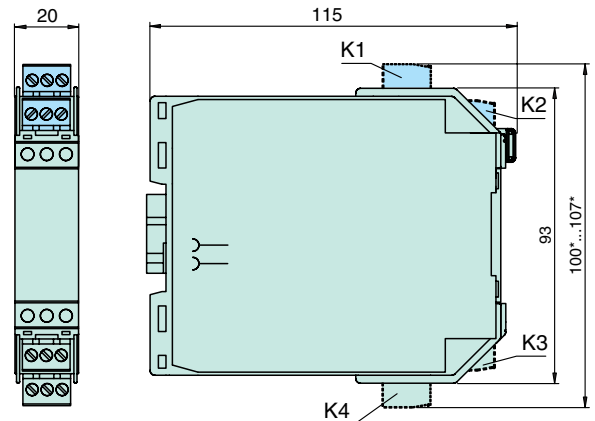
Housing type B3

Height: 100 mm (3.9 in)
(without K4 terminal)

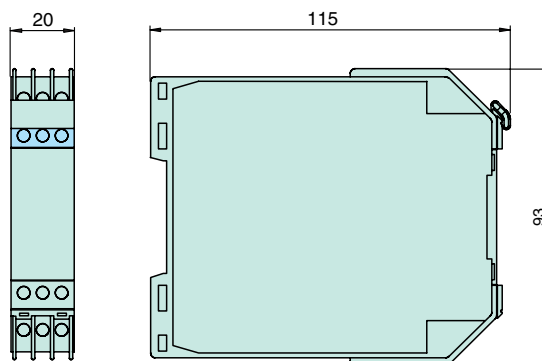
Housing type B4

Height: 107 mm (4.2 in)
* The unit is 102.5 mm ... 112 mm (4 in ... 4.4 in) in height when using the KF-STP-** connector.

