Selection table for safety relays ESM

Safety relays

- **BL** Non-time-delay category 3
- **BA** Non-time-delay category 4
- **BT** Time-delay/non-time-delay category 4
- **2H** 2-hand requirement level IIIC according to EN 574

Contact expansion

- **ES** Non-time-delay category 4
- **TE** Time-delay category 4

Category according to EN 954-1

- **K** Category according to EN 954-1

Enable path

- **SU** Safety contacts non-time-delay
- **SV** Safety contacts time-delay
- **M** Auxiliary contacts

Relay start

- **A** Automatic start
- **M** Start button
- **U** Monitored start button

Monitoring

- **R** Feedback loop
- **Q** Short circuit monitoring
- **E** Earth fault monitoring
- **M** Ground fault monitoring

Devices							Outputs			Start			Monitoring				Page
BL	BA	BT	2H	ES	TE	K	SU	SV	M	A	M	U	R	Q	E	M	
●						3	2			●	●		●				8
	●					4	2			●	●	●	●	●	●	●	9
	●					4	3		1	●	●	●	●	●	●	●	9
		●				4	1	3		●	●	●	●	●	●	●	10
		●				4	2	2		●	●	●	●	●	●	●	10
		●				4	3	1		●	●	●	●	●	●	●	10
			●			4	2					●	●	●	●	●	11
				●		4	3		1						●	●	12
					●	4		3	1						●	●	13

Safety relays ESM-BL.. and ESM-BA..

- **ESM-BL.. up to category 3 according to EN 954-1**
- **ESM-BA.. up to category 4 according to EN 954-1**
- **LED status indicators**
- **1-channel or 2-channel control**
- **Up to 3 redundant safety contacts**
- **Auxiliary contact optional**
- **Short circuit and earth fault/ground fault monitoring optional**

Relay outputs

The outputs are electrically decoupled and of redundant design

Connection options

By using suitable wiring the following functions can be selected:

- Relay start with automatic start or a start button
- Monitoring of downstream relays or contactors

On the series **ESM-BA..** safety relays, by using suitable wiring it is also possible to select:

- Simultaneity monitoring to monitor safety components over time
- Relay start using a monitored start button
- Short circuit monitoring to detect short circuits between the connection cables and to shut down the outputs or prevent relay starting if necessary
- Earth fault/ground fault monitoring to detect short circuits between the connection cables and earth or ground and to shut down the outputs or prevent relay starting if necessary

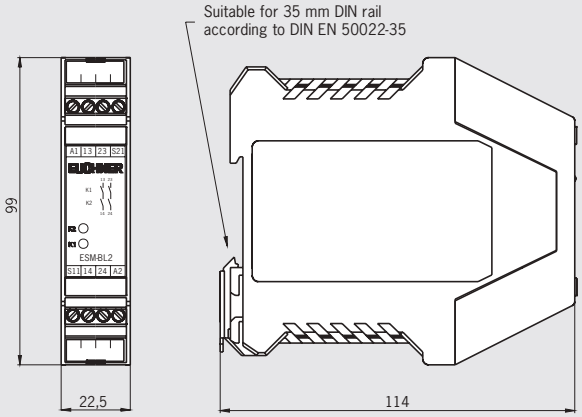
Auxiliary contacts

On series ESM-BA3.. relays an electrically separate normally closed contact is available as an auxiliary contact

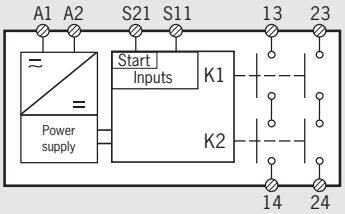
Safety relay ESM-BL..

Cat. 3 | STOP 0

Dimension drawing



Block diagram



Technical data outputs

Parameter		Value		
Minimum switching current at 24 V DC		20 mA		
Maximum switching voltage		DC 24 V / AC 250 V		
Utilization category *		U_e	I_e	ΣI_e
according to EN IEC 60947-5-1	AC-12	250 V	6 A	12 A
	AC-15	230 V	4 A	
	DC-12	24 V	1,25 A	
	DC-13	24 V	2 A	

U_e = Switching voltage

I_e = Maximum switching current per contact

ΣI_e = Maximum switching current for all safety contacts (cumulative current)

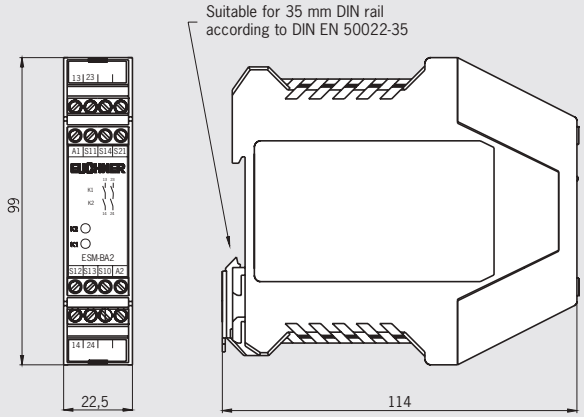
* See page 29 for informaton about the utilization category

Ordering table

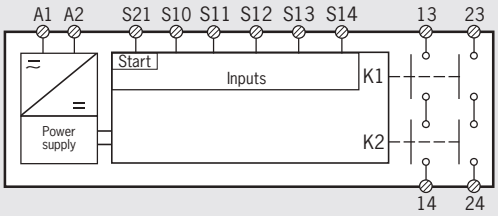
Series	Version	Outputs	AC/DC 24 V	AC 115 V	AC 230 V
ESM	BL Safety relay	2 2 NO	085 607 ESM-BL201	085 608 ESM-BL202	085 609 ESM-BL203

Safety relay ESM-BA2..

