MSI-sx/Rx MSI-sx/Tx

Modulares Sicherheits-Interface
Anschluß- und Betriebsanleitung

Modular Safety Interface
Connection and Operating Instructions

603200-09/02 Änderungen vorbehalten / Subject to change without notice

Notes on connection and operating instructions

These instructions contain information on the efficiency in the use of MSI Safety Interfaces in accordance with their intended applications. These instructions constitute a part of the scope of delivery.

Warning and safety notes are indicated by the symbol  .

Leuze lumiflex GmbH + Co. KG is not liable for damage resulting from improper use.
Acquaintance with these instructions constitutes part of the knowledge required for proper use.

Leuze lumiflex GmbH + Co. KG
Liebigstraße 4
D-82256 Fürstenfeldbruck
Tel. 0 81 41 / 53 50 - 0
Fax 0 81 41 / 53 50 - 1 90
E-Mail: lumiflex@leuze.de
http://www.leuze.de

Table of contents: MSI-sx/Rx, MSI-sx/Tx

1 System Overview and Range of Applications

1.1 General Information

The Modular Safety Interface (MSI) serves as a link between one or more active optoelectronic protective devices (AOPD), Type 2, Type 3 or Type 4, and the machine controls. All MSI safety components include restart interlock and external device monitoring functions that can be activated and deactivated. They are also equipped with a series of status outputs and LED displays as well as a diagnosis interface to a PC.

Leuze lumiflex offers a range of additional MSI safety interfaces with standard and special function, e.g. muting or cyclical operation (single break, double break) as well as the combination of muting and cycling mode.

All MSI safety components are available with either relay outputs or with safety-oriented pnp semiconductor outputs. The MSI x-variants allow the additional connection of safety interlocks or emergency-stop push buttons regarding category 4.

1.2 Approvals

Europe	North America
Type Examination in accordance with EN IEC 61496, Section 1 B I A Berufsgenossenschaftliches Institut für Arbeitssicherheit (Trade Association Institute for Industrial Safety) 53757 Sankt Augustin Germany	UL and C(UL) Approval pending

1.3 Terminology

AOPD	Active Optoelectronic Protective Device
Diagn.	Diagnosis Function
EDM	External Device Monitoring
ESPE	Electro-sensitive Protecting Equipment
Fault	Relay Fault
Locked	Start/Restart Interlock active
N.C.	Normal Closed Contact
N.O.	Normal Open Contact
OSSD	Output Signal Switching Device
Reset	Start/Restart Interlock Initiator
RS 232	Interface RS 232

S1 - S4	Safety input 1 - 4
S1 & S2 S3 & S4	Indication Protected fields free/interrupted
SSD	Secondary Switching Device (switches to ON state when the MSI is ready for operation)
Test	Test Signal Outputs
T1, T2	Test signal output 1, 2
Warn. (Rx Module)	Warning (preset number of switching actuations exceeded)

1.4 Nomenclature MSI-sx/Rx and MSI-sx/Tx

MSI	Modular Safety Interface
s	standard
x	extended functions The extended version offers the following standard functions for either **2** AOPDs, Type 4, or up to **4** AOPDs, Type 2: – Restart interlock – External device monitoring – Diagnosis function
/Rx	Relay output with extended functions: – two normal open safety contacts, OSSD 1 and OSSD 2 – one normal closed safety contact OSSD 3 – one normal open contact ”MSI readiness” SSD Additional special function: – relay operation monitoring with pre-failure message
/Tx	Transistor output with extended functions: – two safety-oriented pnp semiconductor outputs, OSSD 1 and OSSD 2 – one normal open contact ”MSI readiness” SSD

2 Safety Precautions

2.1 General Hazards Caused by Non-Observance of Safety Precautions

Leuze lumiflex products are developed and produced with careful attention to recognized codes of engineering practice. However, the protective function of the equipment can be impaired if the devices are not used for their intended purpose or if they are used improperly. Such instances can jeopardize the health and lives of the personnel operating the machinery.

2.2 Operating Conditions and Proper Use

The relevant regulations for machine safety apply for the use of the Modular Safety Interface. The responsible local authorities (e.g. the German Berufsgenossenschaft [trade association] or OSHA) are available to answer questions related to safety issues. In general, the following conditions for use must be complied with:

- The electrical connection is to be performed only by experienced, expert personnel. Familiarity with the safety precautions in this operating manual constitutes part of this expert knowledge.
- Depending on the external cabling, the switch outputs can have dangerously high voltages. Before any work is done on the MSI safety interface, these outputs as well as the supply voltage must be switched off and safeguarded against being switched on again.
- The MSI is designed to be installed in an electronics cabinet or in a protective housing with an enclosure rating of at least IP 54.
- The supply voltage of 24 V DC ± 20% must exhibit a safe mains separation and be able to bridge brief power outages of 20 ms.
- The MSI fulfills the requirements of Safety Category 4 in accordance with EN 954-1. However, if an AOPD from a lower safety category is connected, the overall category for that path of the controls cannot be higher than that of the connected AOPD.
- As a rule, at least two switch contacts or safety-related pnp-semiconductor outputs must be connected into the switch-off circuit of the machine. In order to prevent the relay switch contacts from welding together, they must be externally fused as specified in the Technical Data, Chapter 6.
- It is not allowed to use status outputs to switch safety-related signals.
- Cross circuits between S1 and S2 respectively S3 and S4 are detected by the MSI safety component only if the two time-displaced test signal outputs T1 and T2 are used for the connected AOPD(s) with relay outputs.

Type 4 AOPDs with safety-related semiconductor outputs and their own cross circuit monitoring can be connected directly to S1 and S2 or S3 and S4.

- The "Reset" button for resuming operation following a restart interlock must be placed in a location from which the entire danger area can be clearly watched.

- The safety distance between the AOPD and the danger point must be maintained. It is calculated according to the formulas in the specific machine-related C-Standards or in the general B1 Standard EN 999. The response time of the MSI (Chapter 6, Technical Data), the response time of the protective device, and the stopping time of the machine must all be taken into consideration when calculating the safety distance.

