FIESSLER
ELEKTRONIK

**Folding Machine Protection System saftey category 4**

**AKAS®-LCF/SBM**

# Operating Instructions

**EC type examination certified**

DIN EN ISO 9001
Reg. Nr. 96007

**CONTENTS:**




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FIESSLER ELEKTRONIK

# Contents

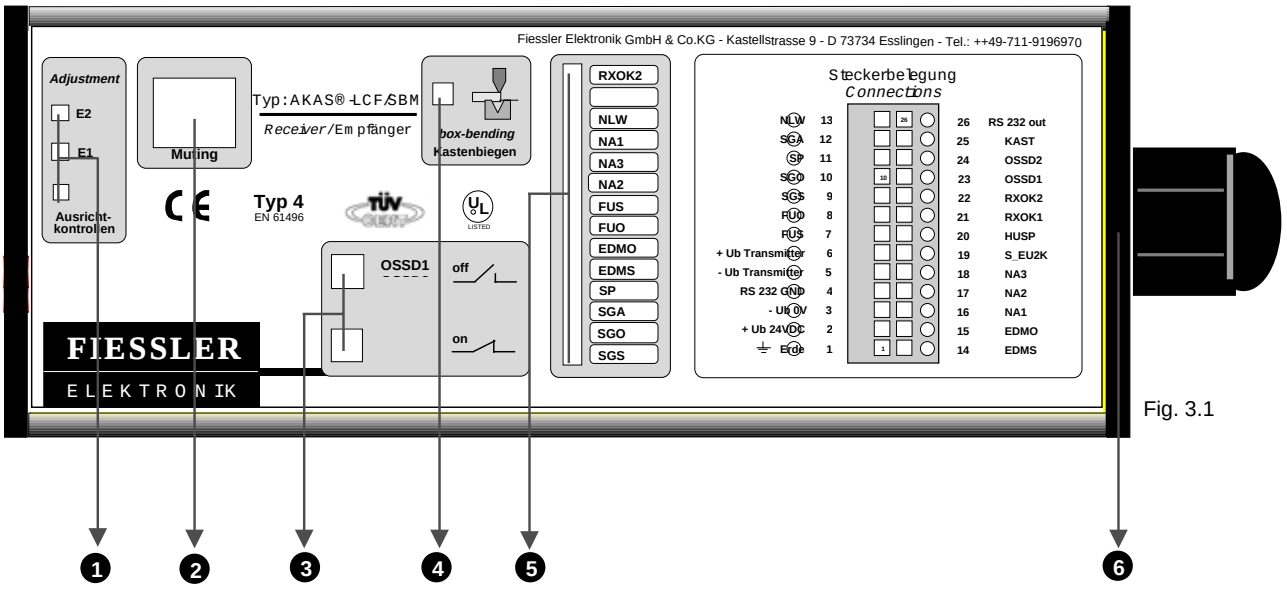



Fig. 3.1

**view of the receiver elements**


Fig. 3.2

**view after removing the connection lid on the receiver**

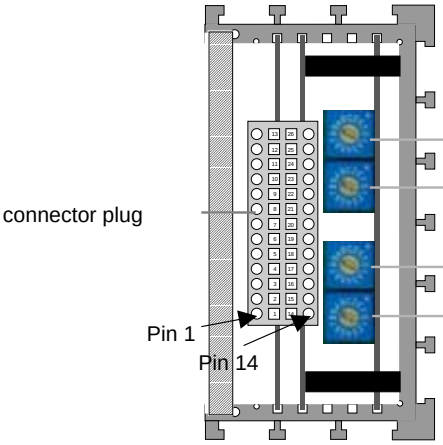
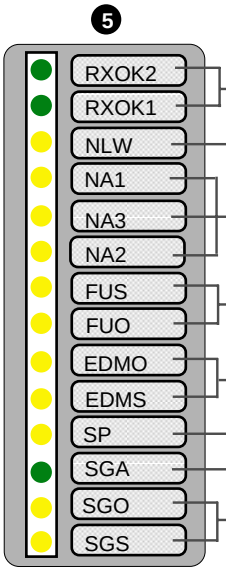



Fig. 3.3

1. ajustment controll-Leds of the receiver elements E1, E2, E3
   LEDs are on if the beam does focus at all (see page 14)
2. integrated mutinglamp
   lamp is on if the protective field of the AKAS is not activated
   lamp is flashing if EDM- or SP-input-signals are wrong
   (see page 28)
3. LEDs for safety outputs (OSSDs, Fail-Safe PNP)
   red LEDs are on if the OSSDs are in OFF status
   green LEDs are on if the OSSDs are in ON status
4. LED is on if box bending funktion is activated
5. Indicator lights for in- and outputs
6. connection lid




**Indicator lights for in- and outputs**
(see page 28)

- RXOK2, RXOK1: Outputs for release of rear stoppers
- NLW: Input for Overruntraverse controll
- NA1, NA3, NA2: Inputs for control of protective grids or doors and emergency-off circuits
- FUS, FUO: Inputs for press start / stop (release of closing stroke)
- EDMO, EDMS: Input for stop contactor control
- SP: Input for safety point
- SGA: Output for demand for slow speed
- SGO, SGS: Input for position control in slow speed

Attention is drawn to all safety instructions by this symbol.

Particular attention must be paid to such instructions.
These operating instructions provide to the user important information concerning the correct use of the AKAS®. These instructions are a component of the light barrier concerned. It is essential that they are easily available at the location where the safety light barrier is installed. Before the initial operation of the AKAS®, all requirements detailed in these operating instructions must be observed. Other relevant regulations and the requirements of the employers' liability insurance associations have also to be complied with.

Mounting, initial operation and maintenance may only be performed by qualified persons.

Light barriers do not protect anybody from machine-caused flying objects.
The AKAS® protects fingers and hands that hold the sheet metal during the operation.
**Therefore it does not protect during any fast engagement between the bending punch and the matrix short time before those are closed.**
**The protection function of the system is cancelled when the Muting lamp is on.**
**AKAS®-LCF/SBM does not protect the area between an upstand and the upper tool.**
**The front beam E1, which is located in front of the bending line, does not protect if the box-bending function has been activated. (see Fig. 4.2)**
**The pivotal movement of the bending beam is not monitored. (see Fig. 4.1)**

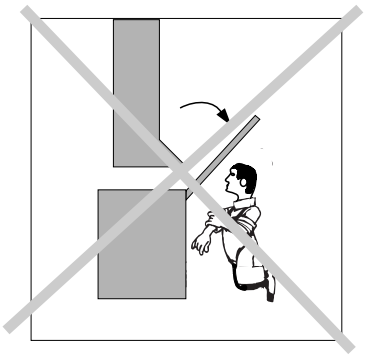


Fig.4.1

Injuries caused by the wheel of the bending beam (eg the risk of injury can be avoided by an additional light curtain)

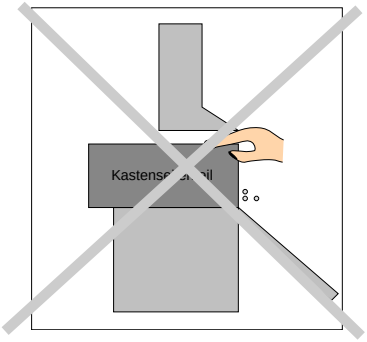


Fig.4.2

Hand injury when this is departing clamping tool on the raised edge.

1. **Use only tools with the same height in the same fixing on the press. All utilized tools must have one common bending line.**

2. **Attacks are mounted on the lower die, do not allow a downward movement.**

3. **The maximum allowable overrun traverse of the machine: 6mm / AKAS®-LC...**

**The machine should have an automated overrun traverse control for the first stroke. If not, it can be realised by the AKAS®-...F and a cam controller or by the Fiessler AMS-system . Before the initial start-up, the overrun traverse must be checked either by using the test rod or by using an Overrun Traverse measuring device.** (upon customer's request, Fiessler Elektronik will perform the Overrun Traverse Measuring on the customer's machine.) **If one results of 10 consecutive measurements is larger than 6mm / AKAS®-LC... , the fast speed must be reduced.**

4. **Muting signal** If a light beam is interrupted by the clumping tool, the AKAS® would stop the working stroke immediately. Therefore the AKAS® must be muted before it gets interrupted by the clumping tool. To prevent an accidental disconnection of the labor movement, from an opening of ≤ 15 mm (**AKAS®-LC...**) the control system of the machine must send a Mutingsignal to the reciever.. **Then the control system of the machine must reliably guarantee according to safety category 4, that from this time the stroke speed is < 10 mm/s**.