Dimension drawing



Block diagram



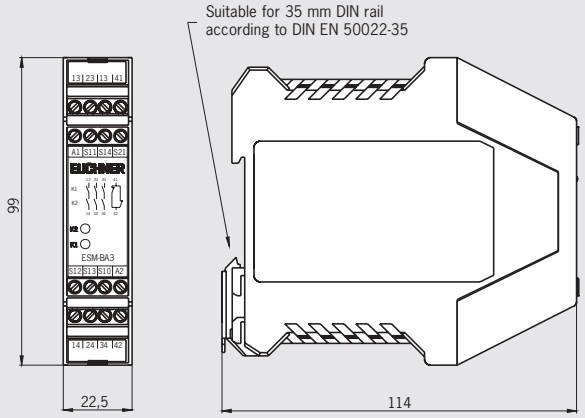
Technical data outputs

Parameter	Value			
Minimum switching current at 24 V DC	20 mA			
Maximum switching voltage	DC 24 V / AC 250 V			
Utilization category * according to EN IEC 60947-5-1		U_e	I_e	ΣI_e
	AC-12	250 V	6 A	12 A
	AC-15	230 V	4 A	
	DC-12	24 V	1,25 A	
	DC-13	24 V	2 A	

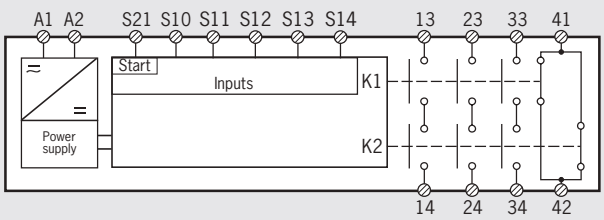
U_e = Switching voltage
I_e = Maximum switching current per contact
$\Sigma\ I_e$ = Maximum switching current for all safety contacts (cumulative current)
* See page 29 for informaton about the utilization category

Safety relay ESM-BA3..

Dimension drawing



Block diagram



Technical data outputs

Parameter		Value			
Minimum switching current at 24 V DC		20 mA			
Maximum switching voltage		DC 24 V / AC 250 V			
Utilization category * according to EN IEC 60947-5-1	ESM-BA301		U_e	I_e	ΣI_e
		AC-12	Ue 250 V	8 A	15 A
		AC-15	Ue 250V	3 A	
		DC-12	Ue 24 V	2 A	
		DC-13	Ue 24 V	2 A	
	ESM-BA302	AC-12	Ue 250 V	8 A	
	ESM-BA303	AC-15	Ue 250V	3 A	
		DC-12	Ue 50 V	8 A	
		DC-13	Ue 24 V	3 A	

U_e = Switching voltage
I_e = Maximum switching current per contact
$\Sigma\ I_e$ = Maximum switching current for all safety contacts (cumulative current)
* See page 29 for informaton about the utilization category

Ordering table

Series	Version	Outputs	AC/DC 24 V	AC 115 V	AC 230 V
ESM	BA Safety relay	2 2 NO	085 610 ESM-BA201	085 611 ESM-BA202	085 612 ESM-BA203
		3 3 NO + 1 NC	085 613 ESM-BA301	087 412 ESM-BA302	087 413 ESM-BA303

For technical data see page 21

Safety relay ESM-BT..

- **Up to category 4 according to EN 954-1**
- **LED status indicators**
- **1-channel or 2-channel control**
- **4 redundant safety contact of which 1, 2 or 3 contacts time-delayed**
- **Time delay can be adjusted between 1 s and 30 s**
- **Short circuit and earth fault/ground fault monitoring**

Relay outputs

The outputs are electrically decoupled and of redundant design

Connection options

By using suitable wiring the following functions can be selected:

- Relay start with automatic start, a start button or a monitored start button
- Monitoring of downstream relays or contactors
- Simultaneity monitoring to monitor safety components over time
- Short circuit monitoring to detect short circuits between the connection cables and to shut down the outputs or prevent relay starting if necessary
- Earth fault/ground fault monitoring to detect short circuits between the connection cables and earth or ground and to shut down the outputs or prevent relay starting if necessary

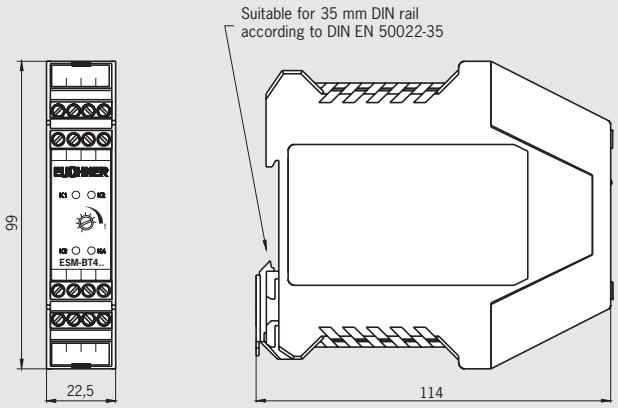
Time-delayed shutdown

The release time for the time-delay contacts can be set as required using a potentiometer on the safety relay.

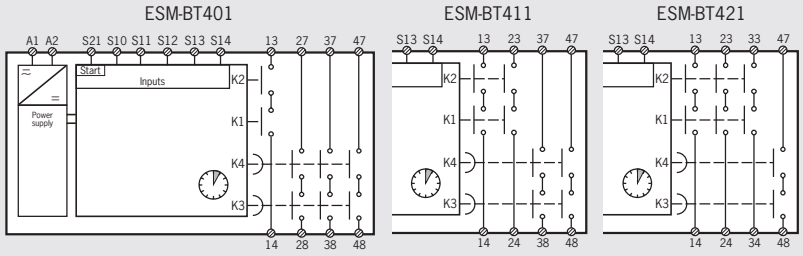
Safety relay ESM-BT..

