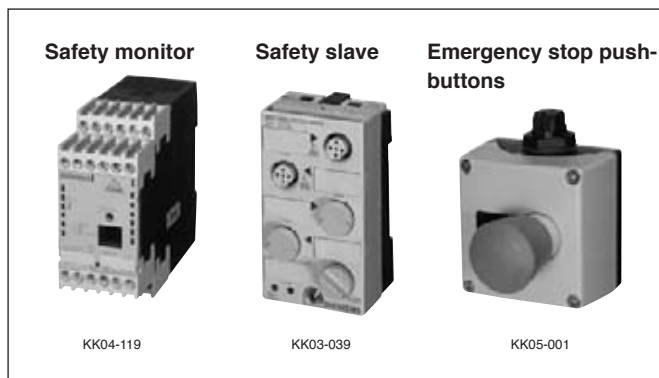


## AS-Interface Safety at Work, which transfers safety-related signals and I/O signals over a single bus.

AS-Interface Safety at Work (AS-i Safety) is an open network that can be added to existing AS-i systems to support EN954-1 category 4 (the highest safety class). With the globalization of both enterprises and standards (e.g., JIS), there is an increasing worldwide tendency to attach greater importance to safety in order to prevent labor accidents caused by machines. Against this background, FUJI has decided to market Siemens' AS-i Safety products.



### ■ Features

- AS-i Safety makes it possible to unify the safety components that handle all binary signals.  
Examples: Emergency pushbutton switches, safety door switches, safety limit switches, safety area sensors, and output circuit configurations.
- The simultaneous operation of a number of safety components is possible over standard AS-i cable.
- No safety PLC or special master is required for AS-i Safety.
- Quickly and easily expands existing systems.
- Safety signals can be grouped.
- System diagnosis is possible through a standard AS-i master and standard PLC.

- Supports up to EN954-1 category 4 (ISO 13849-1/JIS B9705-1).
- Functional safety: Supports up to SIL 3 (IEC 61508)
- High speed with a maximum response time of 40ms.
- Approved by TÜV and BIA (Institution for Statutory Accident Insurance and Prevention in Germany).
- Compatible with all AS-i components (IEC 62026-2 and EN 50295).
- The standard AS-i protocol is used to transfer safety signals.
- Connects to up to 30 safety slaves. (The number of safety slaves varies with the programming in the safety monitor.)
- Allows setting of stop categories 0 and 1 (EN 60204-1).