5. **The protection of a folding machine by the AKAS® does not permit bending in the bottom of a box inside the box in fast speed.**

6. **The AKAS® does not protect:**

**-if the machine is only run in the work speed**
**-AKAS will be interrupted during fast speed and the stroke wil be continued**
**-if the overrun traverse of the press brake is too long**
**-from squeezing during the bending operation**
**-if the mutinglamp is constantly on**

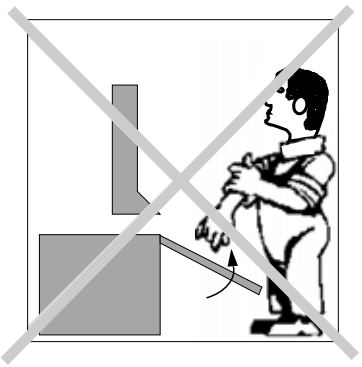


Fig. 5.1

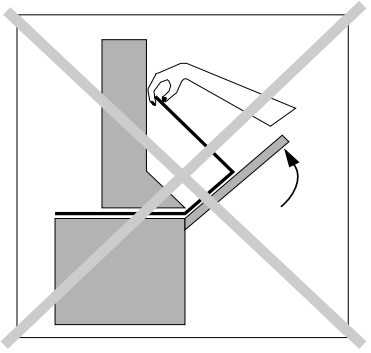


Fig. 5.2

7. **The hazardous state of the machine must be terminated by the sensor function.**

8. **The safety level (class 4) of the accident preventing light barrier should at least correspond to the safety level of the control system of the machine.**

9. **Laser beams may be deviated due to air currents, this may cause unwanted and unforeseen machine stops. Therefore the machine must be erected at a place free of air currents.**

**Acceptance**

Acceptance test: the installation acceptance test and inspections should be carried out by a competent person in possession of all the information supplied by the manufacturer of the machine and the ESPE.
Upon customer's request, Fiessler Elektronik will perform the initial acceptance as well as the annual test. Additionally, customer training seminars on how to execute annual tests will be conducted at regular intervals.

## Annual Inspection

The machine owner must make sure that a competent person is assigned to check the light barrier annually. This person can be an employee either from the light-barrier manufacturer or from the operator's staff.

The laser - accident preventing light barrier AKAS® is an electro sensitive protective and controlling device (ESPE) which has the function to protect operators from accidents.
This happens as follows : Before a part of the body is squeezed between two opposed moving machine parts, this part of the body interrupts at least one light beam. By this means the movement of the machine is stopped, before it comes to an injury.

AKAS®

- meets EN61496-1 and CLC/TS 61496-2 Typ4; ENISO13849 PL e, Kat4, MTTF>300y; EN62061 SIL3, PFH2, 38 E-10 1/h
- is self- monitoring without additionally wiring.
- easy to adjust after tool changing.

Operative range for the laser-accident preventing light barrier of the AKAS®-LCF/SBM types are:
**folding machines.**

**Mounting example: AKAS®-LCF/SBM**

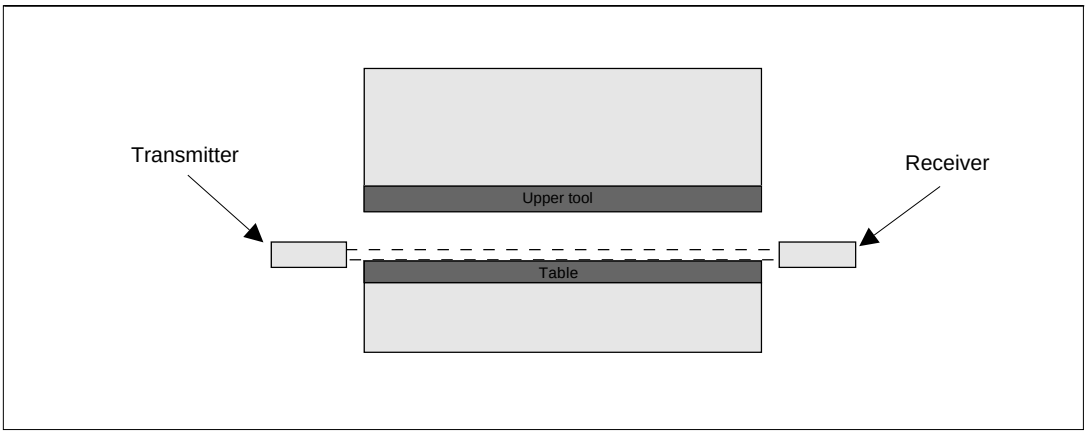



Fig. 6.1

**Serial Numbers AKAS®-LC…**

The serial numbers are located at the down side of the housings of both AKAS®-LC/SBM transmitter and AKAS®-LC/SBM receiver.

| | systems <u>with</u> operating mode selection<br>with integrated safety fuunctions | | |
|---|---|---|---|
| **Funktionen / Eigenschaften** | | | **AKAS®-LCF/SBM** |
| **with / without Support**<br>self-adjusting onto different tool heights | | | without |
| **max. Overrun Traverse of the press brake** | | | 6 mm |
| **recommended turnover point**<br>from fast speed into slow speed (according to overrun traverse of the press) | | | 15 mm |
| **Detecting beams / Receiver elements** | | | 1 / 3 |
| **Inputs** | | | |
| **Overruntraverse control**<br>NLW | 1 -selectable with / without | | |
| **3 inputs for control of protection doors / emergency-OFF-circuit** NA1, NA2, NA 3 for paired use<br>1 pair lateral door circuit, equivalent or antivalent,<br>1 pair rear door circuit , equivalent or antivalent,<br>1 pair emergency-OFF-circuit s | 3 Pairs -selectable with / without | | |
| **Stopp contactor control**<br>EDMO, EDMS | 2 -selectable with / without | | |
| **data of traverse in slow speed**<br>SGW | 1 -selectable with / without | | |
| **start / stop of closing stroke**<br>FUS, FUO | 2 -selectable antivalent or equivalent switching | | |
| **position control in slow speed**<br>SGO, SGS | 2 -selectable antivalent or equivalent switching<br>- selectable with / without foot pedal delay | | |
| **selection of box bending**<br>KAST | | | 1 |
| **safety point**<br>SP | | | 1 |
| **Outputs** | | | |
| **Safety outputs for release of closing stroke**<br>OSSD1, OSSD2 | | | 2 |
| **release and Emergency OFF of the rear stoppers**<br>RXOK1, RXOK2 | | | 2 |
| **demand of a higher change-over point from fast speed into slow speed above the slug during box-bending** HUSP | | | - |
| **box bending function is displayed**<br>HUSP | | | 1 |
| **output for messages RS 232**<br>TXD | | | 1 |
| **demand for slow speed**<br>SGA | | | 1 |

**Principle of function bending of flat sheet metal**

**1.** Release the closing movement by activating the foot pedal.

**2.** Machine closes in **fast speed (> 10mm/s)**

| | | AKAS®-LCF/SBM |
|---|---|---|
| | | change-over point from fast into slow speed:<br>15 mm<br><br>receiver elements:<br>**E1, E2, E3 active (protection)** |

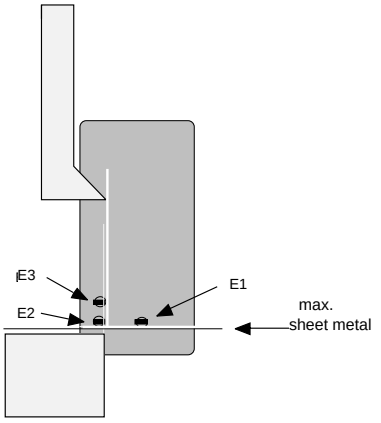



Fig. 8.1

**3.** After reaching the change-over point from fast speed to **slow speed (= 10 mm/s)** :

| | | AKAS®-LCF/SBM |
|---|---|---|
| | | E3 is deactivated<br>**E1 u. E2 remain activated for 0,6s (6 mm) more (protection)** |

**4.** All Receiver elements are muted and the muting lamp is on. The bending procedure is finished.
(The fast speed mode and the slow speed mode are limited of about 2 min.)

**Advice:**

Caution! Use only tools with equal overall height within one fixing.

**Bending of wavy sheet metal**

**Closing movement with interrupted protective field**

The AKAS® system offers the possibility to execute a closing movement under monitored slow speed even when the protective field is interrupted by a wavy sheet metal.
After the interruption of the protecfive field and the release and reactivation of the foot pedal, the AKAS will deactivate the SGA output when the protective field is interrupted. By this, only slow speed will be enabled by the machine control (NC).
AKAS® provides a reaction time of about 200ms for the machine control and then activated the safety switching outputs for the closing movement (OSSDs). The OSSDs remain activated as long as the AKAS® receives a slow speed message to SGS and SGO within the next 70 ms + the selected enhanced tolerance. A tolderance enhancement is possible only with the AKAS® .....F systems.

**Function principle box bending**

**1. "Box Bending"** is activated by the box bending button. The signal at the box bending input KAST must be high (+24V) for at least 100 ms and after that low (0V) for at least 100 ms.
(The box bending function can be canceled by twice activating the box bending button again)

**2.** AKAS® confirms the selection of the box bending by activating the output HUSP and the LED *box-bending*

| | | |
|---|---|---|
| | | change-over point from fast into slow speed:<br>same as for bending of flat sheet metals<br><br>receiver elements:<br>E1 not activated<br>**E2, E3 activated (protection)** |

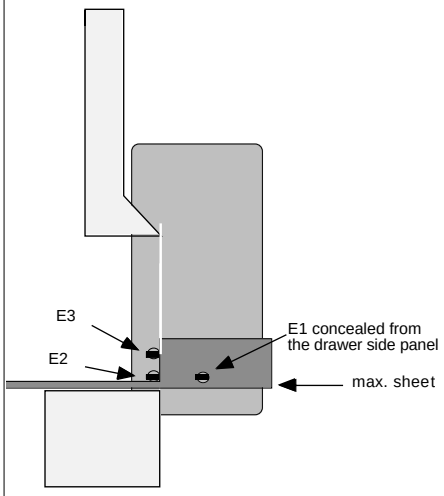



Fig. 9.1

**3.** Release the closing movement by activating the foot pedal. The press closes in **fast speed (> 10mm/s).**

**4.** After reaching the change-over point from fast speed to **slow speed (= 10 mm/s)** :

| | | **AKAS®-LCF/SBM** |
|---|---|---|
| | | E3 is deactivated<br>**E2 remain activated for 0,6s (6mm) more (protection)** |

**5.** All Receiver elements are muted and the muting lamp is on. The bending procedure is finished.
(The fast speed mode and the slow speed mode are limited of about 2 min.)