- AOPDs are not suitable in applications where a danger of throwing out pieces or splashing out hot or dangerous liquids exists. Also they are not suitable for machines with extended stopping times. For these or similar applications Leuze lumiflex GmbH + Co. KG offers interlocking devices (safety switches) with or without guard locking.

2.3 Additional advice as to connect EMERGENCY STOP buttons

- It must be secured that the EMERGENCY STOP function is always and immediate effective. In Chapter 5, Connection examples, there is a particular example illustrating the connection of an EMERGENCY STOP button.

- When a two-channel Section Emergency Stop button is connected, MSI is able to realize a Section Emergency Stop function. Section Emergency Stop buttons connected to the MSI only affect the safety ciruit that is assigned to the AOPD. For this reason, it is referred to as an Section Emergency Stop. The limited area of effect of the button must be identified for the operating staff in a manner that is cleary visible.

3 System Configuration and Functions

3.1 System Configuration

Two microprocessors handle the redundant processing of the signal sequences within the intelligent Modular Safety Interface MSI. The results of the two processors are continuously compared. If any deviations are found, the safety-related outputs are immediately switched off and the LED indicating an MSI failure lights up.

Sensor signals at inputs S1 and S2 as well as S3 and S4 are checked. Depending on which of the functions (as described below) are selected, when the protected fields of all connected AOPDs are free the MSI outputs switch automatically to the ON state (without restart interlock) or remain in the OFF state until the reset button has been pressed and released (with restart interlock = standard operating mode).

MSI-sx is available with two output options: the MSI-sx/Rx has two positive-guided normal open contacts and one positive-guided normal closed contact, while the MSI-sx/Tx has two safety-oriented pnp semiconductor outputs.

Furthermore, both versions offer an additional normal open contact SSD (Secondary Switching Device) which assumes the ON state when the MSI-sx is ready for operation.

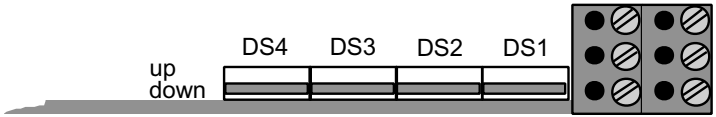
The SSD contact does not open when a protected field is interrupted! It may be used to switch off a second path (e.g. the motor power supply) if the MSI Safety Interface falls into an error condition.

The MSI safety interface comes in a 35 mm-wide slide-in housing that holds the MSI-sx module and the /Rx or /Tx output module. It is suitable for mounting on a grounded 35 mm standard rail.

3.2 DIP Switch Settings

3.2.1 DIP Switch Settings for the MSI-sx Module

Cut off the voltage supply to the interface (see safety precautions in Section 2.2) loosen the subassembly with the imprint "MSI-sx" and pull this module partly out of the housing before resetting the DIP switches:



Functions **only** in conjunction with external wiring, see Section 3.3:

DIP Switch	DS4	DS3	DS2	DS1
Function	None	Locking	External Device Monitoring	None
Up		restart interlock only	Static•- none ••	–
Down		start/restart interlock* - none **	dynamic	–

Factory setting: all switches down

* See 3.3.1.1 – 3.3.1.3

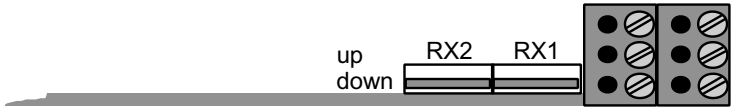
** See 3.3.1.4

• See 3.3.1.2

•• See 3.3.1.3 – 3.3.1.5

3.2.2 DIP Switch Settings for the Rx Output

Cut off the voltage supply to the interface (see safety precautions in Section 2.2) loosen the subassembly Rx Output and pull it partly out of the housing before resetting the DIP switches:



DIP Switches	RX2	RX1
Function	Warning: 1,000,000 operations performed	
Up		
Down	x	x

DIP Switches	RX2	RX1
Function	Warning: 500,000 operations performed	
Up	x	
Down		x

DIP Switches	RX2	RX1
Function	Warning: 200,000 operations performed	
Up		x
Down	x	

DIP Switches	RX2	RX1
Function	Warning: 100,000 operations performed	
Up	x	x
Down		

Factory setting: switches down (Warning after 1,000,000 operations)
Recommended setting: See Section 3.3.2

3.3 Operating Modes and Functions

3.3.1 Operating Modes: Interlocking Functions and External Device Monitoring

The following 5 combinations can be selected by externally wiring the MSI Safety interface and/or by changing the settings of the DIP switches DS2 and DS3 in the MSI Module:

OPERATING MODES		
Section	Type of Locking	Type of External Device Monitoring
3.3.1.1	With start/restart interlock	with dynamic ext. device monitoring
3.3.1.2	With start/restart interlock	with static ext. device monitoring
3.3.1.3	With start/restart interlock	without external device monitoring
3.3.1.4	Without start/restart interlock	without external device monitoring
3.3.1.5	With start/without restart interlock	without external device monitoring

The MSI safety interface is factory-set for the operating mode ”with start/restart interlock and dynamic external device monitoring”. If this setting is changed, these functions (i.e. the appropriate safety level) must be guaranteed by other means.

- Types of interlocking functions
  The start interlock function ensures that when the system is switched on or when the supply voltage returns, even if the protected field is free the safety-related output contacts or semiconductor outputs (OSSDs) do not automatically go into ON state, but rather wait until the reset button has been pressed and let go. The restart interlock function prevents the OSSDs from automatically entering the ON state when the protected fields of one or more of the connected AOPDs are released again after an interruption. Here as well, the reset button must be pressed and let go to initiate the system.

- Types of External Device Monitoring
  The function dynamic external device monitoring monitors the relays connected downstream from the MSI safety interface. Each time before the OSSDs switch to the ON state, a check is made of whether the subsequent circuit elements have closed and reopened. If they have not, the OSSDs of the MSI safety interface remain in the OFF state. If the function static external device monitoring is selected, a check is merely made of whether the subsequent circuit elements are in an open state. If they are, the start/restart interlock can be initiated.