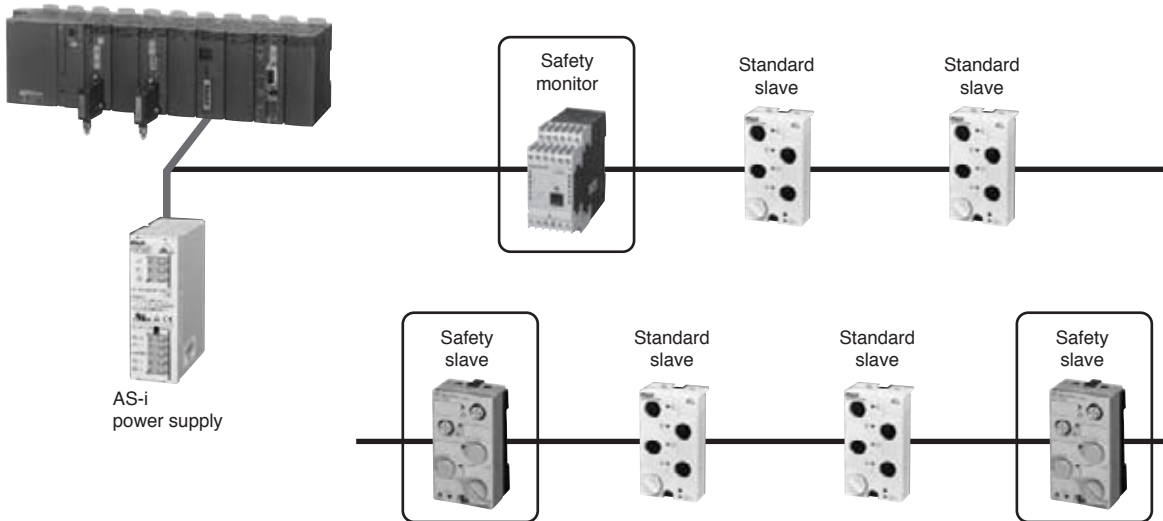
### ■ Types

Description		Type
Safety monitor	One 2-channel circuit	3RK1105-1AE04-0CA0
	Two 2-channel circuits	3RK1105-1BE04-0CA0
Safety monitor with enhanced functionality	One 2-channel circuit	3RK1105-1AE04-2CA0
	Two 2-channel circuits	3RK1105-1BE04-2CA0
Sealable cap		3RP1902
K45F safe compact module		3RK1205-0BQ00-0AA3
K45F mounting plate	Rail/screw dual mounting	3RK1901-2DA00
	Exclusive screw mounting	3RK1901-2EA00
Input jumper for K45F		3RK1901-1AA00
Configuration software		3RK1802-2FB06-0GA0
Cable set (Safety monitor to personal computer)		3RK1901-5AA00
AS-Interface EMERGENCY STOP pushbutton	Yellow cover	3SF5811-0AA08
	Yellow cover with protective collar	3SF5811-0AB08

**■ Description**

AS-i Safety added to the standard AS-i system allows the transmission of safety signals.

Standard PLC, standard AS-i master

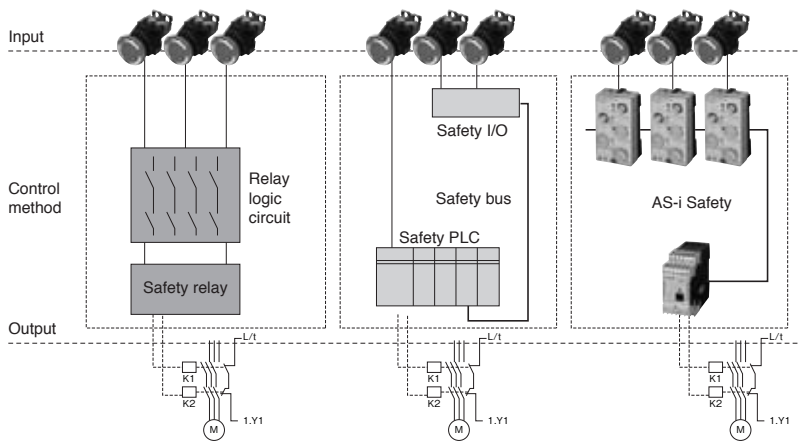


**Safety network easily configured with safety monitor and safety slaves.**

The safety monitor receives a signal from each safety slave in a cycle. The receiving signal continuously changes according to the defined algorithm. If a fault or alarm condition occurs and no signal is received, the safety monitor automatically switches off via the 2-channel operating circuit after waiting a maximum of 40 ms. Safety-related signals can be grouped when multiple safety monitors are installed on a network. It is also possible to view safety-related events via a human machine interface, etc. on a display.

**■ Comparison between safety systems**

Cost-effective I/O level network can be configured using AS-i safety system, compared with safety relays or safety PLCs.



**■ Configuration of typical safety systems and advantages**

(Where Safety Category Type 3 or 4 is requested.)

	Relay sequence using Safety Relays	Safety PLCs + Safety I/O terminals	AS-i Safety
Wiring	NG: Complicated relay wiring	Ordinary: Centralized wiring	Excellent: Common wiring to safety signals and control signals
Technical issues	Ordinary	Hard	Easy
Maintenance	NG: Relay maintenance	Excellent	Excellent
Scalability	Low	Ordinary	Scalable: Easy expansion
Total cost	Ordinary: Much expensive for complicated logic circuit	Expensive: Expensive hardware	Low

## Safety devices

### ■ Safety monitor

The safety monitor is the core device of AS-i Safety (Safety at Work).