**6.** After the bending procedure the box bending function is cancelled.

**Bending of very small pieces**

**In the case of bending of very small pieces, which must be guided by the fingers, the box-bending function must be selected. Otherwise, the fingers would interrupt E1, which would lead to the switching off of the bending process !**
**With activated box-bending function, a finger which is placed next to the slog on a large matrix, is <u>not</u> detected!!**

**housing type** The aluminium housing of both transmitter and receiver are powder coated in silver. The optical head is made of acid-resistant spherically reinforced plastic (polyamide).

**fastening** fastening with shifting tenon blocks at the three side of transmitter and receiver housings

**dimensions**

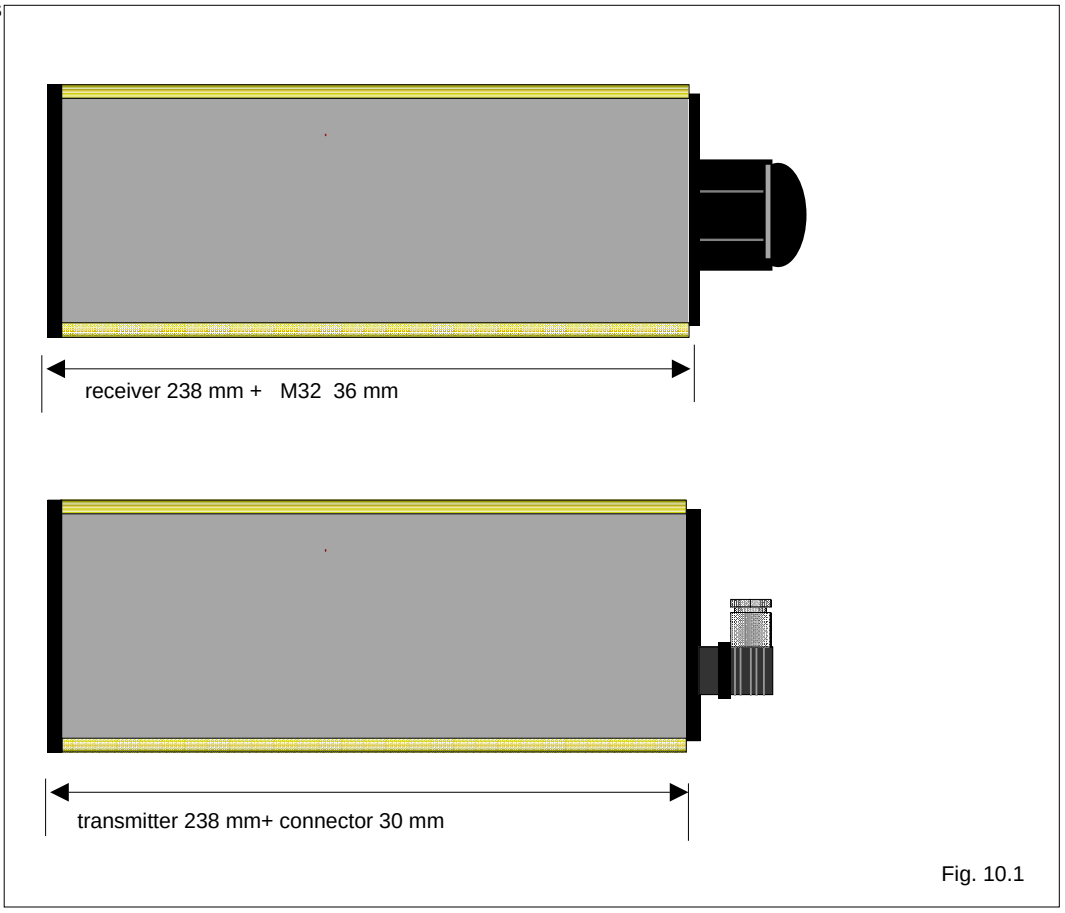



Fig. 10.1

**mounting bracket**

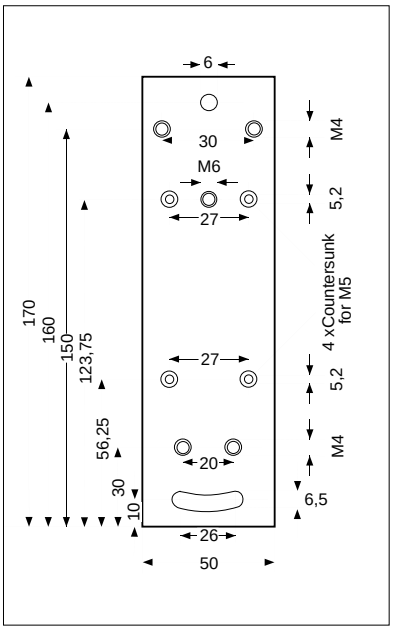



Fig. 10.2

**How to proceed: Step by step mounting the AKAS®**

| | |
|---|---|
| 1 | Overrun traverse measurement |
| 2 | Design of the mechanical holders |
| 3 | Mounting of the holders at the matrix |
| 4 | Mounting of the AKAS® on the holders |
| 5 | Connection of the AKAS® / Selection of the operating mode |
| 6 | Adjustment of the AKAS® during first installation |
| 7 | Function Verification of all electrical connections in view of the safety classs 4 requirements |
| 8 | Self-acting Overrun Traverse Test |

**1. Overrun Traverse Measurement**

**The machine should have an automated overrun traverse control for the first stroke. If not, it can be realised by the AKAS®-...F and a cam controller or by the Fiessler AMS-system . Before the initial start-up, the overrun traverse must be checked either by using the test rod or by using an Overrun Traverse measuring device.**

(upon customer's request, Fiessler Elektronik will perform the Overrun Traverse Measuring on the customer's machine.)

**If the results of 10 consecutive measurements are larger than 6mm AKAS®-LCF/SBM, the fast speed must be reduced.**

**2. design of the holders**

**- The dimensions of the self-supplied holders must be individually laid out according to the dimensions of the machine.**
**- If frequent tool change requires the presence of a swivable holder, this should be installed at the receiver arm, in order to leave the precise adjustment of the transmitter arm unchanged.**

**3. Mounting of the holders at the matrix**

a) The holders must be mounted at the matrix in a way that the marks on transmitter and receiver correspond exaclty to the bending line. The receiver element E1 must face to the operator.
b) The lowest edge of both housings must be at the same level.

**please observe!**

**Transmitter and receiver of the AKAS® must not be subject to mechanical stress (e.g. bottles must not be placed on it). To prevent this and to protect the AKAS® from any damages, a solid protection cap should be always mounted.**

## 4. Mounting the AKAS® on self-supplied holders

**fastening bracket with tenon blocks at the rear**

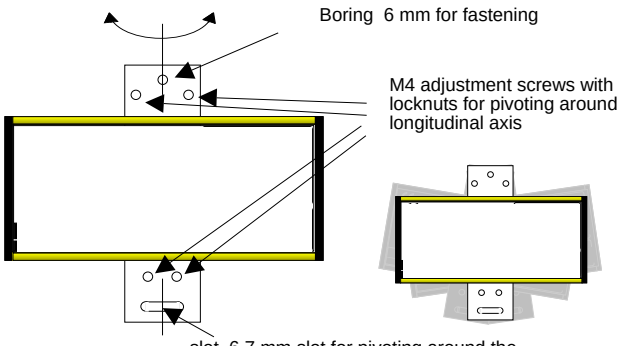



Fig. 12.1

To guarantee a trouble-free operation, both the receiver and the transmitter must be fixed at solid, deformation-free plane-parallel constructions at the matrix.

The adjustment screws must be easily accessible. Pay attention to avoid any deformation of the profile.

When pivoting around the longitudinal axis, the locknuts of each M 6 screw at the angle bracket should be loosened.

There are additional fastening possibilities with shifting tenon blocks at the three side of transmitter and receiver housings.

## 5. Connecting the AKAS®

Wiring diagrams are shown in chapter 6 **Electrical connections.**

**Choose the operating mode** at ...F series

The functions are described in chapter **6.3**
The position of the Hex switches is described in chapter **6.5.2.**

## 6. Adjustment of the AKAS® at the first installation

### AKAS®-LCF/SBM

To guarantee a trouble-free operation, the mecanical fixtions of both the receiver and the transmitter must be fixed at solid, deformation-free plane-parallel constructions at the matrix.

The fastening brackets are designed for the fastening and adjustment of the AKAS®-LCF/SBM.

Together with the sliding tenein blocks, the brackets allow a universal fastening.

Transmitter and receiver must be mounted in a way that,the marks for maximum sheet metals thickness (6mm) and the bending line are mounted on the receiver front.

The receiver and the transmitter must be swiveled around the longitudinal axis in a way that their housings are plane parallel to the matrix. With pivoting around the longitudinal axis, the adjustment screw or the locknut that counteracts the screwing movements, must be loosened.