3.3.1.1 Operating Mode: With Start/Restart Interlock – With Dynamic External Device Monitoring

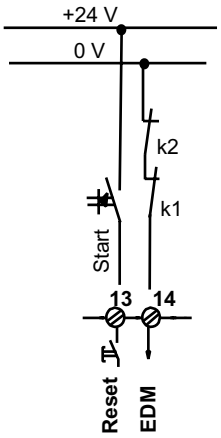
External wiring requirements:

Terminal 13 ”Reset”	connected to +24 V by way of a start button
Terminal 14 ”EDM”	connected to 0 V by way of feedback contacts of the positive-guided downstream relay

Required DIP switch settings in the MSI module (Section 3.2):

DS3 down	DS2 down (factory setting at delivery)

Start/restart interlock is no longer active when the protected fields of all connected AOPDs are free, the downstream relays have returned to their original state, and the reset button is pressed and released.



3.3.1.2 Operating Mode: With Start/Restart Interlock – With Static External Device Monitoring

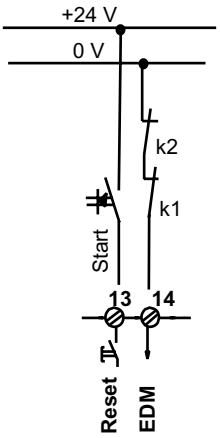
External wiring requirements:

Terminal 13 ”Reset”	connected to +24 V by way of a start button
Terminal 14 ”EDM”	connected to 0 V by way of feedback contacts of the positive-guided downstream relay

Required DIP switch settings in the MSI module (Section 3.2):

DS3 down	DS2 up

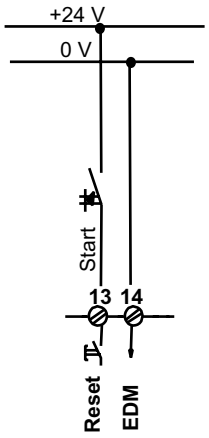
In this operating mode, if the protected fields are free, a check is merely made of whether the downstream circuit elements have returned to their original state. If so, a release is issued by pressing and letting go of the reset button.



The dynamic monitoring of the downstream relays, which may be required in order to maintain the safety category, must be performed by other means.

3.3.1.3 Operating Mode: With Start/Restart Interlock – Without External Device Monitoring

External wiring requirements:



Terminal 13 ”Reset” connected to +24 V by way of a start button

Terminal 14 ”EDM” connected to 0 V

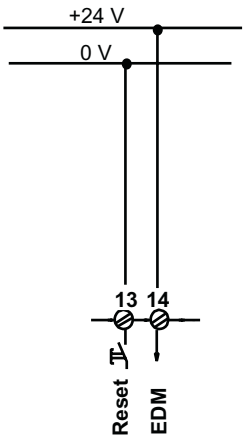
Required DIP switch settings in the MSI module (Section 3.2):

DS3 down DS2 up

The dynamic monitoring of the downstream relays, which may be required in order to maintain the safety category, must be performed by other means.

3.3.1.4 Operating Mode: Without Start/Restart Interlock – Without External Device Monitoring

External wiring requirements:



Terminal 13 ”Reset” connected to 0 V

Terminal 14 ”EDM” connected to +24 V

Required DIP switch settings in the MSI module (Section 3.2):

DS3 down DS2 up

After the supply voltage is applied, the OSSDs immediately go into the ON state if all of the protected fields of the connected AOPDs are free.

In this case, the start/restart interlock function and the dynamic monitoring of the downstream relays, which may be required in order to maintain the safety category, must be performed by other means.

3.3.1.5 Operating Mode: With Start/Without Restart Interlock – Without External Device Monitoring

External wiring requirements:

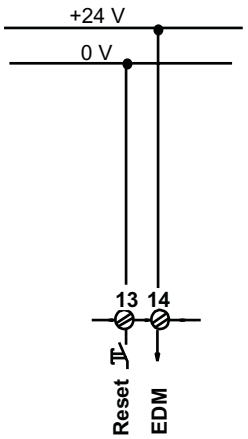
Terminal 13 connected to 0 V "Reset"

Terminal 14 connected to +24 V "EDM"

Required DIP switch settings in the MSI module (Section 3.2):

DS3 up DS2 up

After the supply voltage is applied, the OSSDs remain in the OFF state even if all of the protected fields of the connected AOPDs are free.



When the protected fields of all connected AOPDs are initially free, the OSSDs first enter the ON state when the protected field of the AOPD connected at S1 (for Type 4: S1 and S2) is interrupted and released. Only then do the rest of the connected AOPDs respond to the interruption and release of their own protected fields by switching the OSSDs directly to the OFF and ON states.

In this case, the restart interlock function and the dynamic monitoring of the downstream circuit elements, which may be required in order to maintain the safety category, must be performed by other means.

3.3.2 Relay Operation: Monitoring Function Pre-failure Message in /Rx Versions

For purposes of preventive maintenance, the /Rx output subassemblies are equipped with a function that counts the number of relay operations and issues a pre-failure message. Four different values can be selected at the DIP switches on the subassembly. Before the DIP switches can be set, the Rx subassembly must be completely disconnected from all power sources. It can then be released from its two holding brackets with a screwdriver and pulled slightly out of the housing.

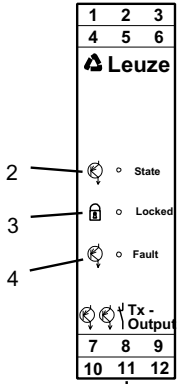
The table below shows the recommended DIP switch settings with respect to the switching current. Switching voltages of up to 60 V DC and 250 V AC are admissible.

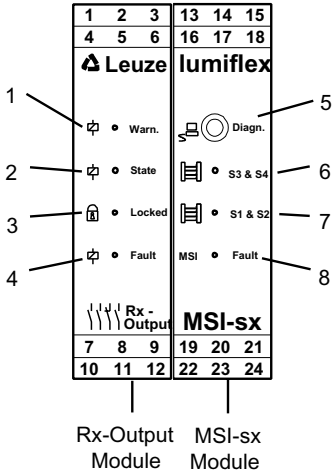
OSSD Switching current (Switching Voltage 60 V DC, 250 V AC max.)	≤ 0.75 A	> 0.75 A ≤ 1.5 A	>1.5 A ≤ 3 A	> 3 A ≤ 5 A
Recommended number of Operations	1,000,000 (factory setting)	500,000	200,000	100,000

For setting, see Section 3.2.2.