Cat. 4 | STOP 0 | STOP 1

Dimension drawing



Block diagram



Technical data outputs

Parameter		Value		
Minimum switching current at 24 V DC		20 mA		
Maximum switching voltage		DC 50 V / AC 250 V		
Utilization category * according to EN IEC 60947-5-1		U_e	I_e	ΣI_e
	AC-12	250 V	8 A	15 A
	AC-15	250 V	3 A	
	DC-12	50 V	8 A	
	DC-13	24 V	3 A	

U_e = Switching voltage

I_e = Maximum switching current per contact

ΣI_e = Maximum switching current for all safety contacts (cumulative current)

* See page 29 for informaton about the utilization category

Ordering table

Series	Version	Outputs	AC/DC 24 V
ESM	BT Safety relay	**401** 1 NO non-time-delay 3 NO time-delay	**090 818** ESM-BT401
		411 2 NO non-time-delay 2 NO time-delay	**090 819** ESM-BT411
		421 3 NO non-time-delay 1 NO time-delay	**090 820** ESM-BT421

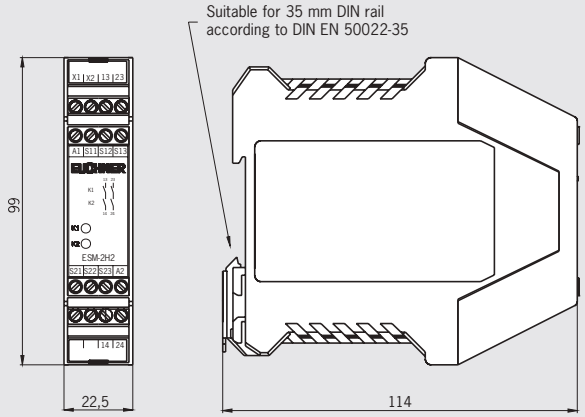
Safety relay ESM-2H..

- **Up to category 4 according to EN 954-1**
- **Requirement level IIIC according to EN 574**
- **LED status indicators**
- **Operation using 2-hand control**
- **2 redundant safety contacts**
- **Short-circuit and earth fault/ground fault monitoring can be selected**

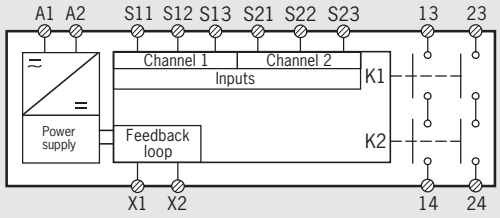
Safety relay ESM-2H..

Cat. 4 | STOP 0

Dimension drawing



Block diagram



Relay outputs

The outputs are electrically decoupled and of redundant design

Connection

- Two buttons each with one normally closed contact and one normally open contact that are monitored for simultaneity according to EN 574. In this way a high level of protection against tampering is provided.
- Short circuit monitoring to detect short circuits between the connection cables and to shut down the outputs or prevent relay starting if necessary
- Earth fault/ground fault monitoring to detect short circuits between the connection cables and earth or ground and to shut down the outputs or prevent relay starting if necessary

Connection option

By using suitable wiring the following function can be selected:

- Monitoring of downstream relays or contactors

Technical data outputs

Parameter		Value		
Minimum switching current at 24 V DC		20 mA		
Maximum switching voltage		DC 24 V / AC 250 V		
Utilization category *		U_e	I_e	ΣI_e
according to EN IEC 60947-5-1	AC-12	250 V	6 A	8,4 A
	AC-15	230 V	4 A	
	DC-12	24 V	1,25 A	
	DC-13	24 V	2 A	

U_e = Switching voltage

I_e = Maximum switching current per contact

ΣI_e = Maximum switching current for all safety contacts (cumulative current)

* See page 29 for informaton about the utilization category

Ordering table

Series	Version	Outputs	AC/DC 24 V	AC 115 V	AC 230 V
ESM	**2H2** Safety relay	**2** 2 NO	**085 620** ESM-2H201	**098 345** ESM-2H202	-

For technical data see page 21

Contact expansion ESM-ES..

- **Up to category 4 according to EN 954-1**
- **LED status indicators**
- **Control using safety relays**
- **3 redundant safety contacts**
- **1 auxiliary contact**
- **Earth fault/ground fault monitoring can be selected**

Relay outputs

The outputs are electrically decoupled and of redundant design

Connection option

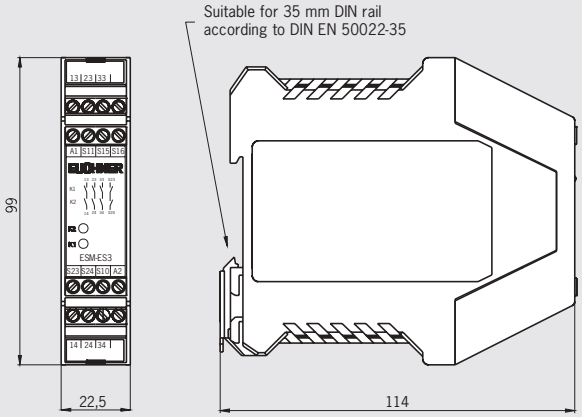
By using suitable wiring the following function can be selected:

- Earth fault/ground fault monitoring to detect short circuits between the connection cables and earth or ground and to shut down the outputs or prevent relay starting if necessary

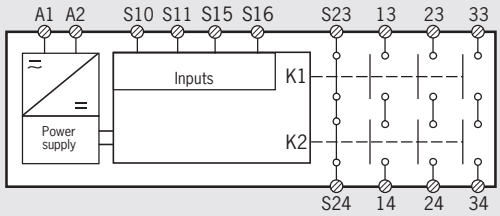
Contact expansion ESM-ES..