**adjustment of the receiver**

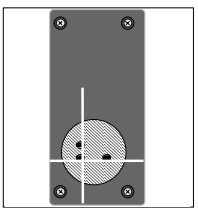
Drop a perpendicular from the bending line of the bending punch and adjust optically the receiver with the the help of M4 adjustment screws so that the mark (centre of the receiver elements) is located vertically at the front of the receiver.

The top of the max thick of the plate on the table must be located on the same level as on the mark on the receiving end

**adjustment of the transmitter**

The transmitter must be mounted in a way that its marks are located perpendicularly to the bending line, the same way as the receiver is positioned and is at the height of the marked maximum thickness (up to 6mm).

The red transmitting beams should meet the receiver like it is shown in the below illustration.



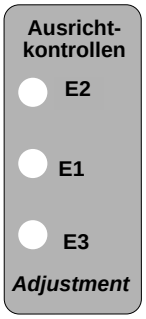
**Caution!**

Should Plates > 6mm thickness can be clamped, then the AKAS be further adjusted upward. In this case, a finger >8mm thickness directly on the table are not detected, and the finger is not protected when a sheet metal is clamped with a lower strength!

**AKAS®-LCF/SBM**

**adjustment control - LEDs**

| synchronization transmitter - receiver | AKAS®-LC… |
|---|---|
| transmitter-beam does focus at all | E...on |
| transmitter-beam does not focus precisely | E...partially off |
| transmitter-beam does not focus at all | E...off |




⚠ **Advise!**

**AKAS®-LCF: E3, E1, E2**
**LEDs are flashing slowly** about once per second: Machine has successfully stopped at the cam during the overrun traverse test, only when the cam is free again, the OSSDs can be enabled again.
The ajustment controll-LEDs are flashing slowly until the machine is not opened completely.

**adjustment**

AKAS ® transmitter and receiver -LCF/SBM must be firmly attached to the matrix. (see Chapter 5.2)

The tip of the punch must be located on the bend line.

The upper edge of the thick plate potential (maximum 6 mm) is positioned in the amount of the marker.

Then align the laser transmitter so that the laser beam parallel to the upper beam runs and hits the receiver. (Figure see p. 13)

**Caution!**

Should Plates > 6mm thickness can be clamped, then the AKAS be further adjusted upward. In this case, a finger >8mm thickness directly on the table are not detected, and the finger is not protected when a sheet metal is clamped with a lower strength!

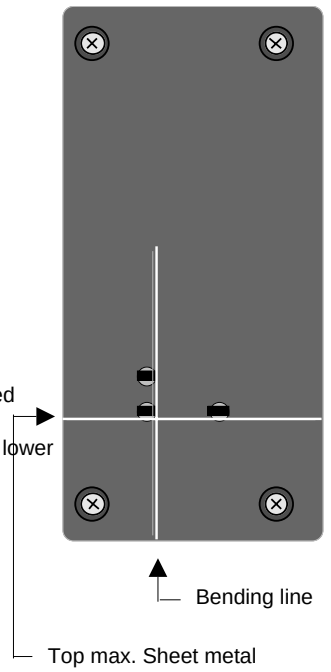
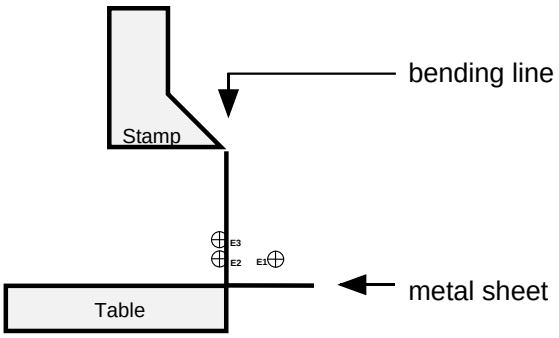



Fig. 15.1

SP, SGS = 0
SGO = 1

Fast speed




SP, SGS = 1
SGO = 0

Switching point
Fast speed/slow speed

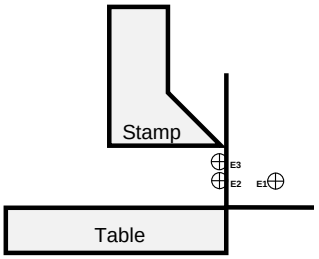



Fig. 15.2

**7. Verification of all electrical connections referring to safety class 4**

see chapter **6 Electrical connections**

**8. Automatic overrun traverse tes**

According to prEN 12622, the overrun traverse of the machine should be verified automatically at the first stroke after its connection to power of the press brake or of the AKAS® and it must be repeated at least after 30 h, if the machine remains connected to power for a longer period of time.

The products of the **AKAS®-**...**F** product family can execute this overrun traverse test with the help of a cam scitch and a normally closed contact. For this, the length of the cam must correspond to the allowable overrun traverse plus the hysteresis of the cam switch. The maximum allowable overrun traverse must not exceed the value of 6 mm with the **AKAS®-LCF .**

This overrun traverse cam must be mounted in a way that the press is in the maximum closing speed when the cam switch is opened by the cam, and the stroke is started out of the upper dead center of the machine.

The overrum traverse test is carried out after every voltage reset and must be repeated every 24 hours. After the successful overrun traverse test, the press must be at first opened for the execution of one bending stroke. The ajustment controll-LEDs are flashing slowly until the press brake is not opened completely.

If the overrrun traverse is too long, the cam does not open the overrun traverse cam switch when the closing movement is stopped, and the AKAS will prevent the complete bending stroke in fast speed.

If the overrun traverse control is not carried out by the AKAS®, the machine control must carry out an overrun traverse test at least after a voltage reset. This overrun traverse test must be repeated within the next 30 hours.

| Electrical data | |
|---|---|
| **safety class** | EN61496-1 and CLC/TS 61496-2 Typ4; ENISO13849 PL e, Kat4, MTTF>300y; EN62061 SIL3, PFH2, 38 E-10 1/h |
| **operation voltage** | 24 V DC, +/- 20 %, SELV |
| **max. power cunsumption** | (no charge)**:** max. 2,0 A, AKAS....LC: 0,5 A |
| **protection from incorrect con** | Protection against all possibilities of errors is not provided. |
| **protection class** | III |
| **electrical connection** | transmitter: **AKAS®-LC...:** angular plug<br>receiver: integrated plug-in connector with M 32 as strain relief |
| **connecting cables** | transmitter: **AKAS®-LC...:** core max. 1 mm<br>receiver: **AKAS®-LC...:** max. 1 mm |
| **cable arrangement** | Cables to be laid separately from high-voltage cables. The cable laying must be arranged in a way that no mechanical damage of the cable is possible. For that reason the cable must be installed in a reinforced hose if not protected by the machine. |
| **outputs** | OSSD 1 and 2: Fail-Safe PNP outputs , max. 0,5A, with short-cut and side-current monitoring<br>RXOK1 and 2: PNP-outputs with short-cut and side-current monitoring during switching on, max. 0,5 A<br>SGA , HUSP, SEU2K, KAST (KAST: only when using the external muting lamp): PNP-outputs max. 0,5A<br>TXD: RS 232 serial interface |
| **inputs** | FUO, FUS, SGO, SGS, SP, EDMO, EDMS, NA1, NA2, NA 3, NLW: 0 V / 24V DC +/- 20 %, 10 mA<br>KAST: : 0 V / 24V DC +/- 20 %, 25 mA |
| **response times** | 1,5 ms between the interruption of a light beam and the disabling of the OSSDs<br>10 ms between the release of the foot pedal orthe opening of a protective circuit and the disabling of the OSSDs<br>10 ms between the opering of a protective circuit and disabling of the release of the rear stoppers RXOK1 & -2<br>2,6 ms between the opeing of the overrun traverse cam switch and the disabling of the OSSDs during the over-run traverse test |
| **time windows for the input signals (basic tolerances)** | switch-over from stopped state into closing state after enabling of the OSSDs : 300 ms (only with operatiing mode with contactor/valve control EDM).<br>switch-over into slow speed state when the start is carried out within the range of the safety point (at SP = 1): 100 ms after detection of the closing movement state by the EDM, i.e. 100 ms after enabling of the OSSDs when the press is operating without the EDM.<br>switch-over into fast speed when the start of the press is outside the range of the safety point (at SP = 0): 100 ms after detection of the closing movement state by the EDM, i.e. 100 ms after enabling of the OSSDs when the press is operating without the EDM.<br>switch-over into slow speed state when the start of the press with slow speed request (200 ms after SGA = 0 has been transmitted to NC): 70 ms after detection of the the closing movement state by the EDM, i.e. 70 ms after enabling of the OSSDs when the press is operating without the EDM. |
| **Tolerance enhancement** | only with **AKAS®-...F**: max. 300 ms |
| **environmental data** | |
| **ambient operation temp** | 0° bis 50° C |
| **storage temperature** | -25° bis 70° C |

**Caution!!** The use of both AKAS® ...**without F** series and the AKAS®...**with F** series adjusted to "operation with connection to an additional safety PLC" receiver is only permitted in combination with an additional safety PLC (e.g. **FPSC**) which provides the safe fast speed-/slow speed signals and closing request signals via cables with short-cut and side-currant monitoring and which provides a safe processing of the OSSD-Signals of the AKAS®.

**Caution!!!** Only if the accident preventing light barrier AKAS® has been installed according to the operating instructions and connected according to the wiring diagrams, and if all relevant national and international accident prevention/safety regulations are observed , a safe operation is ensured !

Any modification of the specified circuits can cause hazardous states and is therefore forbidden.