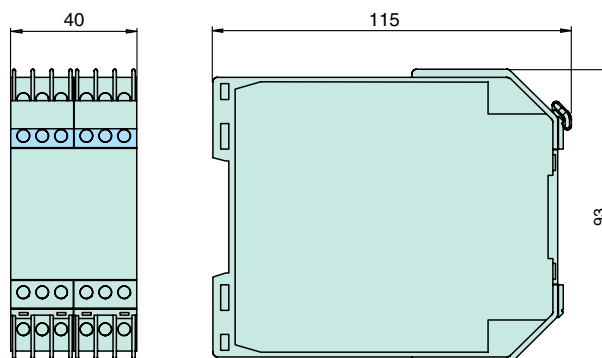
Housing type C



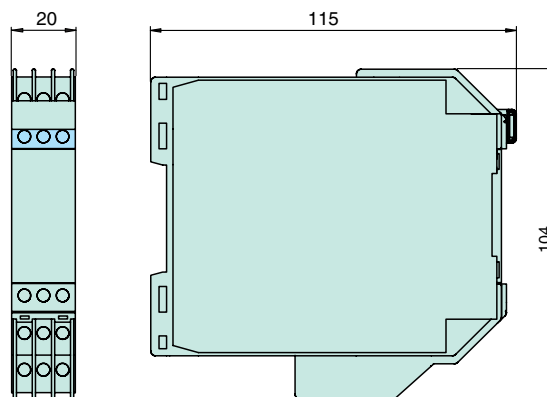
Housing type D



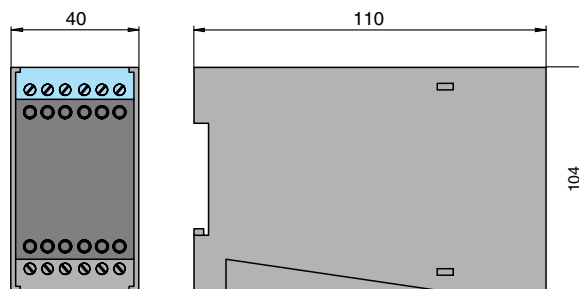
Housing type E



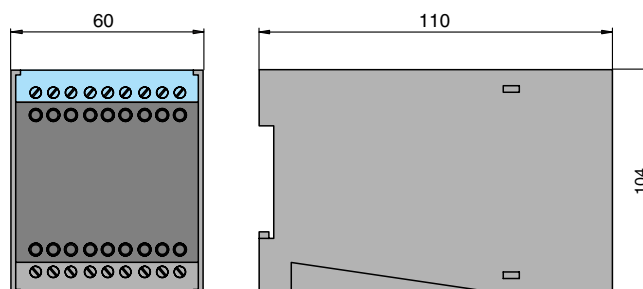
Housing type F



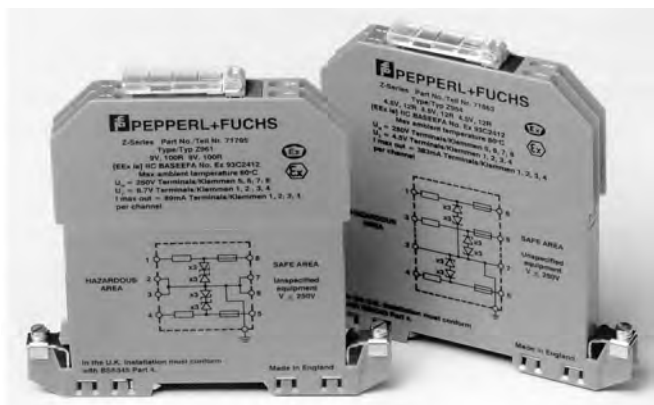
Housing type W1



Housing type W2



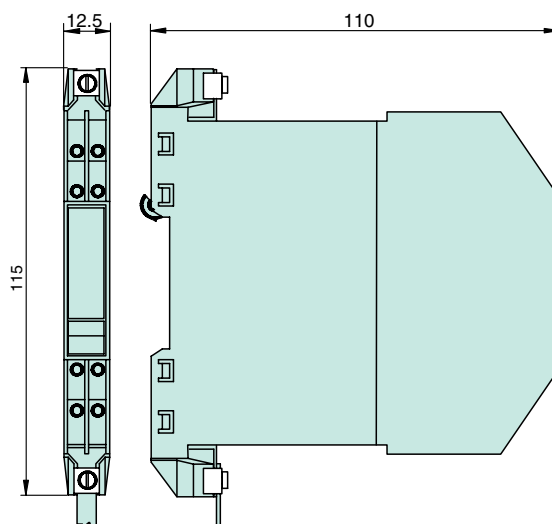
1.3 Housing type (Zener barrier and overvoltage suppressor type K-LB)



The Zener barrier and overvoltage suppressor housing is 12.5 mm (0.5 in) wide and can be snapped easily onto the standard 35 mm rail in accordance with EN 50022. Leads with a core cross-section of up to 2 x 2.5 mm² can be connected to the self opening terminals.

For further information see Zener barrier operating instructions and overvoltage suppressor operating instruction.

Housing type Z1



1.4 Alternative mounting arrangements for the K-series

The interface modules are basically connections to an upper level controller system (PLC/Process control system), combined in multi-channel function groups. An important aspect of this interface is its efficient and safe operating design. Pepperl+Fuchs offers two mounting concepts:

Motherboard

Standard motherboards are available for 4, 8, 12 and 16 KF modules. These can accommodate modules with 1-, 2- or 4-channel modules, as required. The power source features a redundant design, thus increasing the reliability of the system. The operating status of the power supply is monitored and reported via a relay output.

The motherboards are available with permanent functions (DI, DO, AI, AO).

They are connected directly to the I/O cards of the respective automation system via special adapter circuit boards and the system cable.

The KF modules are connected with the motherboard on the non-Ex-side via 2- to 6-pin codeable cable connectors. The motherboard circuit board is mounted on a stable metal mounting plate. Two mountings are integrated in the mounting plate, enabling the boards to be simply and quickly mounted on a standard 35 mm rail to EN 50022.

Pepperl+Fuchs offers standard adaptations for automation systems from the following manufacturers:

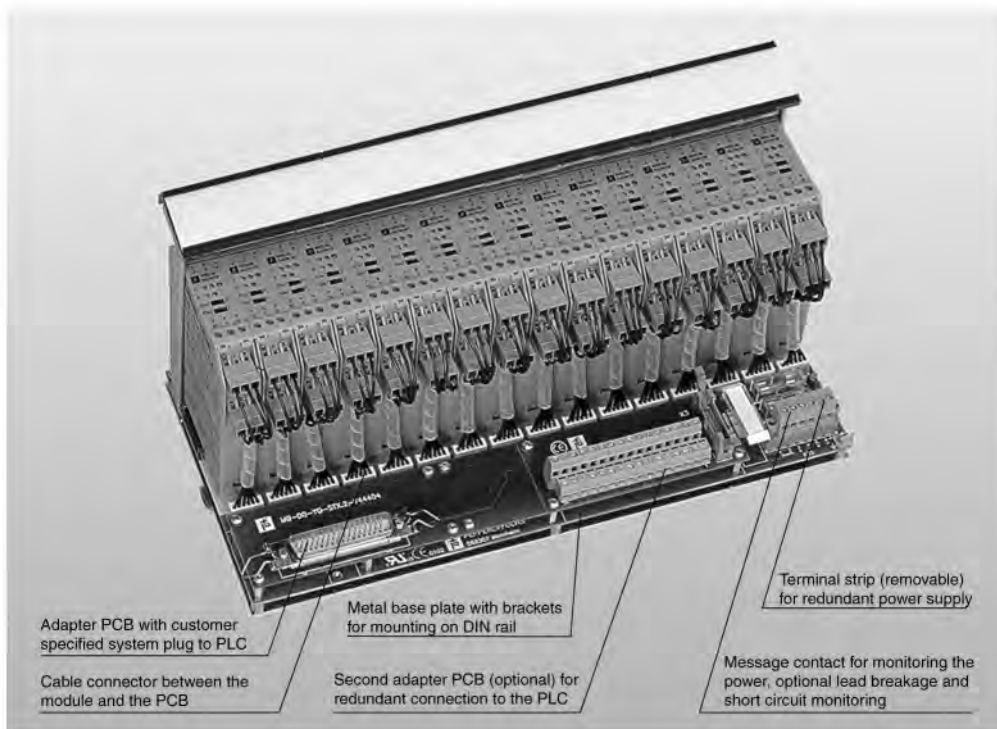
ABB-Elsag-Bailey-Hartmann+Braun, Allen Bradley, Emerson, Foxboro, Honeywell, Modicon, Moore, Siemens, Simrad, Triconex, VEGA and Yokogawa.

Special solutions can be devised on request.

Detailed documentation on the individual adaptations is also available on request.

The Pepperl+Fuchs motherboard offers the following advantages:

1. Packing density has been increased by integrating the power feed module and system connectors.
2. The redundant power supply and the system cable interface for upper level controller systems increase functional safety and reduce remote wiring costs.
3. The motherboard is matched to an upper level controller system via an adapter circuit board with the corresponding system connector.



Motherboard

The Pepperl+Fuchs KF mounting rail

The KF mounting rail from Pepperl+Fuchs has an overall length of 1.8 m (5.4 ft), and can be used to provide space-saving mounting for up to 90 KF modules and accommodate the associated wiring. The system and field cables for Ex- and non-Ex-signals are easily installed in the integral cable ducts of the KF rail. Thus no additional cable guides are necessary. The power supply to the individual modules is preferably provided via the Power Rail that can be integrated into the system. The power supply can in fact be achieved in two different ways:

1. If a 24 V DC supply is available, the supply to the modules can be by means of a KFD2-EB... power supply. It is also possible to build up various function groups and to supply these separately via power supply modules. If required, a redundant power supply to the KF modules can also be provided.
2. If a 230 V AC supply is available, the KFA... power supply module is used.

Pepperl+Fuchs can also supply prefabricated system cables for both the MB-technology and for KF rail assemblies. This significantly reduces the installation and commissioning work required. These cables, which are readily available in arbitrary lengths, are factory-tested, so that faults on connection of automation systems are practically excluded.

Which advantages does the KF-profile offer?

1. Very tight packing density in control cabinet assemblies, since the cable trunking is integrated in the mounting profile.
2. By using pre-configured system cables, an extremely short commissioning/start-up time is possible.
3. The prefabricated cables are equipped with the appropriate system connector. Thus the number of connections from the interface module to the control system is reduced to a minimum.