Cat. 4 | STOP 0

Dimension drawing



Block diagram



Technical data outputs

Parameter		Value		
Minimum switching current at 24 V DC		20 mA		
Maximum switching voltage		DC 50 V / AC 250 V		
Utilization category *		U_e	I_e	ΣI_e
according to EN IEC 60947-5-1	AC-12	250 V	6 A	12 A
	AC-15	230 V	4 A	
	DC-12	24 V	1,25 A	
	DC-13	24 V	2 A	

U_e = Switching voltage

I_e = Maximum switching current per contact

ΣI_e = Maximum switching current for all safety contacts (cumulative current)

* See page 29 for informaton about the utilization category

Ordering table

Series	Version	Outputs	AC/DC 24 V	AC 115 V	AC 230 V
ESM	ES Contact expansion	3 3 NO + 1 NC	085 614 ESM-ES301	085 615 ESM-ES302	085 616 ESM-ES303

Contact expansion ESM-TE..

- **Up to category 4 according to EN 954-1**
- **LED status indicators**
- **Control using safety relays**
- **3 redundant time-delayed safety contacts**
- **Time delay can be adjusted between 1 s and 30 s**
- **1 auxiliary contact**
- **Earth fault/ground fault monitoring can be selected**

Relay outputs
The outputs are electrically decoupled and of redundant design

Connection option
By using suitable wiring the following function can be selected:

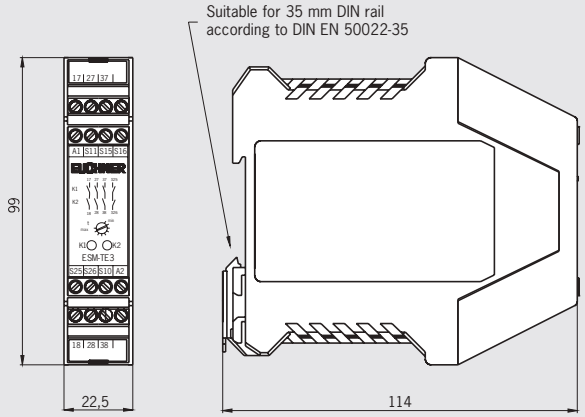
- Earth fault/ground fault monitoring to detect short circuits between the connection cables and earth or ground and to shut down the outputs or prevent relay starting if necessary

Time-delayed shutdown
The release time for the time-delay contacts can be set as required using a potentiometer on the safety relay.

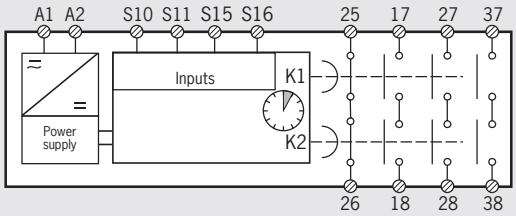
Contact expansion ESM-TE..

Cat. 4 | STOP 1

Dimension drawing



Block diagram



Technical data outputs

Parameter		Value		
Minimum switching current at 24 V DC		20 mA		
Maximum switching voltage		DC 50 V / AC 250 V		
Utilization category *		U_e	I_e	ΣI_e
according to EN IEC 60947-5-1	AC-12	250 V	6 A	10,5 A
	AC-15	250 V	4 A	
	DC-12	24 V	1,25 A	
	DC-13	24 V	2 A	

U_e = Switching voltage
I_e = Maximum switching current per contact
ΣI_e = Maximum switching current for all safety contacts (cumulative current)
* See page 29 for informaton about the utilization category

Ordering table

Series	Version	Outputs	AC/DC 24 V	AC 115 V	AC 230 V
ESM	TE Contact expansion	3 3 NO + 1 NC time-delayed	085 617 ESM-TE301	085 618 ESM-TE302	085 619 ESM-TE303

For technical data see page 21

Overview safety relays ESM

Safety relays ESM

- **BL** Non-time-delay category 3
- **BA** Non-time-delay category 4
- **BT** Time-delay/non-time-delay category 4
- **2H** 2-hand requirement level IIIC according to EN 574

Contact expansions ESM

- **ES** Non-time-delay category 4
- **TE** Time-delay category 4

Safety relay ESM							
BL	BA	BT	2H	ES	TE		Page
●							22
	●						23
		●					24
			●				24
				●			25
					●		25

Overview modular safety system ESM-F

Base units ESM-F

- **BSN** Non-time-delay category 4
- **BMN** Non-time-delay category 4

Input modules ESM-F

- **ISI** 2-channel
- **IMI** 2-channel diverse (NC contact and NO contact)
- **I3I** 2-channel
- **ILI** 2-channel, without short circuit/earth fault/ground fault monitoring

Output modules ESM-F

- **OSN** Non-time-delay
- **OTN** Time-delay (adjustable)
- **OT05N** Time-delay (fixed)

Modular safety system ESM-F										
BSN	BMN	ISI	IMI	I3I	ILI	OSN	OTN	OT05N		Page
●										26
	●									26
		●								27
			●							27
				●						27
					●					27
						●				27
							●			28
								●		28

Housing

Parameter		Value				Unit
Housing material		Polyamide PA6.6				
Dimensions		114 x 99 x 22.5				mm
Weight		Approx. 0.25				kg
Connection type		Connection terminals				
Connection terminals		0.14 … 2.5				mm^2
Ambient temperature	**Base**	**ESM-BL2.. ESM-BA2..**	**ESM-BA3..**	**ESM-BT4..**	**ESM-2H..**	
	at U_B = 24 V DC	-15 ... 60	-15 ... 40	-15 ... 40	-15 ... 40	°C
	at U_B = 115/230 V AC	-15 ... 40	-15 ... 40	-	-	°C
	Contact expansion	**ESM-ES3.. ESM-TE3...**				
	at U_B = 24 V DC	-15 ... 60				°C
	at U_B = 115/230 V AC	-15 ... 40				°C
Degree of protection acc. to EN IEC 60529		IP 20				
Degree of contamination		2				
Mounting		35 mm DIN rail acc. to DIN EN 50022-35				
Life	**Base**	**ESM-BL2.. ESM-BA2.. ESM-BA3..**		**ESM-BT4..**	**ESM-2H..**	
	Mechanical	1×10^7		1×10^6	1×10^7	operating cycles
	Electrical	1×10^5		1×10^5	1×10^5	operating cycles
	Contact expansion	**ESM-ES3.. ESM-TE3...**				
	Mechanical	1×10^7				operating cycles
	Electrical	1×10^5				operating cycles

Connection ESM-BL2..