The configuration of safety-related devices connected to the safety monitor is defined by the PC.

A unique control mode according to the combination is selectable with the definition on the PC.

For example, emergency stop, electromagnetic lock safety door switch, two-handed operation, and category 0 or category 1 stop can be selected.

The monitor can be controlled using the AS-i address in order to make full use of the AS-i diagnostic function.

The following two types of monitor control are possible.

- A safety monitor with one 2-channel operating circuit.
- A safety monitor with two 2-channel operating circuits.

### ■ Safety slave

The safety slave is a compact module with two safety input terminals.

Two inputs can be used for applications extending up to category 3 safety class.

For category 4, one input point can be used.

### ■ AS-Interface EMERGENCY STOP pushbuttons

Safety communications technology makes it possible to connect emergency stop devices directly to the standard AS-i.

The emergency pushbutton can be mounted inside or on the surface of the panel.

### Benefits

- Safety-related signals and I/O signals are transmitted over a single bus cable.
- No fail-safe PLC or special master is required.
- Safety-related signals can be grouped.
- A simple system structure making use of standardized AS-i technology.
- Existing systems can be quickly expanded.
- Safety-related signals can be built into plant diagnostic functions.
- Supports EN954-1 up to category 4
- AS-i Safety (Safety at Work) has been certified by TÜV (the German Association for Technical Inspection) and BIA (a German Institution for Statutory Accident Insurance and Prevention).

## ■ Specifications

### Safety monitor

#### • General specifications

Item	Specification
Rated voltage	24V DC
Supply voltage range	20.4 to 27.6V DC
Power consumption	One 2-channel circuit type: 3.6W max. Two 2-channel circuit type: 4.8W max.
Power-off retentive time	20ms
Response time	40ms max.
Start delay time	10s max.
Operating temperature	0 to +60°C (No icing or no condensation)
Storage temperature	-30 to +70°C (No icing or no condensation)
Degree of protection	Panel mounted type IP20
Cooling method	Natural cooling
Mass	One 2-channel circuit type: Approx. 350g Two 2-channel circuit type: Approx. 450g

#### • AS-i specifications

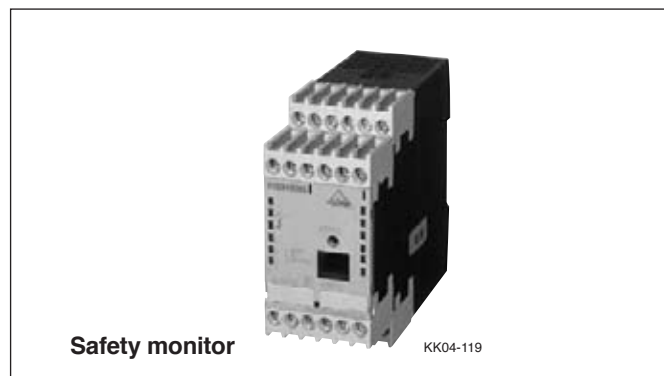
Item	Specification
Profile	Monitor 7F
ID code	7
IO code	F
Voltage range	18.5 to 31.6V
Current consumption	45mA max.

#### • Input specifications

Item	Specification
Start input	Photocoupler input (high active) Approx. 10mA (at 24V DC)
Protective control (EDM) input	Photocoupler input (high active) Approx. 10mA (at 24V DC)

#### • Output specifications

Item	Specification
Message output (Safety on)	PNP transistor output: 200mA Short-circuit protection and polarity changeover protection
Safety output rated control current	Nonpotential NO contact I <sub>e</sub> /AC-12: 2A at 250V AC I <sub>e</sub> /AC-15: 2A at 115V AC, 2A at 230V AC I <sub>e</sub> /DC-12: 2A at 24V DC I <sub>e</sub> /DC-13: 1A at 24V DC, 0.1A at 115V DC 0.05A at 230V DC
Durability	Mechanical: 10x10 <sup>6</sup> operation Electrical: 100x10 <sup>3</sup> operation (230V AC, 3A, AC-15)
Fuse	Constant-speed breaking type (MT) with a maximum breaking current of 4A used externally.
Overvoltage category	3: Conforming to VDE0110 part 1 at a rated operating voltage of 300V AC.