If the press does not posssess any position-monitored contactors for the seitch-over from fast speed into slow speed, a safe integration is possible using the Fiessler **AMS-System.**

**Muting signal**

**Muting signal from the machine control system:**
(Mutingsignal available from the contactor position control of the working stroke valve, from the pressure switch or from the AMS)
**The muting signal out of the machine control must be laid out in a way that no muting signal is given to AKAS® if there is any malfunction of the involved switching elements (i.e. no release of a contactor or no switching over from fast motion into working motion) !**

**set up operation**

The set up operation has to be carried out according to the description in chapter 6.5.1 function 7 on the AKAS ....F systems, or the AKAS® must be switched off, the safety outputs of the AKAS® (OSSDs) must be muted, and the fast speed closing speed must be reliably excluded.
After the set up operation it must be made sure that this special muting of the OSSDs is cancelled.

**Checklist**

| | | OK |
|---|---|---|
| **1** | AKAS® is used on "foot operated fast motion" mode. | |
| **2** | "Foot operated fast motion" should only be possible with activated AKAS® | |
| **3** | During foot operated motion with AKAS®, the downward movement should only happen by pressing the foot pedal . | |
| **4** | The valves relevant for the downward movement must be triggered as directly as possible by the Fail-Safe PNP outputs OSSD1 and OSSD2 to keep the overrun traverse as short as possible | |
| **5** | In all operating modes except "Foot operated fast motion" the AKAS® must be disconnected from the power supply (=switched off). | |
| **6** | The machine control system issues a muting signal with AKAS®-LC...: 15mm above the slug. (Mutingsignal coming from the contactor position control of the working stroke valve, from the pressure switch or from the AMS) | |
| **7** | The machine control system prevents the fast speed during the closing movement if no static signal is given (SGA). This function of the press must not be necessarily safety-orientated. | |
| **8** | When the muting signal is given, it must be guaranteed according to safety class 4 that the stroke of the machine is < 10mm/s. | |
| **9** | The box-bending function must be chosen and acknowledged by a button (change-over contact). Here a pedal is more advantageous, because by using it both hands stay free to hold the | |
| **10** | After a voltage reset, an overrun traverse test is carried out. | |
| **11** | The overrun traverse is smaller than 6mm at the AKAS®-LC... | |

**Terminals AKAS®-LCF Receiver**

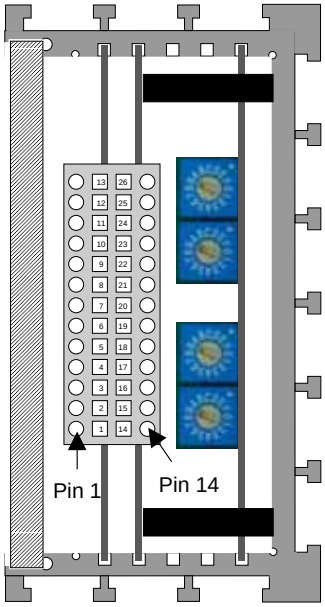



Fig. 19.1

Using the gray lines depending on the selected mode (see pages 26/27)

| Terminals of the Receiver AKAS®-LCF | | | example for operation mode B8 B8 or F8 F8 | example for op. mode 00 00 |
|---|---|---|---|---|
| **Nr** | **designation** | **meaning** | **signal level** | **signal level** |
| 1 | Erde | functional ground | | |
| 2 | +Ub 24VDC | power supply | | |
| 3 | -Ub 0V | power supply | | |
| 4 | RS 232 GND | message output (State-/error) | | |
| 5 | -Ub Sender | connection for -Ub AKAS transmitter | | |
| 6 | +Ub Sender | connection for +Ub AKAS-transmitte /key-operated switchfor adjustment | +24V if foot pedal is activated or key-operated switch is on | +24V if FUS is triggered or key-operated switch is on |
| 7 | FUS | input **Start / Stop closing stroke** | 0V Press brake stop<br>+24V Press brake close | 0V Press brake stop<br>+24V Press brake close |
| 8 | FUO | input **Start / Stop closing stroke** | +24V Press brake stop<br>0V Press brake close | 0V Press brake stop<br>+24V Press brake close |
| 9 | SGS | input **monitoring of slow speed position** | 0V: at fast speed<br>+24V: at slow speed | 0V: at fast speed<br>+24V: at slow speed |
| 10 | SGO | input **monitoring of slow speed position** | +24V: at fast speed<br>0V: at slow speed | 0V: at fast speed<br>+24V: ar slow speed |
| 11 | SP | input **safety point** | 0V within fast speed range<br>+24V within slow speed range | 0V: at fast speed<br>+24V: at slow speed |
| 12 | SGA | output **slow speed request** | 0V only slow speed permitted<br>+24V fast / slow speed possible | 0V only slow speed permitted<br>+24V fast / slow speed pos- |
| 13 | NLW | input **overrun traverse control input** | 0V: if activated by cam switch<br>+24V if not activated by cam | |
| 14 | EDMS | input **monitoring of the Stopvalves** | 0V at stop<br>+24V at closing stroke in fast | |
| 15 | EDMO | input **monitoring of the Stopvalves** | 0V: at closing stroke<br>+24V: at Stop | |
| 16 | NA1 | input **Emergency OFF / rear metal grid** | +24V if grid is closed i.e. emergency OFF is not activated | |
| 17 | NA2 | input **rear / lateral metal grid** | +24V if grids are closed | |
| 18 | NA 3 | input **Emergency OFF / lateral metal grid** | +24V if grid is closed i.e. emergency OFF is not activated | |
| 19 | S_EU2K | +Ub transmitter EU2K 500/2- rear guard with antivalent switching light grid | | |
| 20 | HUSP | output **message box bending** | +24V: if box-bending is selected | +24V: if box-bending is selected |
| 21 | RXOK1 | output **drive rear stopper emergeny-OFF** | +24V: if enabled | |
| 22 | RXOK2 | output **drive rear stopper emergeny-OFF** | +24V: if enabled | |
| 23 | OSSD1 | safety output **release of the closing stroke** | +24V: if enabled | +24V: if enabled |
| 24 | OSSD2 | safety output **release of the closing stroke** | +24V: if enabled | +24V: if enabled |
| 25 | KAST / SGW | input **box bending / Slow speed traverse information** | **box bend.:** +24V pulse min 100ms<br>**SGW:** +24V if completely muting | +24V pulse min. 100 ms |
| 26 | RS 232 out | messaage output (State-/error) | | |

transmitter

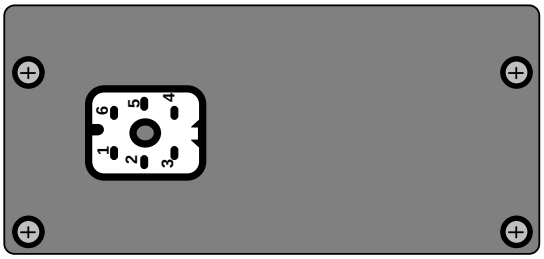


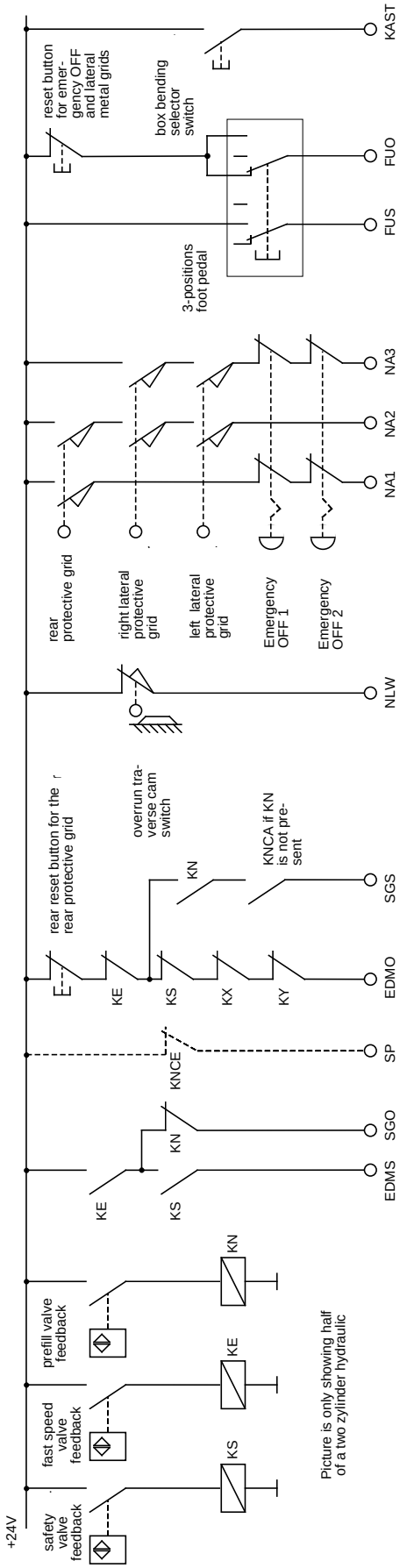

Fig. 19.2

| Terminals of the transmitter | | |
|---|---|---|
| **Nr** | **designation** | **meaning** |
| 1 | +S | +Ub transmitter |
| 2 | -S | -Ub transmitter |
| 6 | Erde | functional ground |

## Machine-Safety monitoring by AKAS®-...F

**Wiring example with a suitable hydraulics. AKAS is responsible for all safety related monitoring tasks (at a Hex switch B8 B8 or F8 F8)**