Parameter		Value				Unit
Operating voltage	ESM-BL201	24 ± 10% [1]				V AC/DC
	ESM-BL202	115 ± 10%				V AC
	ESM-BL203	230 ± 10%				V AC
Reverse polarity protection		On ESM-BL201				
Rated supply frequency		50 ... 60				Hz
Power consumption		Approx. 4				VA
Control voltage for start button		18.6 … 26				V DC
Control cable length (cross-section 0.75 mm^2)		Max. 1000				m
Control current for start button		Approx. 40				mA
Contact fuses		T4 / F6				A
Rated impulse withstand voltage		2.5				kV
Leakage path and air gap acc. to DIN VDE 0110-1		4				kV
Safety contacts		**2 NO contacts (redundant)**				
Minimum switching current at 24 V DC		20				mA
Maximum switching voltage		24				V DC
		250				V AC
Breaking capacity acc. to cULus		6 A AC 250 V 2 A DC 24 V				
Utilization category [2]			**Ue**	**Ie**	**Σ Ie**	
according to EN IEC 60947-5-1		AC-12	250 V	6 A	12 A	
		AC-15	230 V	4 A		
		DC-12	24 V	1,25 A		
		DC-13	24 V	2 A		
LED indicators		2, status display for relays K1 and K2				

1) All the electrical connections must either be isolated from the mains supply by a safety transformer according EN IEC 61558-2-6 with limited output voltage in the event of a fault, or by other equivalent isolation measures.

2) See page 29 for information about the utilization category.

U_e = Switching voltage I_e = Maximum switching current per contact ΣI_e = Maximum switching current for all safety contacts (cumulative current)

Connection ESM-BA2..

Parameter		Value				Unit
Operating voltage	ESM-BA201	24 ± 10% [1]				V AC/DC
	ESM-BA202	115 ± 10%				V AC
	ESM-BA203	230 ± 10%				V AC
Reverse polarity protection		On ESM-BA201				
Rated supply frequency		50 ... 60				Hz
Power consumption		Approx. 4				VA
Control voltage for start button		18.6 ... 26				V DC
Control cable length (cross-section 0.75 mm²)		Max. 1000				m
Control current for start button		Approx. 40				mA
Contact fuses		T4 / F6				A
Rated impulse withstand voltage		2.5				kV
Leakage path and air gap acc. to DIN VDE 0110-1		4				kV
Safety contacts		**2 NO contacts (redundant)**				
Minimum switching current at 24 V DC		20				mA
Maximum switching voltage		24				V DC
		250				V AC
Utilization category [2]			U_e	I_e	ΣI_e	
according to EN IEC 60947-5-1		AC-12	250 V	6 A	12 A	
		AC-15	230 V	4 A		
		DC-12	24 V	1,25 A		
		DC-13	24 V	2 A		
LED indicators		2, status display for relays K1 and K2				

Connection ESM-BA3..

Parameter			Value				Unit
Operating voltage	ESM-BA301		24 ± 10% [1]				V AC/DC
	ESM-BA302		115 ± 10%				V AC
	ESM-BA303		230 ± 10%				V AC
Reverse polarity protection			On ESM-BA201				
Rated supply frequency			50 ... 60				Hz
Power consumption			Approx. 7				VA
Control voltage for start button			18.6 ... 26				V DC
Control cable length (cross-section 0.75 mm²)			Max. 1000				m
Control current for start button			Approx. 60				mA
Contact fuses			Slow-blow T6 / quick-blow F8				A
Rated impulse withstand voltage			2.5				kV
Leakage path and air gap acc. to DIN VDE 0110-1			4				kV
Safety contacts			**3 NO contacts (redundant)**				
Minimum switching current at 24 V DC			20				mA
Maximum switching voltage			50				V DC
			250				V AC
Utilization category [2]	ESM-BA301			U_e	I_e	ΣI_e	
according to EN IEC 60947-5-1			AC-12	250 V	8 A	15 A	
			AC-15	250 V	3 A		
			DC-12	24 V	2 A		
			DC-13	24 V	2 A		
	ESM-BA302/303		AC-12	250 V	8 A		
			AC-15	250 V	3 A		
			DC-12	50 V	8 A		
			DC-13	24 V	3 A		
LED indicators			2, status display for relays K1 and K2				
Auxiliary contacts			**1 NC contact**				
Maximum switching voltage			24				V DC
			250				V AC
Utilization category [2]				U_e	I_e		
according to EN IEC 60947-5-1			AC-12	250 V	2 A		
			AC-15	230 V	2 A		
			DC-12	24 V	1,25 A		
			DC-13	24 V	1,25 A		

1) All the electrical connections must either be isolated from the mains supply by a safety transformer according EN IEC 61558-2-6 with limited output voltage in the event of a fault, or by other equivalent isolation measures.

2) See page 29 for information about the utilization category.

U_e = Switching voltage I_e = Maximum switching current per contact ΣI_e = Maximum switching current for all safety contacts (cumulative current)

Connection ESM-BT4..