3.4 Displays

A number of LEDs of various colors indicate the operating status of the MSI modular safety interface. It is also possible to show the LED displays on the PC monitor using the integrated RS 232 interface and diagnosis connector.



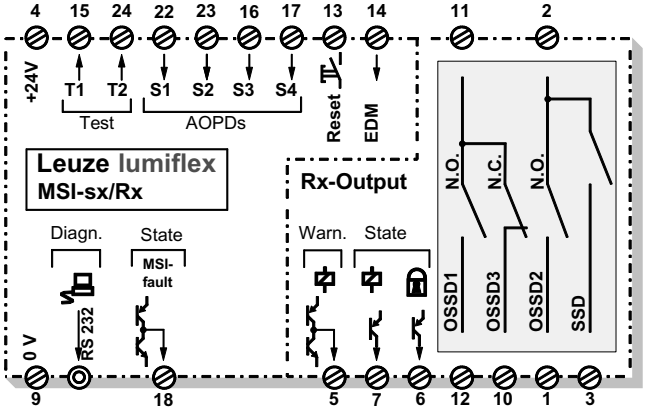


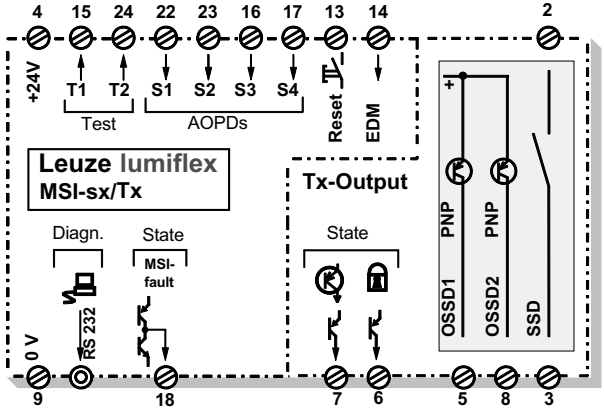
Output /Rx /Tx					
Position	Display/Function	Symbol	Status	LED	Color
1	Preset no. of relay operations (/Rx only)	relay/ Warn	reached not reached	on off	red
2	Safety-related switch output	relay/trans. State	on off	on on	green red
3	Restart interlock	lock	locked not locked	on off	yellow
4	Fault in output module	relay/trans. Fault	fault no fault	on off	red

MSI-sx Module					
Position	Display/Function	Symbol	Status	LED	Color
5	Diagnosis, RS 232 See status outputs	jack diagn.	none	none	none
6	Protected field	AOPDs S3 & S4	protected field free not free	on off	green
7	Protected field	AOPDs S1 & S2	protected field free not free	on off	green
8	MSI fault	MSI fault	fault no fault	on off	red

3.5 Status Outputs

Status outputs are not allowed to be used as safety-related signals in release circuits (see also Section 2. Operating Conditions and Proper Use).





Output /Rx /Tx				
Terminal	Message Function	Symbol	Status	Status Output
5	preset no. of relay operations (/Rx only)	relay	not reached reached	active high active low
6	Restart interlock	lock	locked not locked	active high active low
7	Safety-related switch status	relay/ transistor	ON OFF	active high active low

MSI-sx Module				
Terminal	Message Function	Symbol	Status	Status Output
Front jack	Diagnosis, RS 232 2.5 mm round connector	–	–	connected to PC with Diagnosis program
18	MSI fault	MSI-fault	no fault fault	active high active low

3.6 Diagnosis Function

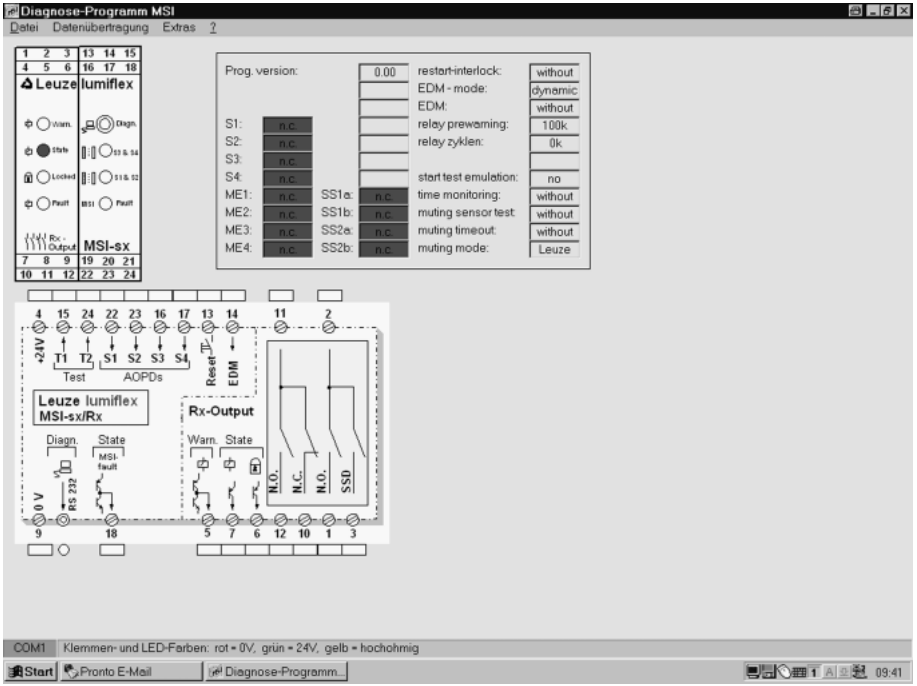
Requirements for running the diagnosis system: a standard PC or laptop operating under Windows (Version 3.1 or higher) and the MSI software, Version 01, on 3 1/2 " diskette, as well as a serial connection cable and a 2.5 mm jack plug.