#### • Setting interface specifications

Item	Specification
Interface	RS-232C
Communications specifications	9600bps with no parity Start bit: 1, End bit: 1, Data bit: 8

#### • LED indication

LED	State	Description
AS-i 1	OFF	No power
	Green LED ON	AS-i power supply
AS-i 2	OFF	Normal
	Red LED ON	Communication error
1READY (each channel)	OFF	—
	Yellow LED ON	Start/Restart lock ON
	Yellow LED flashing	External test required
2ON (each channel)	OFF	Safety output connection open
	Green LED ON	Safety output connection closed
3OFF/FAULT (each channel)	Green LED flashing	Delay time operating in stop category 1
	OFF	—
	Red LED ON	Safety output connection open
	Red LED flashing	Error

## K45F safe compact module

2 safe inputs

### • Specifications

Item	Specification
ID code	B
IO configuration	0
Operating voltage	26.5 to 31.6V
Total current consumption	45mA max.
Input type	PNP (sink)
Input sensor	Mechanical contact
Low signal range	Contact open
High signal range	Contact closed Input current $I_{peak} \geq 5mA$
Pin assignment of socket 1	Pin 1 and pin 2: acts on bits D0 and D1 = channel 1 Pin 3 and pin 4: acts on bits D2 and D3 = channel 2 Pin 5: not used
Pin assignment of socket 2	Pin 1 and pin 2: not used Pin 3 and pin 4: acts on bits D2 and D3 = channel 2 Pin 5: not used
Socket 3	Not used
Socket 4	Not used
Operating temperature	-20 to +85°C (No icing or no condensation)
Storage temperature	-40 to +85°C (No icing or no condensation)
Degree of protection	IP67
Cooling method	Natural cooling
Mass	Approx. 135g (mounting plate (optional): Approx. 35 included)
Approval	UL, CSA, Marine

K45F safe compact module



### • LED indication

LED	State	Description
AS-i/FAULT	Green LED ON	Normal
	OFF	No power
	Red LED ON	Communication error
	(Red/Yellow) ON alternately	Address set to 0
F-IN1	OFF	No input
	Yellow LED ON	With input
F-IN2	OFF	No input
	Yellow LED ON	With input

## AS-Interface EMERGENCY STOP pushbutton

Two NC contacts

### • Specifications

Item	Specification
ID code	B
IO configuration	0
Operating voltage	26.5 to 31.6V
Total current consumption	60mA max.
Low signal range	Contact open (Emergency stop button OFF)
High signal range	Contact closed (Emergency stop button ON) Input current: $I_{peak} \geq 5mA$
Operating temperature	-25 to +70°C (No icing or no condensation)
Storage temperature	-40 to +80°C (No icing or no condensation)
Degree of protection	IP65
Cooling method	Natural cooling
Mass	Approx. 250g
Approval	UL, CSA, Marine