Parameter		Value			Unit
Operating voltage		24 ± 10% [1]			V AC/DC
Reverse polarity protection		Yes			
Rated supply frequency		50 ... 60			Hz
Power consumption		Approx. 4.6			VA
Time-delay range		1 ... 30			s
Control voltage for start button		18.6 ... 26			V DC
Control cable length (cross-section 0.75 mm²)		Max. 1000			m
Control current for start button		Approx. 190			mA
Contact fuses		Slow-blow T6 / quick-blow F8			A
Rated impulse withstand voltage		2.5			kV
Leakage path and air gap acc. to DIN VDE 0110-1		4			kV
Safety contacts		**4 NO contacts (redundant)**			
Minimum switching current at 24 V DC		20			mA
Maximum switching voltage		50			V DC
		250			V AC
Breaking capacity acc. to cULus		8 A AC 250 V 2 A DC 24 V			
Utilization category [2] according to EN IEC 60947-5-1		**U_e**	**I_e**	**Σ I_e**	
	AC-12	250 V	8 A	15 A	
	AC-15	250 V	3 A		
	DC-12	50 V	8 A		
	DC-13	24 V	3 A		
LED indicators		4, status display for relays K1 to K4			

Connection ESM-2H..

Parameter		Value			Unit
Operating voltage	ESM-2H201	24 ± 10% [1]			V AC/DC
	ESM-2H202	115 ± 10%			V AC
Reverse polarity protection		Yes			
Rated supply frequency		50 ... 60			Hz
Power consumption		Approx. 4			VA
Control voltage at buttons		18.6 ... 26			V DC
Control cable length (cross-section 0.75 mm²)		Max. 1000			m
Control current for start button		Approx. 40			mA
Contact fuses		T4 / F6			A
Rated impulse withstand voltage		2.5			kV
Leakage path and air gap acc. to DIN VDE 0110-1		4			kV
Safety contacts		**2 NO contacts (redundant)**			
Synchronization time		max. 0.5			s
Release time for the safety relay (response time)		max. 20			ms
Minimum switching current at 24 V DC		20			mA
Maximum switching voltage		24			V DC
		250			V AC
Breaking capacity acc. to cULus		6 A AC 250 V 2 A DC 24 V			
Utilization category [2] according to EN IEC 60947-5-1		**U_e**	**I_e**	**Σ I_e**	
	AC-12	250 V	6 A	8,4 A	
	AC-15	230 V	4 A		
	DC-12	24 V	1,25 A		
	DC-13	24 V	2 A		
LED indicators		2, status display for relays K1 and K2			

1) All the electrical connections must either be isolated from the mains supply by a safety transformer according EN IEC 61558-2-6 with limited output voltage in the event of a fault, or by other equivalent isolation measures.

2) See page 29 for information about the utilization category.

U_e = Switching voltage I_e = Maximum switching current per contact Σ I_e = Maximum switching current for all safety contacts (cumulative current)

Connection ESM-ES3..

Parameter		Value			Unit
Operating voltage	ESM-ES301	24 ± 10% [1]			V AC/DC
	ESM-ES302	115 ± 10%			V AC
	ESM-ES303	230 ± 10%			V AC
Reverse polarity protection		On ESM-ES301			
Rated supply frequency		50 ... 60			Hz
Power consumption		Approx. 4			VA
Control voltage at inputs		18.6 ... 26			V DC
Control cable length (cross-section 0.75 mm²)		Max. 1000			m
Contact fuses		T4 / F6			A
Rated impulse withstand voltage		2.5			kV
Leakage path and air gap acc. to DIN VDE 0110-1		4			kV
Cumulative current of all contacts acc. to cULus		10.5			A
Safety contacts		**3 NO contacts (redundant)**			
Minimum switching current at 24 V DC		20			mA
Maximum switching voltage		50			V DC
		250			V AC
Breaking capacity acc. to cULus		6 A AC 250 V 2 A DC 24 V			
Utilization category [2] according to EN IEC 60947-5-1		**U_e**	**I_e**	**ΣI_e**	
	AC-12	250 V	6 A	12 A	
	AC-15	230 V	4 A		
	DC-12	24 V	1,25 A		
	DC-13	24 V	2 A		
LED indicators		2, status display for relays K1 and K2			
Auxiliary contacts		**1 NC contact**			
Continuous current max.		500			mA
Maximum switching voltage		24			V AC/DC

Connection ESM-TE3..

Parameter		Value			Unit
Operating voltage	ESM-TE301	24 ± 10% [1]			V AC/DC
	ESM-TE302	115 ± 10%			V AC
	ESM-TE303	230 ± 10%			V AC
Reverse polarity protection		On ESM-TE301			
Rated supply frequency		50 ... 60			Hz
Power consumption		Approx. 4			VA
Time-delay range		1 ... 30			s
Control voltage at inputs		18.6 ... 26			V DC
Control cable length (cross-section 0.75 mm²)		Max. 1000			m
Contact fuses		T4 / F6			A
Rated impulse withstand voltage		2.5			kV
Leakage path and air gap acc. to DIN VDE 0110-1		4			kV
Cumulative current of all contacts acc. to cULus		10.5			A
Safety contacts		**3 NO contacts (redundant)**			
Minimum switching current at 24 V DC		20			mA
Maximum switching voltage		50			V DC
		250			V AC
Breaking capacity acc. to cULus		6 A AC 250 V 2 A DC 24 V			
Utilization category [2] according to EN IEC 60947-5-1		**U_e**	**I_e**	**ΣI_e**	
	AC-12	250 V	6 A	10,5 A	
	AC-15	250 V	4 A		
	DC-12	24 V	1,25 A		
	DC-13	24 V	2 A		
LED indicators		2, status display for relays K1 and K2			
Auxiliary contacts		**1 NC contact**			
Continuous current max.		500			mA
Maximum switching voltage		24			V DC

1) All the electrical connections must either be isolated from the mains supply by a safety transformer according EN IEC 61558-2-6 with limited output voltage in the event of a fault, or by other equivalent isolation measures.