AKAS monitors both positions of the fast speed and slow speed state and requires:
in **fast speed:** at **SGO = + 24 V** and at **SGS = 0 V**
in **slow speed:** at **SGO = 0 V** and at **SGS = + 24 V**
During the switching over from one state into the other state, an enhancable switch-over time is tolerated.
see **selectable switch-over delay enhancement of the valve position monitor**

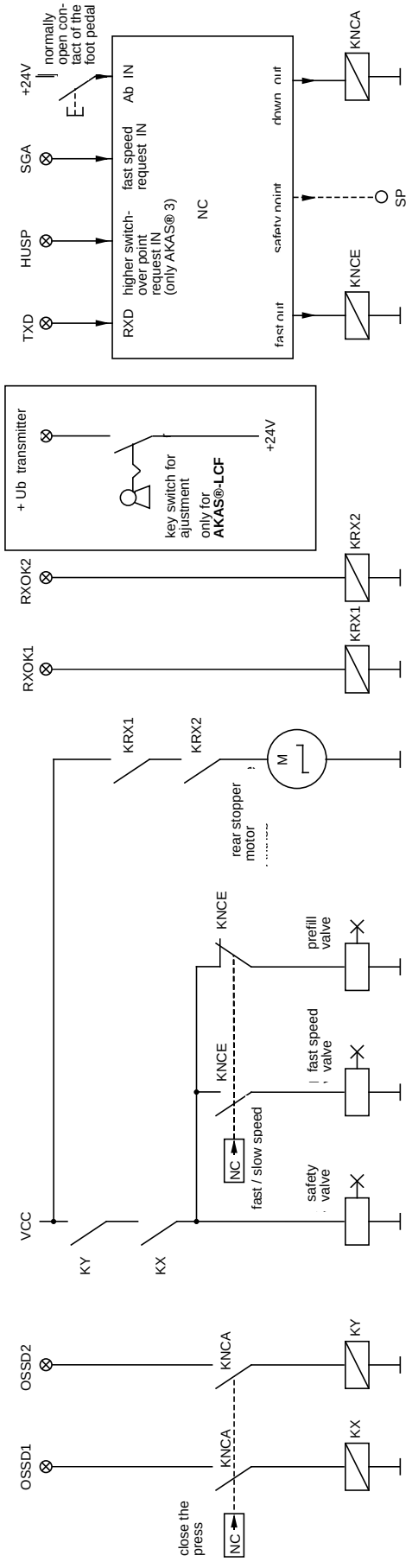



| Press brake | safety contactor / KS | fast speed valve / KE | feeder contactor / KN |
|---|---|---|---|
| Stop | 0 | 0 | 0 |
| fast / down | 1 | 1 | 0 |
| slow/ down | 1 | 0 | 1 |
| up | 0 | 0 | 0 |

○ **AKAS inputs**

⊗ **AKAS outputs**

------ can be carried out by the NC or by a contact of the slow speed/fast speed swiching over




wiring diagramm 1/p.20

**1. operation with additional Safety PLC** (e.g. Safety PLC **FPSC**)

The safety PLC (e.g. **FPSC**) is responsible for the fast speed / slow speed position control and provides this state to the AKAS® inputs SGO, SGS and SP vis a signal line. (see **wiring diagram 1/S. 29**)
in **fast speed:** at **SGO, SGS and SP = 0 V**
in **slow speed**: at **SGO, SGS** and **SP = + 24 V**
During this, the safety PLC must monitor the signal line to the AKAS® **for eventual short-circuits** against potential conductiong lines.

**2. monitoring of the foot pedal**

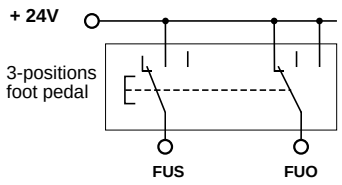
In the operating modes "without additional Safety PLC" the **monitoring of the foot pedal** is permanently present. AKAS ® activates the safety outputs OSSDs only if the foot pedal is permanently pressed. AKAS® monitors both positions of the foot pedal and requires:

if **the foot pedal is released:** at **FUO = +24 V** and at **FUS = 0 V** (see **wiring diagram 4a/S. 21**)
if **the foot pedal is pressed:** at **FUO = 0 V** and at **FUS = + 24 V**
The monitoring function is able to monitor even 2 connected foot pedals, if two operators work at the press brake and if the foot pedals are correctly wired as shown in **wiring diagram 4b/S. 36.**

In the operating modes "with additional Safety PLC" the **monitoring of the foot pedal** can be cancelled, by selecting: " equivalent switching inputs for enabling the closing stroke".

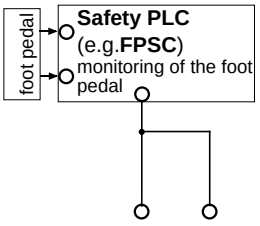
In this case, both AKAS® inputs **FUS and FUO** are triggered **+ 24 V**, if a closing movement of the press brake is wanted.

**wiring of foot pedal** for one-man operation
operation with monitoring of the foot pedal



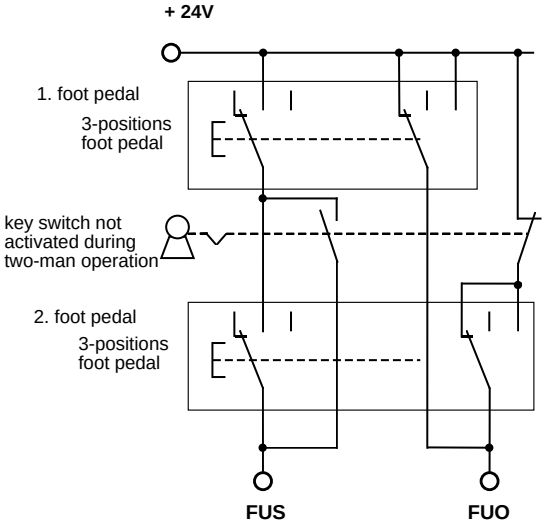

wiring diagram **2a**/p.21

**wiring of foot pedal** for one-man operation
operation without monitoring of the foot pedal




wiring diagram **2c**/p.21

**wiring of foot pedals** with key switch for one - or two-man operation
operation with monitoring of the foot pedal




wiring diagram **2b**/p.21

**3. soft-breaking when the foot-pedal was released** (foot pedal response delay)

During the operating modes without additional safety PLC, a **foot pedal response delay** of the **AKAS® safety outputs** (OSSDs) **of about 30 ms** after the release of the foot pedal during the fast speed closing stroke can be selected.
When the foot pedal is checked also by the machine control, the control will execute an easier, smoother breaking via the proportional valves of the closing movement during this time, just before the OSSDs of the AKAS® disable the other closing stroke valves.

**4. Overrun traverse control**

The overrun traverse control is realized by a cam switch with a normally closed contact. For this, the length of the cam must correspond to the allowable overrun traverse plus the hysteresis of the cam switch. The maximum allowable overrun traverse must not exceed the value of 6 mm with the **AKAS®-LCF/SBM.** This overrun traverse cam must be mounted in a way that the press is in the maximum closing speed when the cam switch is opened by the cam, and the stroke is started out of the upper dead center of the machine.

The overrum traverse test is carried out after every voltage reset and must be repeated every 24 hours. After the successful overrun traverse test, the press must be at first opened for the execution of one bending stroke. The ajustment controll-LEDs are flashing slowly until the press brake is not opened.

If the overrrun traverse is too long, the cam does not open the overrun traverse cam switch when the closing movement is stopped, and the AKAS will prevent the complete bending strokes in fast speed.

If the overrun traverse control is not carried out by the AKAS®, the machine control must carry out an overrun traverse test at least after a voltage reset. This overrun traverse test must be repeated within the next 30 hours.

**5. Control of the stop contactors** (EDM)

AKAS® monitors in a safe way both positions of the stop- and the fast speed closing state of the contactor position monitors and switching contactors and requires:
in **fast speed state** at **EDMS = + 24 V** and at **EDMO = 0 V**
in **Stop state** at **EDMS = 0 V** and at **EDMO = + 24 V** (see **wiring diagram 2/S.39**)
During the **closing movement in slow speed, EDMO has to be = 0 V, EDMS is not monitored.**
After the relase of the safety switching outputs (OSSDs) the AKAS® requires a switch-over of the EDM signals no later than 300 ms + the programmed tolerance enhancement.
In the operating modes with additional safety PLC (e.g **FPSC**) the safety PLC must carry out the monitoring of the stop contactors.