- Simultaneous display of all input and output statuses as well as all LED displays on the MSI

With its diagnosis interface, the intelligent modular safety interface MSI offers a convenient way to visualize all of the input and output statuses simultaneously on the monitor.

The connection circuit diagram as well as display fields in different colors can be shown on the screen via the connection terminals. A graphic representation of the MSI front design with the display elements as described in 3.4 also appears on the screen.

Example:



This enables the sequences at individual screw-type terminals to be tracked without the use of additional measuring instruments. The diagnosis function is equipped with online help and can be operated in either English or German.

4 Electrical Connection

4.1 Installation Regulations

The general safety precautions in Chapter 2 must be observed. The electrical installation may be performed only if there is no voltage applied, and it must be performed by trained specialists.

In the /Rx versions, it is possible that high voltages may be present at the output contacts. A no-voltage state is achieved only when the 24 V DC supply voltage as well as the supply lines to the switch contacts are safely switched off and secured against being switched on again.

Coded plug-in terminal blocks allow a connection cross-section of up to 2.5 mm^2. The supply voltage must be externally fused against excess current with a fuse of 2.5 A. The switch contacts must also be externally fused against excess current with a maximum of 5 A. This prevents the safety-related contacts from welding together if the current load is too high!

4.2 Power Supply Requirements

The supply voltage of 24 V DC must guarantee safe mains separation and be able to bridge an interruption in voltage of 20 ms at full load. The MSI-AC 115 or MSI-AC 230 from Leuze lumiflex have these capabilities up to 0.8 Amps. The ground connection of the MSI is made when it snaps up to the metallic, grounded mounting rail by means of the rear clamping device.

The lead for the supply voltage must be externally fused against excess current with a maximum of 2.5 A.

4.3 Connecting AOPDs, Type 4 or Type 2

The examples below show possibilities for connecting and combining AOPDs of various safety categories and with various output features (relays, safety-oriented semiconductor outputs, cross circuit monitoring within and outside the AOPD).

AOPDs Type 4 with semiconductor outputs and cross connection monitoring function can directly connected to the safety inputs S1 and S2, respectively to S3 and S4. See Example 1.

All available safety inputs must be occupied! In case no components are connected, the remaining inputs must be connected to the corresponding test signal using bridges. In doing so, please note that the odd-numbered test signal must be connected to the odd-numbered safety input via the non-delaying bridge (T1 => S1 or S3) and vice versa (T2 => S2 or S4). See Example 2.

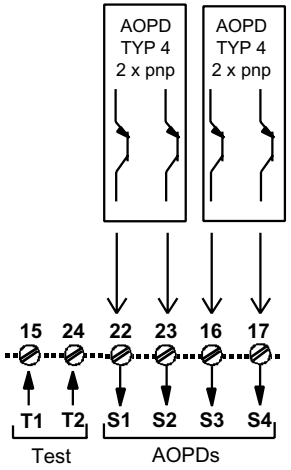
AOPDs Type 4 with relay outputs, safety switches or emergency stop buttons must be connected so that the

odd-numbered test signal T1 are directed via the non-delaying contacts to an odd-numbered safety input (T1=>S1 or S3) and vice versa (T2=>S2 or S4). See Example 3 and 4.

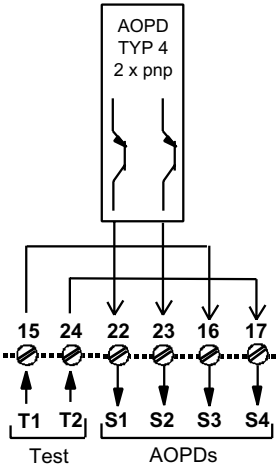
AOPDs Type 2 are periodically tested using the time-displaced test signals T1 or T2. The odd-numbered test signal must be directed to an even-numbered safety input by the way of the time-delaying AOPD (T1=>S2 or S4) and vice versa (T2=>S1 or S3). The AOPD response time to a test request must be in a range of 2 to 18 ms. See Example 5 and 6.

Using both, the safety inputs S1 & S2 and S3 & S4 separate insulated connector cables must be used to avoid undetected cross connections between S1 and S3 respectively S2 and S4. Cross connections between S1 and S2 as well as between S3 and S4 are automatically detected.

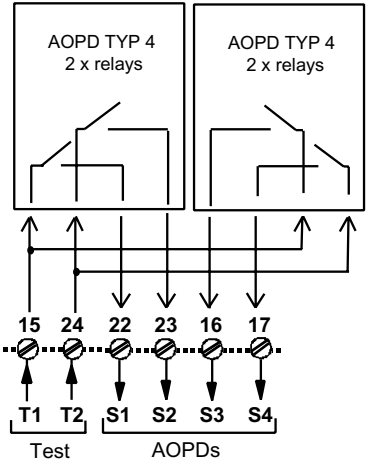
Example 1
2 AOPDs Type 4 with 2 safety-related semiconductor outputs and internal cross connection monitoring function each.



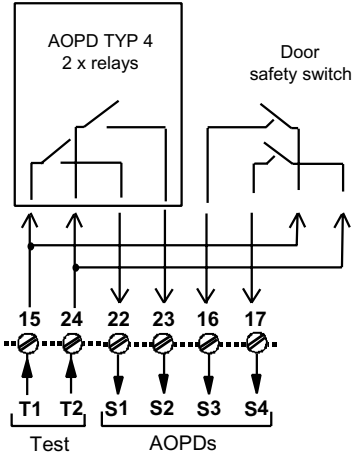
Example 2
1 AOPD Type 4 with 2 safety-related semiconductor outputs and internal cross connection monitoring function.



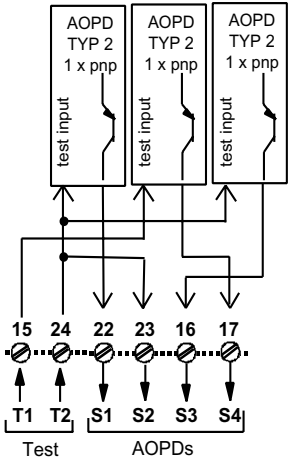
Example 3
2 AOPDs Type 4 with 2 normally open contacts each. Separated connection cables to the individual AOPDs are required.