2) See page 29 for information about the utilization category.

U_e = Switching voltage I_e = Maximum switching current per contact ΣI_e = Maximum switching current for all safety contacts (cumulative current)

Glossary

Feedback loop
Components connected downstream of the safety relay can be monitored for correct function. For this purpose normally closed contacts on these components are integrated into the feedback loop on the relay.

Relay start
After the relay has switched off due to a request from a safety component connected, the relay must be re-started.

- Automatic start

The relay switches on automatically as soon as the safety component connected changes back to the safe state. On this topic note the information in EN 954-1, section 5.5, that renewed starting of the machine can only occur automatically if it is ensured that there can be no dangerous state.

- Manual start

The relay is started by actuating a button. First the safe state of the safety components connected must be re-established.

- Monitored, manual start

The relay is started by actuating a button. The button is monitored for jamming or possible tampering. Prior to starting the relay the safe state of the safety components connected must be re-established.

Single-channel safety circuit
A single positively driven contact in the safety component is connected to the relay. This type of connection is suitable for categories 1 or 2 according to EN 954-1.

Dual-channel safety circuit
Two contacts of which at least one is a positively driven contact are connected to the relay. This type of connection is suitable for categories 3 or 4 according to EN 954-1.

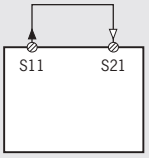
Utilization category according to EN IEC 60947-5-1 (excerpt)

Voltage type	Utilization category	Typical applications
AC	AC-12	Controlling resistive load and semi-conductor load in input circuits of optocouplers
	AC-15	Controlling electromagnetic load (> 72 VA)
DC	DC-12	Controlling resistive load and semi-conductor load in input circuits of optocouplers
	DC-13	Controlling electromagnetic loads with economy resistors in the circuit

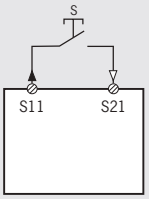
Connection examples safety relays ESM

Safety relay ESM-BL..

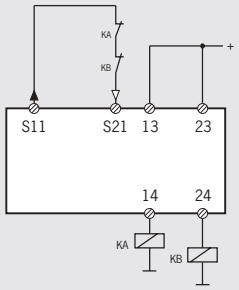
Automatic start without integration of the feedback loop



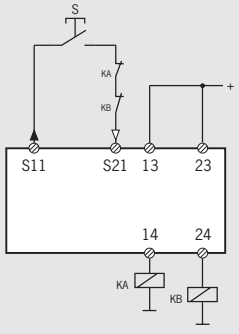
Manual start without integration of the feedback loop



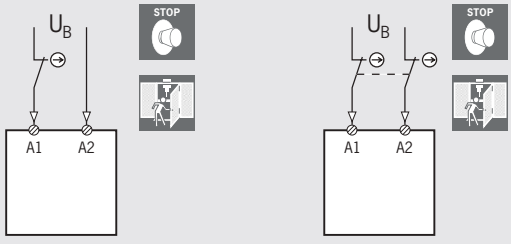
Automatic start with integration of the feedback loop



Manual start with integration of the feedback loop



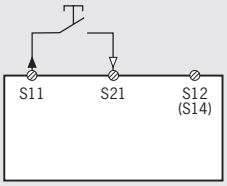
EMERGENCY STOP/safety circuit



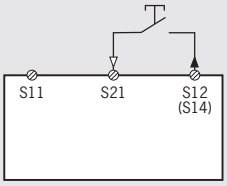
1-channel 2-channel

Safety relays ESM-BA../ESM-BT..

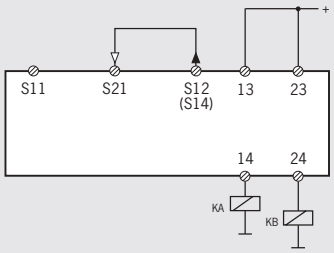
Monitored start without integration of the feedback loop



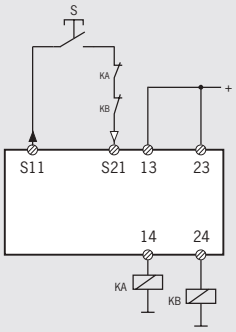
Un-monitored start without integration of the feedback loop



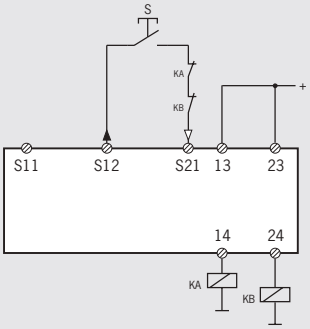
Automatic start without integration of the feedback loop



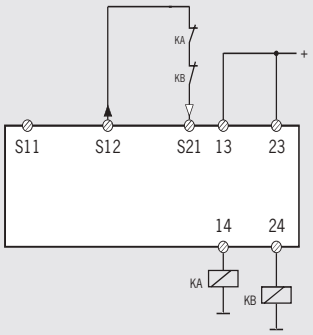
Monitored start with integration of the feedback loop



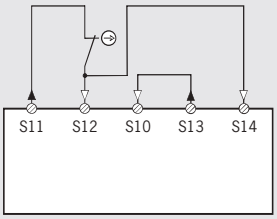
Un-monitored start with integration of the feedback loop



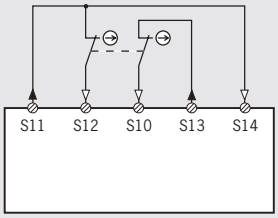
Automatic start with integration of the feedback loop



1-channel EMERGENCY STOP/safety circuit

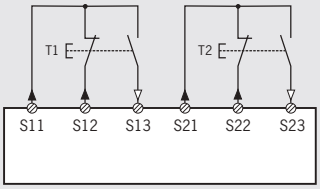


2-channel EMERGENCY STOP/safety circuit with ground fault/short circuit detection

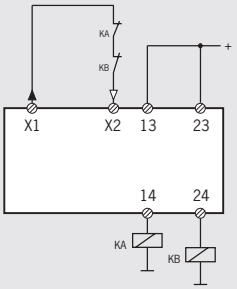


Safety relay ESM-2H2..