Both mounting options can be coupled with control systems from the following manufacturers:

ABB

AEG

Elsac-Bailey

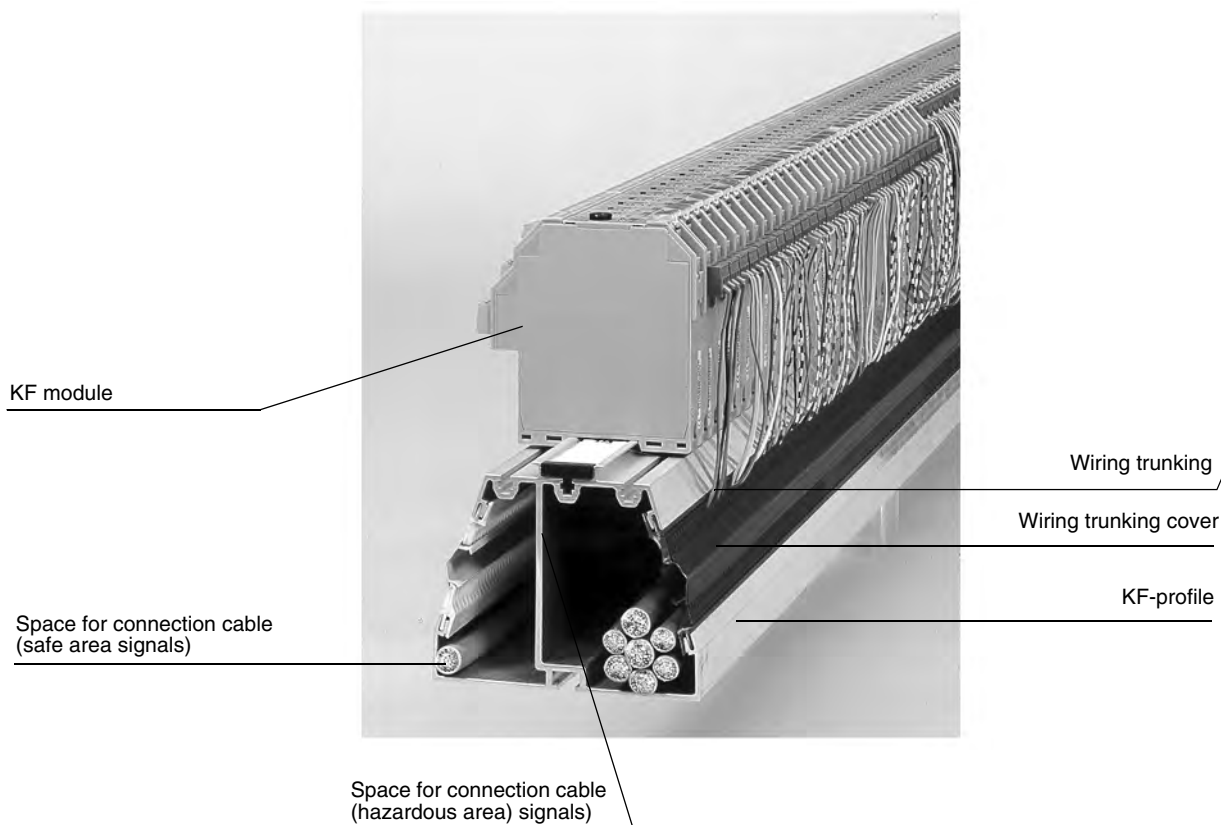
Foxboro

Hartmann+Braun

Honeywell

Siemens

Yokogawa



KF-profile

See data sheet for more information.