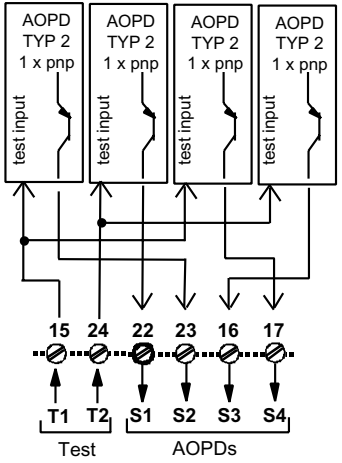
Example 4
1 AOPD Type 4 with 2 normally open contacts and 1 safety switch. Separated connection cables to the individual safety components are required.



Example 5
3 AOPDs Type 2 with 1 safety-related semiconductor output each. Separated connection cables to the individual AOPDs are required.



Example 6
4 AOPDs Type 2 with 1 safety-related semiconductor output each. Separated connection cables to the individual AOPDs are required.



4.4 Connecting Machine Controls

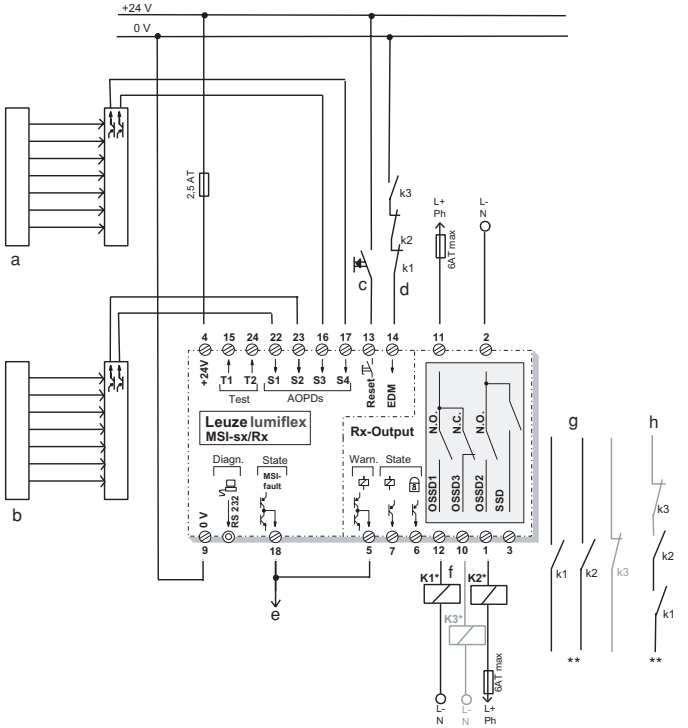
The safety-related parts of the controls comprise more than the MSI-sx/Rx or MSI-sx/Tx described above. They also include successive control elements and even power transmission elements which must be safely and promptly shut down. Particular attention must be paid to maintaining the safety category requirements. Important information in this regard can be found in the harmonized European standard EN 954-1.

Essential prerequisites for safe operation are the abilities to electrically influence the interruption of the dangerous movement and to bring the machine to a standstill as quickly as possible. These factors, as well as the response times of AOPDs and the MSI, must be taken into consideration when calculating the safety distance.

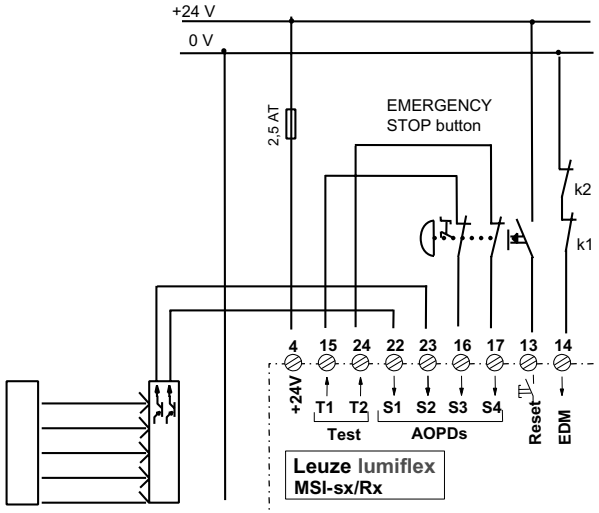
The response times depend on the type of AOPD selected (see Section 6, Technical Data). Other parameters, such as hand/arm/body approach speed or additional safety distance, depend on the particular application and the resolution of the AOPD being used. The European standard EN 999 contains equations and examples for a variety of configurations.

5 Connection Circuit Diagram, Examples

The connection examples below show a wiring suggestion for the MSI-sx/Rx and MSI-sx/Tx as well as a connection example for an EMERGENCY STOP button.



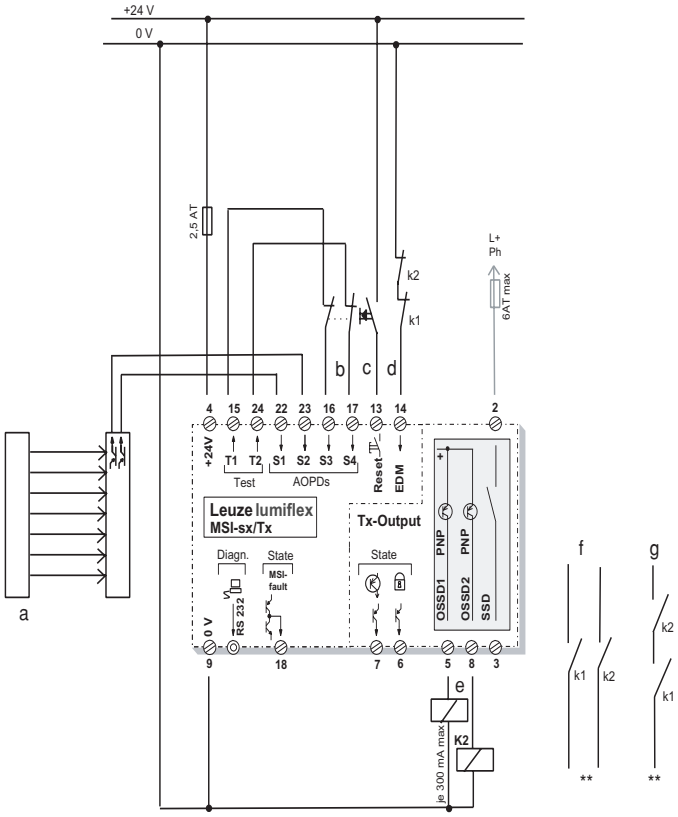
Connection example MSI-sx/Rx with two AOPD Type 4