AS-Interface EMERGENCY STOP pushbutton



Yellow cover

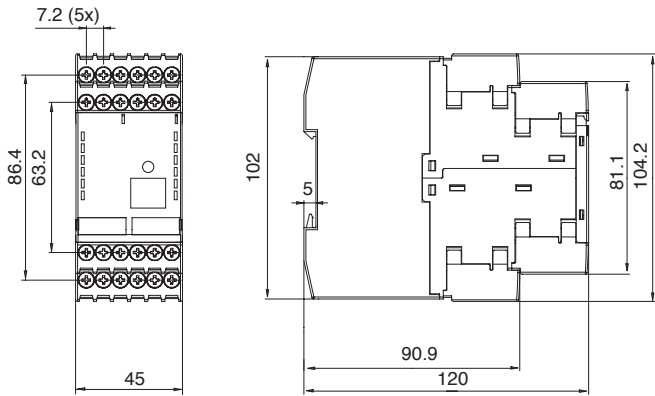
Yellow cover with protective collar



KK05-002

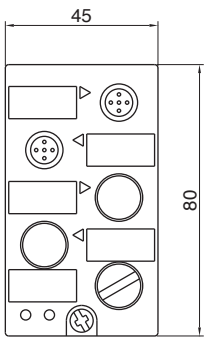
■ Dimensions, mm

• Safety monitor



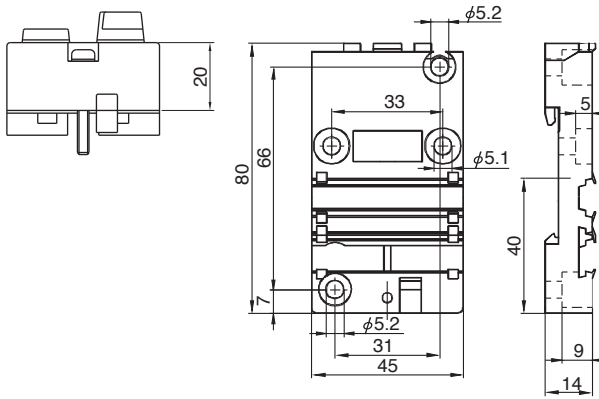
• K45F safe compact module

Actual slave

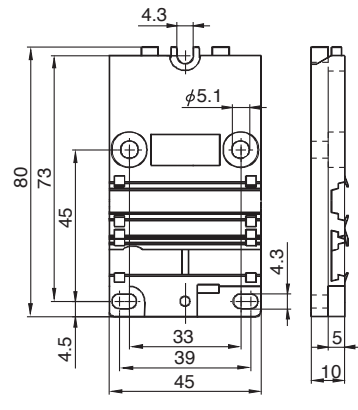


Mounting plate

Rail/screw dual mounting

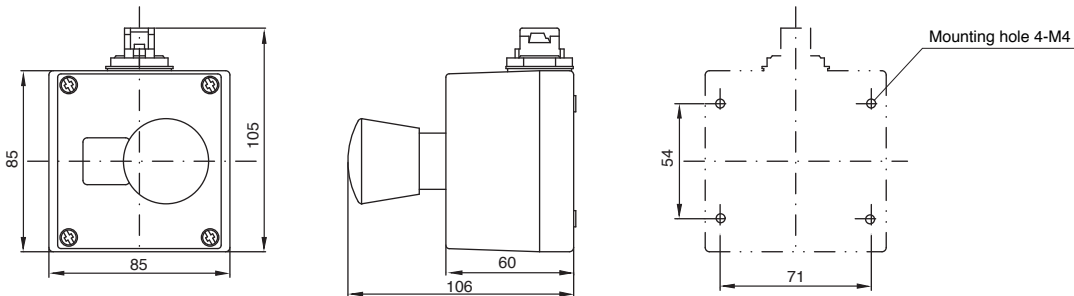


Exclusive screw mounting

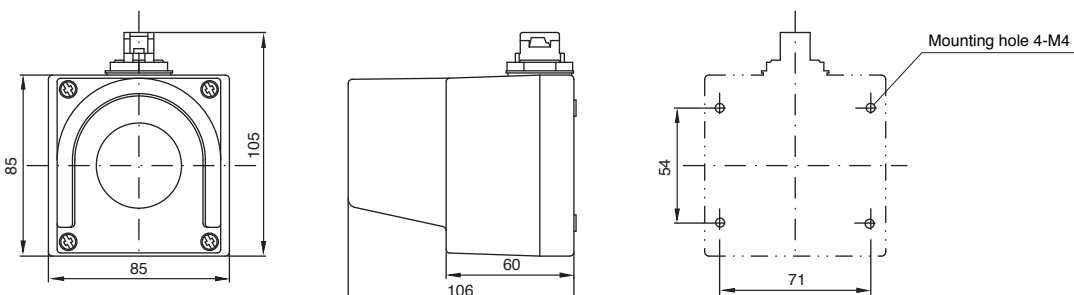


• AS-Interface EMERGENCY STOP pushbutton

Yellow cover

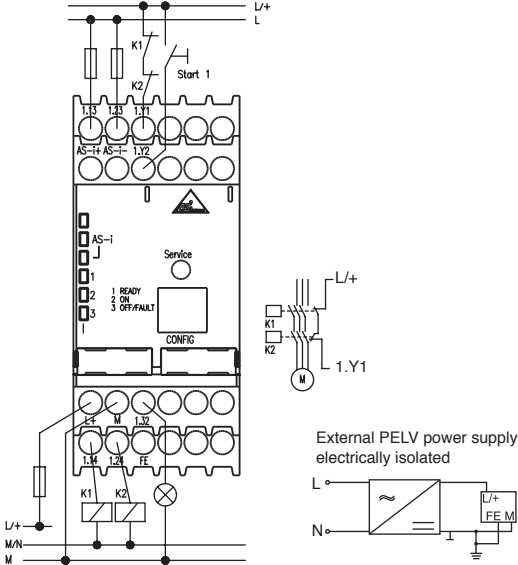


Yellow cover with protective collar

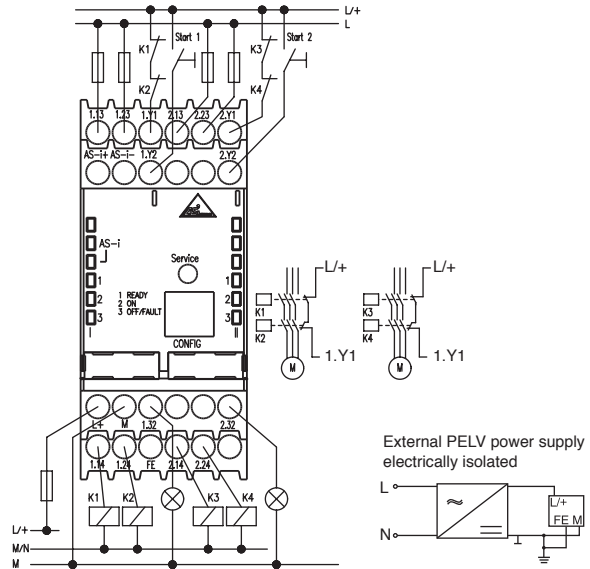


## ■ Wiring diagrams

### • Safety monitor with one 2-channel circuit



### • Safety monitor with 2 two-channel circuits



## ■ Product overview

Item	Description
Configuration software	This software is used to configure and set up the safety monitor on the PC (IBM PC/AT or compatible). A separately sold connection cable (3RK1901-5AA00) is required to make settings. (PC requirements) <ul style="list-style-type: none"> <li>• A Pentium® or newer Intel® processor or a compatible AMD® or Cyrix® processor</li> <li>• CD-ROM drive</li> <li>• Mouse (recommended)</li> <li>• RS-232C serial interface (9-pin D-sub plug)</li> <li>• OS: Microsoft® Windows 95/98/ME/2000/XP®</li> </ul>
Cable set	This cable connects the safety monitor and PC (IBM PC/AT or compatible). The PC connects with the RS-232C serial interface (9-pin D-sub plug).
Input jumper for K45F	This input jumper makes one channel of the safety slave always ON. This input jumper is used one when only channel out of two channels is used. With this jumper, Pin 1 and Pin 2 in K45F are connected internally.
Sealable cap	This cap is the spare of the protective cover for the configuration interface of the safety monitor. Each bag contains five caps. The safety monitor is provided with a single sealable cap.

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