**6. Monitoring of the door- and the Emergency OFF-circuits, Emergency-OFF of the Motor-driven Rear stoppers**

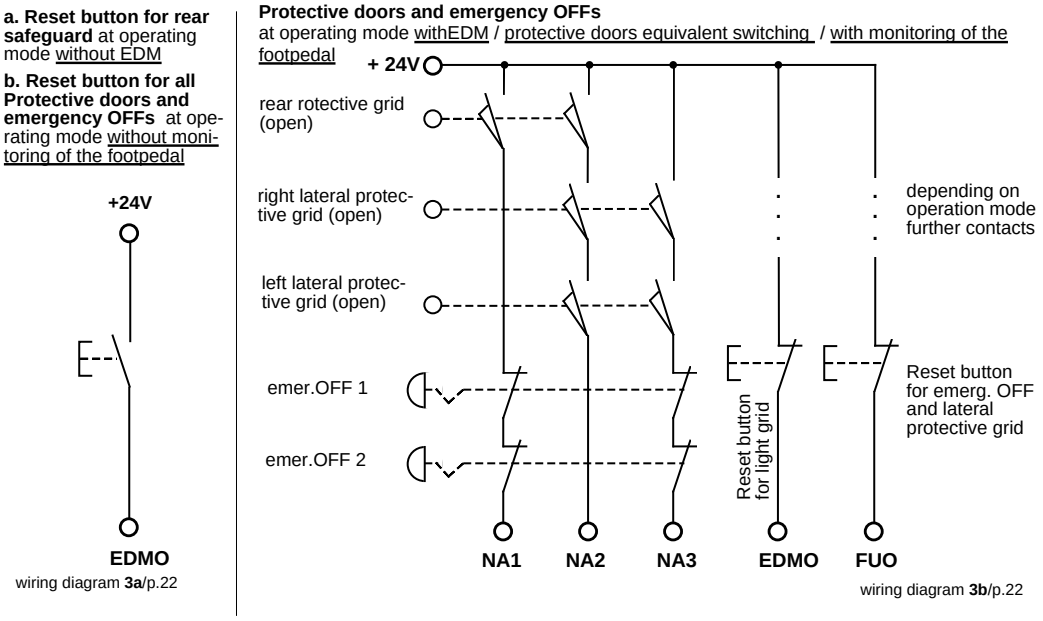
The protective doors and the emergency OFF-buttons are evaluated by double-channel inputs. As soon as at least one inout is disab led, i.e. is in OFF state, the closing movement will be stopped immediately by switching OFF of the OSSDs, and the movement of the rear stoppers is prevented by the disabling of the double channeled release **RXOK1 and RXOK2**. A continuation of the press operation in only possible if all relevant protective switching circuits are disabled and and then closed again, and if afterwards the respective rest button is activated.

**If the protective side doors are opened**, AKAS® permits the movement of the rear stoppers after having activated the respective reset button. The closing movement of the press is permitted only during slow speed state. For this, AKAS® requires the prevention of the fast speed by the NC, by disabling the output SGA . AKAS® monitors the slow speed state during the closing movement. During this, the protective field of the AKAS® is **not** active.

During operation with foot pedal monitoring (antivalent foot pedal contacts) , the reset is carried out after the disabling and re-enabling of the Emergency-OFF-Circuits and of the lateral protective metal grids. This is carried out by activation of an normally closed contact butto., which is connected in series to the normally closed foot pedal contact at FUO (see **wiring diagram 1/p.20 and 3b/p.22**) .

The Reset after the disabling and re-enabling of the rear protective grid is carried out during the operation with EDM by activation of a normally closed contact button, which is connected in series to the normally closed contactor controls at EDMO. (see **wiring diagram 3a/p.22**).

During the operation without foot pedal monitoring (equivalent triggering of FUO and FUS ) the reset of all protective circuits is carried out by a normally open contact which is connected between + 24 V and



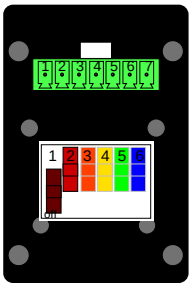

EDMO. (see **wiring diagram 3a/S.22**)

The ermegency-OFF-circuits are equivalent switching, i.e. the eemergenca-OFF-buttons must have 2 normally closed contacts. When laying out the circuits of the protective doors, you may choose from either the equivalent switching protective door contacts, i.e. 2 normally open contacts per door switch, or antivalent switching contacts, i.e. only one normally open and normally closed contact per door switch. The secons possibility, however, is only available with the operation modes without additional safety PLC. The connection of the emergeny OFF- circuits and the equivalent protective door contacts to the reset buttons when EDM is selected, is shown on **wiring diagram 3b/S.22**

## 6a. Rear safeguarding with lightgrid

with **equivalent** switching outputs

| | Receiver | | | |
|---|---|---|---|---|
| | ULVT | TLVT | ULCT | TLCT |
| +24V | 7 | 7 | 1, 2, 4 | 1, 2, 4 |
| 0V | 6 | 6 | 7 | 7 |
| OSSD1 | 3 | 1 | 5 | 5 |
| OSSD2 | 4 | 2 | 6 | 6 |

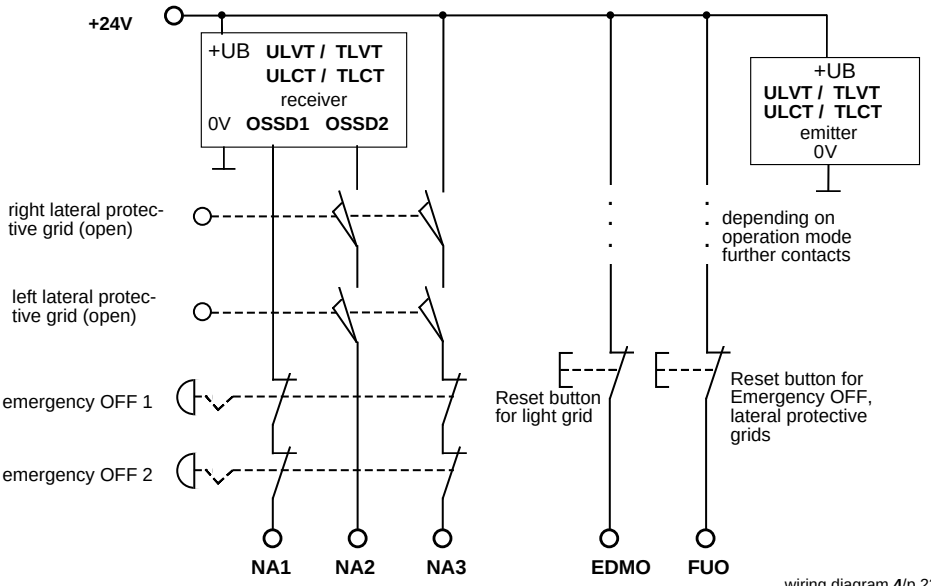


**ULVT / TLVT**:
Dip-switches (see picture)
-without restart interlock
-without EDM
-OSSD equivalent

**ULCT / TLCT**:
programming the operation mode of the lightgrid:
-without restart interlock
-without EDM

Instead of using a rear protective metal grid, a safety light grid with equivalent switching outputs, e.g. type Fiessler ULVT / TLVT or ULCT / TLCT as shown in **wiring diagram 4/p.23** is possible.

**Protective doors and emergency OFFs and light grid ULVT / TLVT or ULCT / TLCT for rear safeguarding**
at operating mode equivalent protective door control pairs / with EDM / with monitoring of the foot pedal / with Start interlock for the lightgrid




wiring diagram **4**/p.23

**Only to use the operation modes D...D... or F...F...!**
**These modes activates Start interlock for the rear safety lightgrid!** (see chapter 6.3.2)

## 6b. Rear safeguarding with lightgrid

with **antivalent** switching outputs

As alternative, the connection of a light grid with antivalent switching outputs is also possible, like p.e. the Fiessler light grid EU2K 500/2. **Wiring Diagram 5/p.23** shows the connection of the Fiessler light grid EU2K 500/2 as a rear safeguard. In this case, the switches of the lateral protective grids must have anti-valent switching contacts (1 normally closed and 1 normally open contact each) and the operating mode with antivalent switching protective door circuits must be selected. In this case, the connector 1 at the transmitter of the **EU2K 500/2** must be wired to the output S_EU2K of the AKAS®.

ble, the lateral protective grids are not monitored. Every switching-over of the selector, the reset buttomn must be activated for the Emergency-OFF circuits and the circuits of the lateralprotective doors.

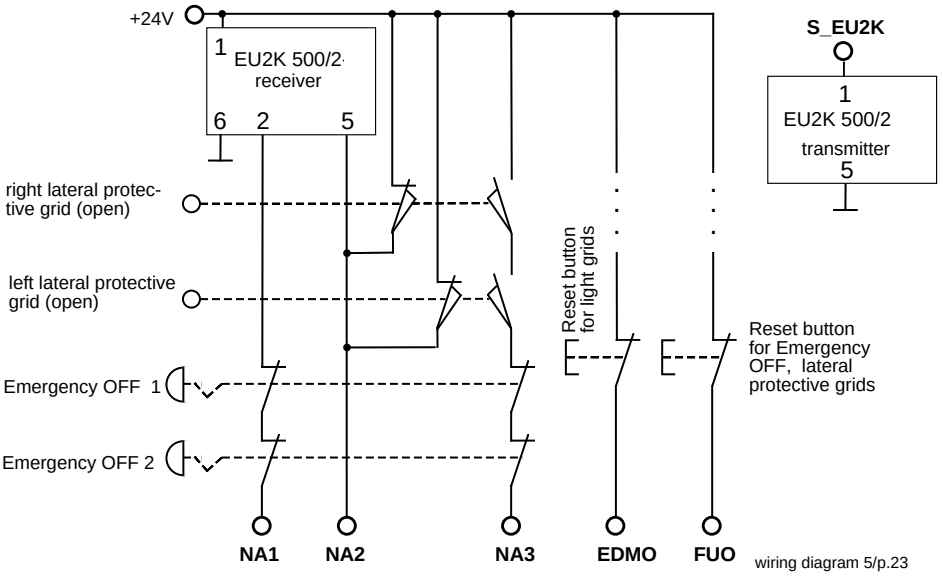
**Protective doors and emergency OFFs and light grid EU2K 500/2 for rear safeguarding**
at operating mode antivalent protective door control pairs with EDM / with monitoring of the foot pedal