Example:connection of two-channel EMERGENCY STOP button

a	=	AOPD Type 4
b	=	AOPD Type 4
c	=	Command device for releasing the start/restart interlock
d	=	Feedback loop for external device monitoring
e	=	Possible collective output for warning/error indications
Pin 18	=	Indicating output "MSI-Fault”
Pin 5	=	Warning output "prediction of relay failure”
Pin 7	=	Indicating output ”status safety outputs”
Pin 6	=	Indicating output ”status start/restart interlock”
f	=	Output Signal Switching Devices (OSSDs)
Pin 3	=	Secondary Switching Device (SSD) opens in case of failures
g	=	Switching off path with two-(three)-channel control
h	=	Switching off path with one-channel control
*	=	Suitable spark suppression required
**	=	In general, both of the contacts must be used in the subsequent machine control path. Use relays or contactors with positive-driven contacts only.Use relays or contactors with positive-driven contacts only.

All available safety inputs must be occupied!
See Section 4.3.



Connection example MSI-sx/Tx with one AOPD Type 4 and one safety switch

a	=	AOPD Type 4
b	=	Safety switch (or emergency stop p button)
c	=	Command device for releasing the s restart interlock
d	=	Feedback loop for external device n toring
Pin 18	=	Indicating output ”MSI-Fault”
Pin 7	=	Indicating output ”status safety outp
Pin 6	=	Indicating output ”status start/restar terlock”
e	=	Output Signal Switching Devices (OSSDs)
Pin 3	=	Secondary Switching Device (SSD) opens in case of MSI-failure
f	=	Switching off path with two-channel trol
g	=	Switching off path with one-channel trol
*	=	Suitable spark suppression required
**	=	In general, both of the contacts mus used in the subsequent machine co path. Use relays or contactors with p tive-driven contacts only.

All available safety inputs must be occupied!
See Section 4.3.

ENGLISCH

6 Technical Data and Ordering Information

6.1 MSI-sx/Rx, MSI-sx/Tx

Version, Type Modular Safety Interface	MSI-sx	
Relevant standards, Safety category	TYPE 4 in accordance with EN IEC 61496 T1 see also Section 2, Safety Precautions EN 954-1 (12/96). Category 4 IEC, DIN EN 60204-1 (11/98), Stop 0 DIN V VDE 0801 and A1, Specification Class 6	
Connectable safety sensors S1-S4	up to 2 AOPDs, Type 4, Type 3 or up to 4 AOPDs Type 2 (all in accordance with EN IEC 61496)	
Connectable safety switches and command units at S1-S4	Safety switches according to EN 1088 Area Emergency-Stop button according to EN 418	
Test outputs T1 and T2, Test interval Test impulses, time-displaced Response time AOPD Type 2 to a test request	 200 ms 24 ms each 2 to 18 ms	
Available functions	Start/restart interlock External device monitoring	
Control input Start/restart interlock (Reset)	Potential-free normal open contact (button or key button)	
Control input External device monitoring (EDM)	Feedback of positive-guided contacts from downstream relays (see connection diagram in Section 5)	
Indication output MSI-Fault	push-pull semiconductor output no fault message fault message	 active high, 24 V 60 mA max. active low
Safety outputs (Technical Data, see below)	Relay outputs Semiconductor outputs	via /Rx-Output via /Tx-Output

Supply voltage	24 V DC, ± 20%, external power supply with safe mains separation and equalization for 20 ms voltage interruption required, e.g. MSI-AC 115 or MSI-AC 230 0.8 A max. from Leuze lumiflex
Current consumption	approx. 200 mA without external load
External fusing	2.5 A m
Housing Enclosure rating	IP 20; must be installed in electronics cabinet or housing with an enclosure rating of at least IP 54 Mounting at 35 mm DIN standard rail
Protective class	II
Ambient temperature, Operation	0 ... + 55 °C
Ambient temperature, Storage	-25 ... + 70 °C
Relative humidity	93 % max.
Connection type	pluggable, coded screw-type terminals up to 2.5 mm2
Dimensions	See dimensional drawing

6.2 /Rx-Output

OSSD safety outputs switching voltage/switching current	2 safety-related normal open contacts, 60 V DC, 250 V AC, 5 A max. 1 safety-related normal closed contact, 60 V DC, 250 V AC, 5 A max. Minimum switching current 20 m A
OSSD external fusing	5 A m
OSSD response time MSI (without AOPD)	for AOPD Type 4, semiconductor outputs 18 ms 54 ms for AOPD Type 4, relay outputs 54 ms for AOPD Type 2 54 ms for safety switches
OSSD reset time	100 ms
OSSD suitable spark extinguishing over the coils of the downstream relays	Required