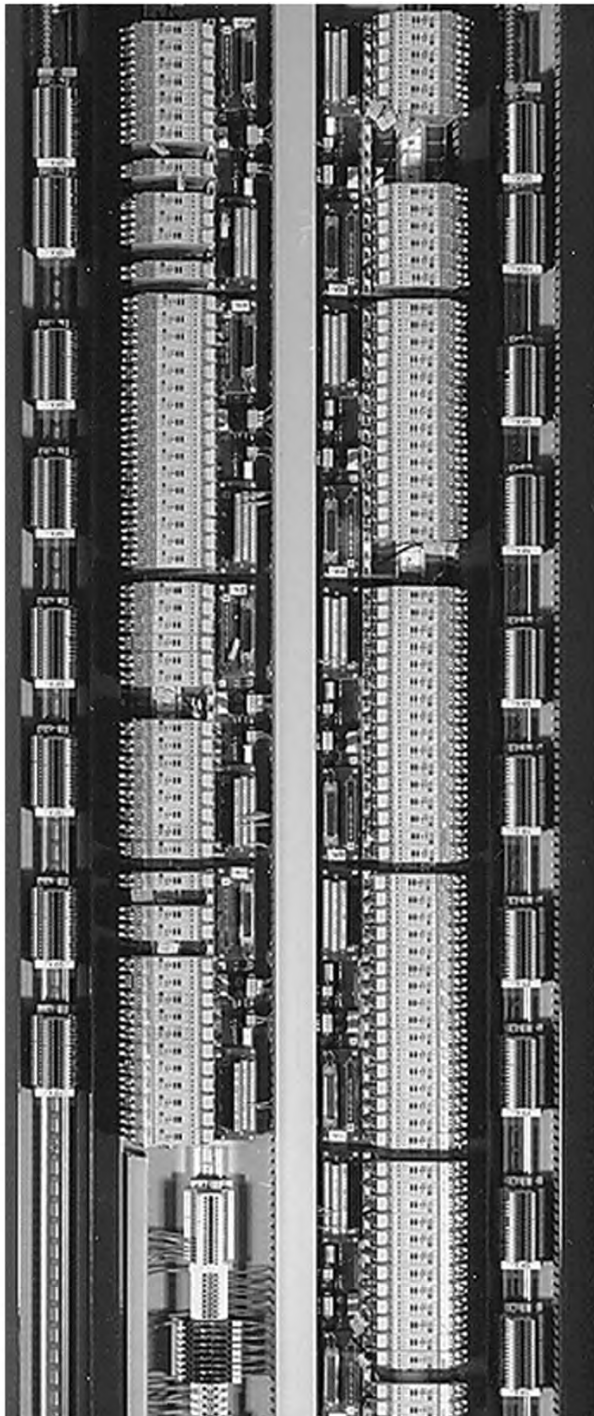
1.5 Switch cabinet layout

Pepperl+Fuchs offers two different ways of laying out a control cabinet:

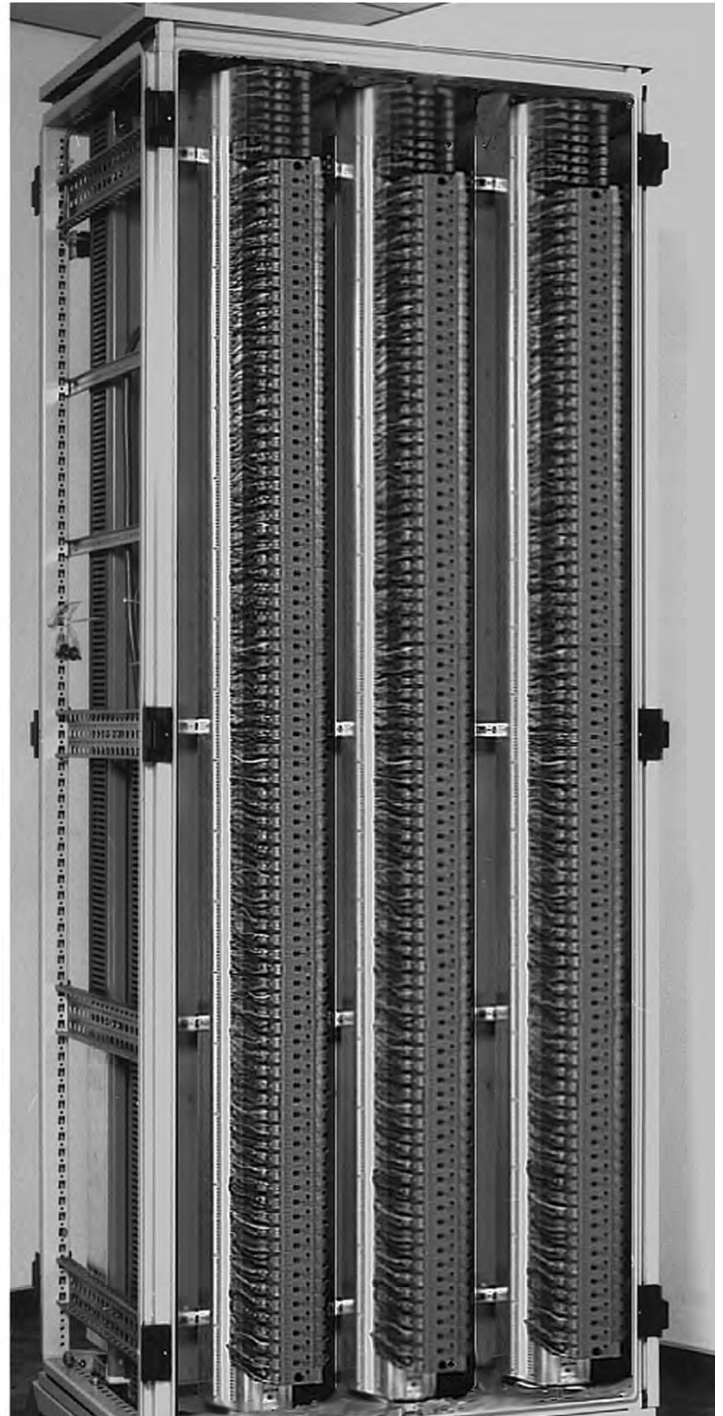
1. Marshalling and interface modules in one control cabinet.
Short cable paths and a compact assembly are features of this configuration.
The system oriented (ungrouped) signals are wired via field cables and terminal strips and from there they are marshalled directly to the KF modules. The non-function oriented signals (grouped according to function: DI, DO, AI, AO) are run to the system cable connector on the non-Ex-side. The system cable provides the connection to the higher level control system. The KF modules are thus an image of the I/O level of the higher order control system.