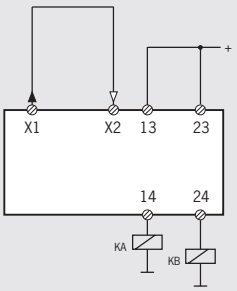
Monitoring a 2-hand control



With integration of the feedback loop

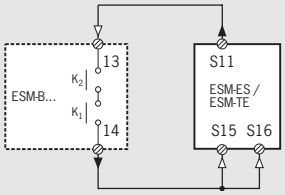


Without integration of the feedback loop

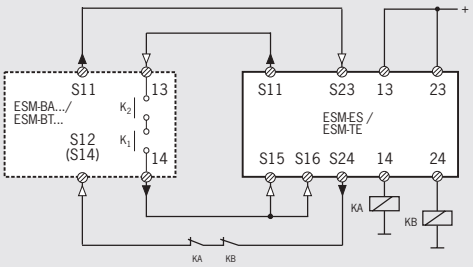


Safety contact expansion ESM-ES../ESM-TE..

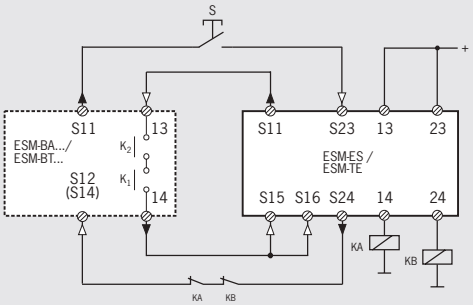
Integration of the contact expansion



Connection of the contact expansion with automatic start and with integration of the feedback loop

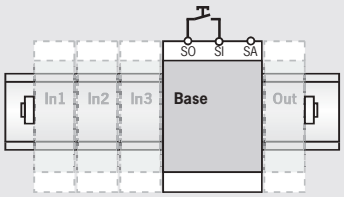


Connection of the contact expansion with manual start and with integration of the feedback loop



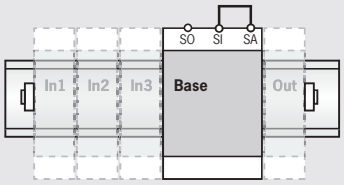
Connection examples safety system ESM-F

Monitored start



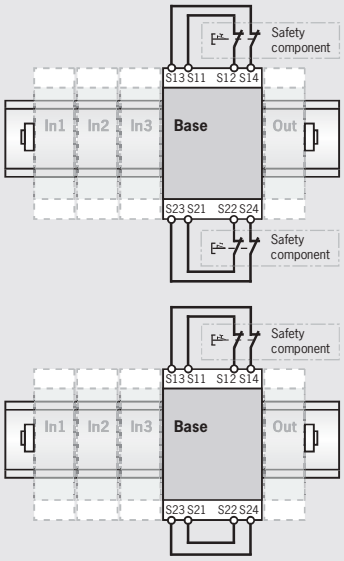
For a monitored start, a start button must be connected between the terminals *SO* and *SI*.
The safety contacts close when the start button is actuated.

Automatic start



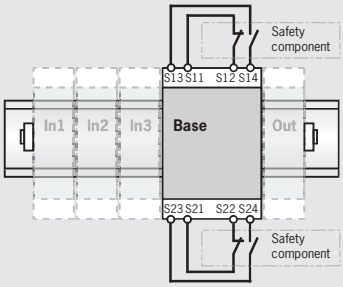
For an automatic start, a bridge must be connected between the terminals *SI* and *SA*.
The safety contacts close immediately if all safety circuits connected are closed.

Safety inputs on the ESM-F-BSN...



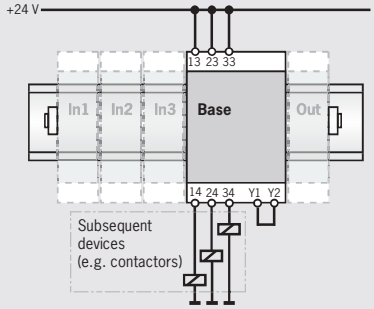
You can connect two dual-channel safety switches (e.g. two emergency stops) to the base unit. In the lower example only one safety switch has been connected, the unused safety inputs must therefore be connected together.

Safety inputs on the ESM-F-BMN...

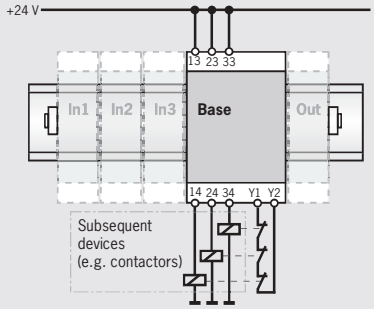


It is possible to connect two safety switches with one normally closed contact and one normally open contact (e.g. CMS from EUCHNER) to the base unit.

Safety contacts without feedback loop



Safety contacts with feedback loop



The base unit has three redundant, fault monitored safety contacts that shut down immediately if one of the safety circuits connected is interrupted or a fault occurs. To check the switching state on a connected load, the auxiliary contacts on a contactor or relay can be connected to terminals *Y1* and *Y2* to form a feedback loop. As supplied, the terminals *Y1* and *Y2* are connected together. The system can be expanded with further safety contacts using additional output modules. The function of the safety contacts and the feedback loop is the same as for the base unit.