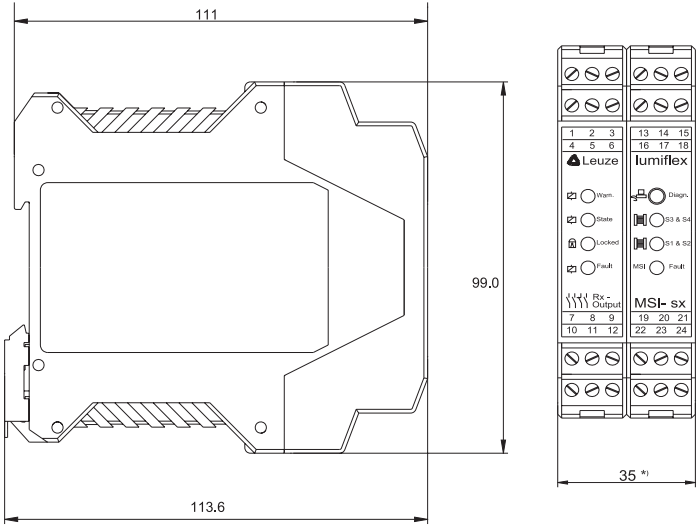
SSD secondary switching device (closes after successful start-up test, opens in case of fault) switching voltage/switching current	1 normal open contact, 60 V DC, 250 V AC, 5 A max. Minimum switching current 20 mA			
SSD external fusing	5 A m			
 Status output "Status switch outputs" not to be used for safety circuit!	pnp switch output OSSDs ON-state: OSSDs OFF-state:		active high, +24 V, 60 mA max. active low	
Status output "Status start/restart interlock"	pnp switch output locked: not locked:		active high, + 24 V, 60 mA max. active low	
OSSD currents over the contacts at 230 V AC switching voltage	≤ 0.75 A	> 0.75 A ≤ 1.5 A	> 1.5 A ≤ 3 A	> 3 A ≤ 5 A
Recommended limit of operations by way of DIP switch of Rx Module (factory setting 1,000,000)	1,000,000	500,000	200,000	100,000
Status output "Warning – preset no. of operations reached"	Push-pull semiconductor output Operations not reached: Operations reached:		active high, + 24 V 60 mA max. active low	

6.3 /Tx-Output

OSSD safety outputs switching voltage/switching current	2 safety-related pnp semiconductor outputs with cross connection monitoring 24 V DC, 300 mA max.	
OSSD response time MSI (without AOPD)	for AOPD Type 4, semiconductor output for AOPD Type 4, relay output for AOPD Type 2 for safety switches	8 ms 44 ms 44 ms 44 ms
OSSD reset time	100 ms	

SSD secondary switching device (closes after successful start-up test, opens in case of fault) switching voltage/switching current	1 normal open contact, 60 V DC, 250 V AC, 5 A max. minimum switching current 20 mA	
SSD external fusing	5 A mT	
Status output "Status switch outputs" not to be used for safety circuit!	pnp switch output OSSDs ON-state: OSSDs OFF-state:	 active high, +24 V, 60 mA max. active low
Status output "Status start/restart interlock"	pnp switch output locked: not locked:	 active high, + 24 V, 60 mA max. active low

6.4 Dimensional Drawing



*) Stringing together without distance possible

6.5 Ordering Information

Type	Part No.
MSI-sx/Rx	549901
MSI-sx/tx	549921
MSI-AC 115 (power supply 24V DC, 0.8 A)	549940
MSI-AC 230 (power supply 24V DC, 0.8 A)	549908
MSI diagnosis software	549930
PC cable 3 m	549953
PC cable 5 m	549955
/Rx output subassembly (replacement part)	509211
/Tx output subassembly (replacement part)	509201

7 Declaration of Conformity

Leuze lumiflex

EC-Declaration of Conformity

according to EC Machinery Directive 98/37/EC

We herewith declare,	Leuze lumiflex GmbH + Co. KG Liebigstr. 4 D-82256 Fürstenfeldbruck GERMANY

that the following described safety components in our delivered version complies with the appropriate basic safety and health requirements of the EC Machinery Directive 98/37/EC based on its design and type, as brought into circulation by us. In case of alteration of the safety components, not agreed upon by us, this declaration will lose its validity.

Description of the safety component:	**Safety Interface to evaluate safety related signals and to create safety related output switching signals according to EN 954-1 Cat. 4 based on two micro-processors (redundant).**
Safety component Type:	**MSI (-s, -sx), (-i, -ix), (-m, -mx), (-mi, -mix) with outputs /R, /Rx and /T, /Tx**
Serial number:	see type plate
Safety function:	Safety Interface to monitor several safety sensors and to create safety related output switching signals.
Applicable EC Directives, Basics:	EC Machinery Directive 98/37/EC EMC-Directive 89/336/EEC and modifications 91/263/EEC and 92/31/EEC Low Voltage Directive 73/23/EEC and modification 93/68/EEC. EN 954-1; 12.-96 Safety of machinery, safety related parts of control DIN EN 61496-1 Electro-sensitive protective device – part 1 DIN EN 60204-1; (June 1998) Electrical equipment for machinery, part 1 General requirements DIN V VDE 0801 (January 1990) with DIN V VDE 0801/A! (October 1994) Basics for computer systems with safety functions
Notified body according to annex VII:	BIA, Berufsgenossenschaftliches Institut für Arbeitssicherheit Alte Heerstr. 111 D-53757 St. Augustin GERMANY No. 1999 20206
Charged to do:	EC - type examination Examination certificate No. **993023**
CE-marking:	**The compliance with the Directives 73/23/EEC and 98/37/EC is certified by the CE-mark.**

Fürstenfeldbruck, May 27th 2002

ppa. Dr. Holger Lehmitz Manager Product Unit Safety at Work	ppa. Werner Lehner Manager Product Management

Reg.-Nr. 2Y22-02

Leuze lumiflex GmbH + Co. KG
Liebigstraße 4
D – 82256 Fürstenfeldbruck
Telefon (08141) 5350 - 0
Telefax (08141) 5350 - 190
E-Mail: lumiflex @ leuze.de
internet: http://www.leuze.de

Postbank München	(BLZ 700 100 80)	185 734 - 807
Dresdner Bank	(BLZ 700 800 00)	847 690 100
Deutsche Bank	(BLZ 700 700 10)	1972 900
UST-ID-Nr.	DE 129 999 527	

Kommanditgesellschaft, Sitz Fürstenfeldbruck, Amtsgericht München HRA 40417, pers. haftende Gesellschaft: Leuze electronic Geschäftsführungs-GmbH, Owen, Amtsgericht Kirchheim/Teck HRB 550. Geschäftsführer: Dr. Harald Grübel Michael Heyne
Vorsitzender des Verwaltungsrats: Meinert Hahnemann