2. Marshalling and interface modules divided in two cabinets.
The advantages: simplified installation of the field cables and the unified terminal structure (isolation between Ex and non-Ex). There is more space available in the marshalling cabinet for cabling. Special field cables (e. g. armoured cables with larger diameters) can be connected more easily to the terminal strips in the marshalling cabinet. An additional terminal strip is required per marshalled group, with the associated system cable for the interface cabinet. This means higher material and planning costs compared to layout 1 above.

Other concepts for structuring control cabinets to customer specific requirements can be obtained from our project management department.



Control cabinet with marshalling



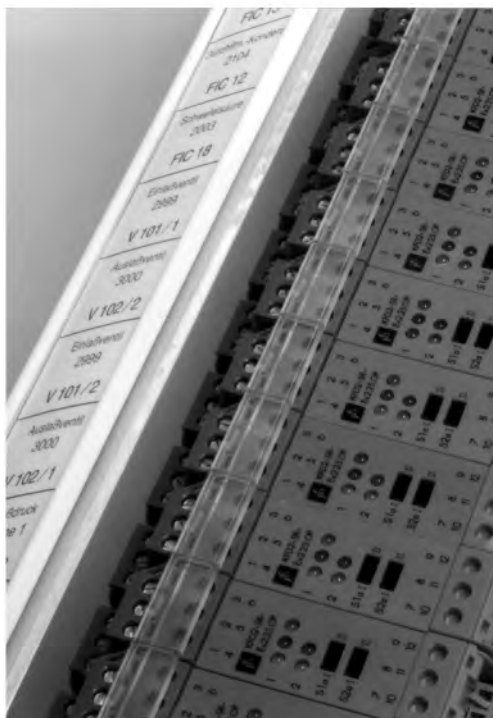
Control cabinet without marshalling

Accessories: label holder

(KFD0-LC1-XXX, KFD0-LC1-YYY)

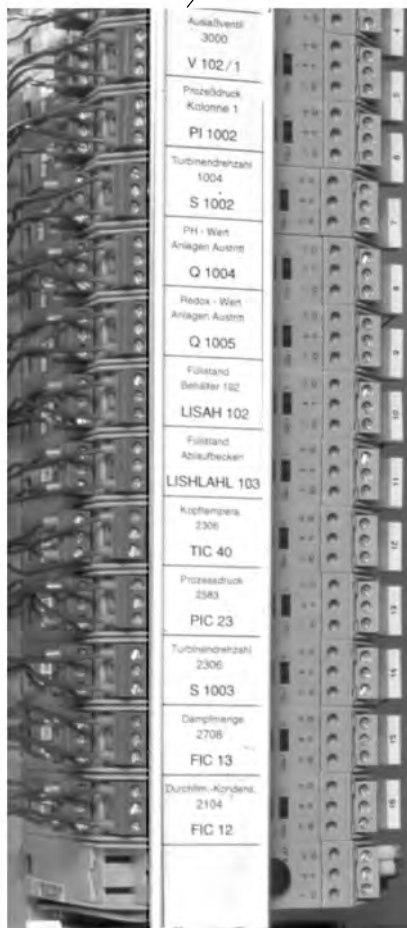
For additional labelling (measuring station numbers, signal names, etc.) of the KF modules in the control cabinet. The labelling strips are 0.5 m (1.5 ft) or 1 m (3 ft) in length. A labelling surface area of 20 mm x 30 mm (0.8 in x 1.2 in) is available per KF module.

See data sheet for more information.



Label holder

Label holder



Label holder