plug EU2K emitter 24 V

Pin 1 : + 24 V DC
Pin 5 : - Ub

plug EU2K receiver

Pin 1 : + 24 V DC
Pin 2 : A1
Pin 5 : A2
Pin 6 : - Ub



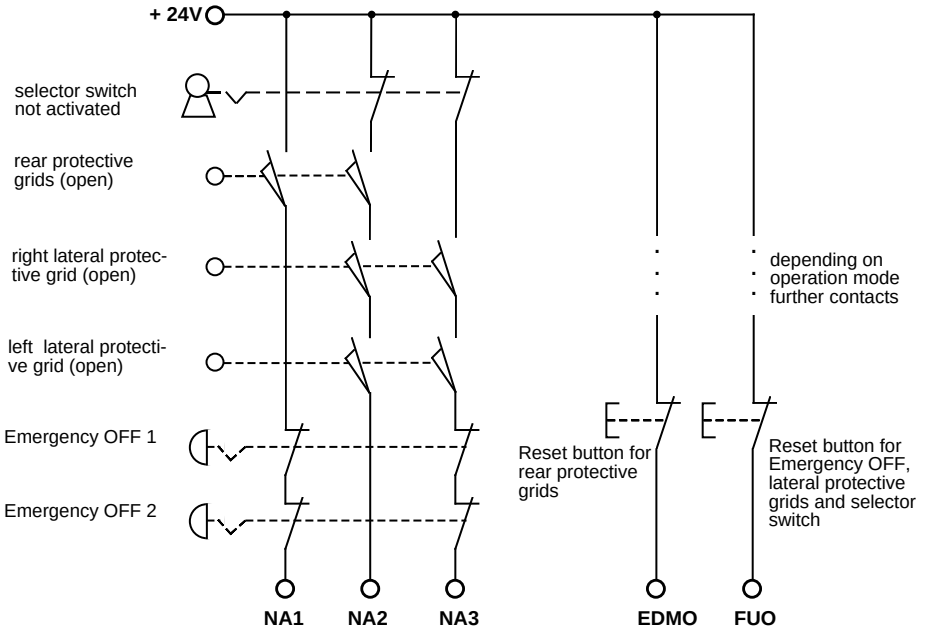

wiring diagram 5/p.23

**7. Installation operating mode, i.e. protection by monitores slow speed without avtivated protective field during operation with door monitoring**

A selector switch provides the possibility to choose between operating mode with activated protective field of the AKAS® and fast closing speed or operating mode with protection only by monitored slow speed closing, see **Wiring diagrams 6/p.24 und 7/p.24**. If the selector switch is activated, the protective field of the AKAS® is muted (bridged). This state is displayed by the shining muting lamp. By disabling of its **output SGA** , AKAS® requires the NC to carry out only cycles in slow speed, which is monitored by the AKAS®. Given the fact that in this operating mode, only cycles in slow speed are possible, the lateral protective grids are not monitored. Every switching-over of the selector, the reset buttomn must be activated for the Emergency-OFF circuits and the circuits of the lateralprotective doors.

operation with equivalent switching protective door contacts

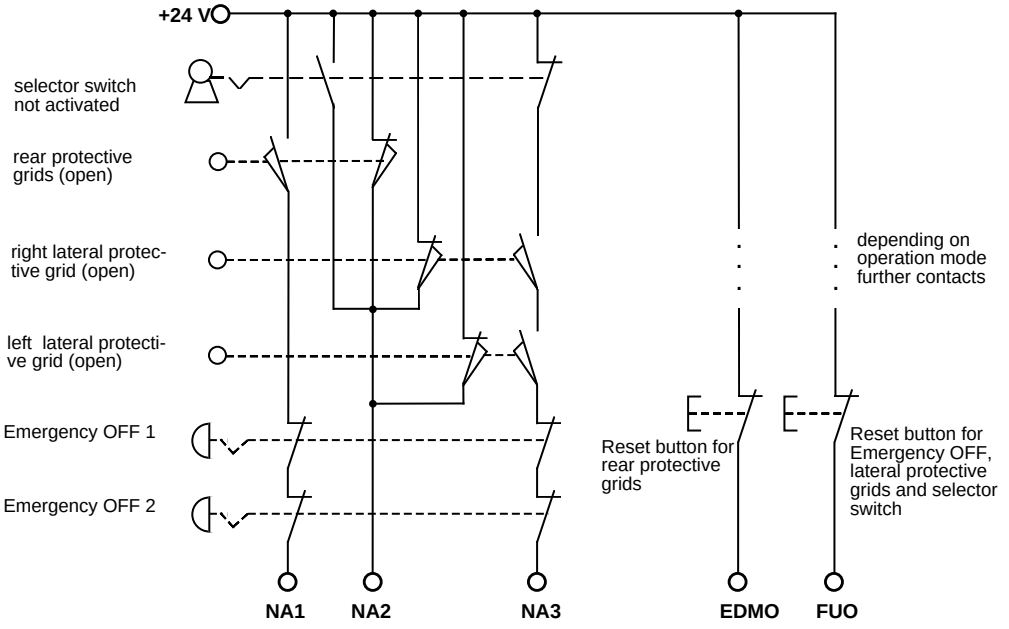
operation with **activated protective field of the AKAS® and slow speed closing movement** (selector not activated)
operation with **only protection by monitored slow speed closing movement** (selector switch activated)




Wiring diagram **6**/p.24

operation with antivalent switching protective door contacts

operation with **activated protective field of the AKAS® and slow speed closing movement** (selector not activated)
operation with **only protection by monitored slow speed closing movement** (selector switch activated)

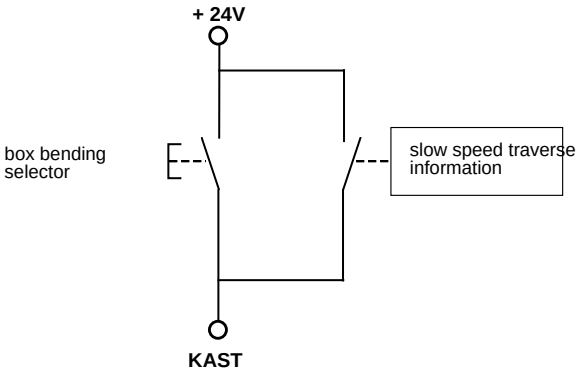



Wiring diagram **7**/p.24

**8. slow speed traverse information**

During the operation with slow speed traverse information, the upper receiver elements are only muted if a +24 V signal is given to KAST. This signal is provided by a traverse measuring system (e.g. Fiessler AMS, or NC) which indicates that the traverse has been actually covered. By this, the upper receiver elements remain activated as longh as possible even in the case of a very low slow speed, and intermediate stops during slow speed. By this, even in slow speed range, protection by the AKAS® is provided until the introduction of the operator`s fingers between bending punch and sheet metal is made impossible. The traverse is at AKAS I LC F: 14 mm, at the AKAS II F: 6 mm, and at AKAS III F: 2 mm in normal operation and 5 mm in box bending operation. Connection: see **wiring diagram 8/p.25.**

connection with slow speed traverse nformation




wiring diagram **8**/p.25

**9. selectable switch-over time tolerance of the valve position monitors**

AKAS® dynamically monitors the valve position signals, i.e. the individual states of the valve position signals must change within a certain time. The basic tolerances for the switching-over of the valve position monitors from stop state into closing movement and from fast speed movement into slow speed movement or vice-versa can be enhanced by additional 300 ms.

**The basic tolerances have the following values:**

Switching-over from stopped condition into closing movement after the enabling of the OSSDs:
300 ms, (only with operating mode "Monitored EDM"

Switching-over into the slow speed condition when the start is within the range of the safety point (SP = 1):
100 ms after from the detection of the closing movement consition by the EDM,
i.e. 100 ms after the enabling of the OSSDs during operating mode "without EDM".

Switching-over into the fast speed condition when the start is outside the safety point (when SP = 0):
100 ms after the detection of the closing movement condition by the EDM, i.e. 100 ms after enabling of the OSSDs during operating mode "without EDM".

Switching-over into the slow speed condition, start with request for slow speed (200 ms after SGA = 0 has been sent to NC ):
70 ms after the detection of the closing movement conditin by the EDM, i.e. 70 ms after the enabling of the OSSDs during operating mode "without EDM.".

By the use of 4 Hex switches different operating modes can be selected.
The Hex-switches must always be programmed in pairs (1 and 3, 2 and 4).
Within each pair, equal values must be programmed.

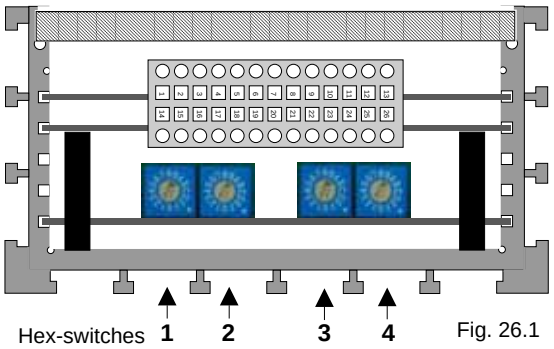



Fig. 26.1

## 1. Operating modes without additinal safety control

with / without monitoring of protective doors / monitoring of the emergency off circuits (inputs equivalent)

| Hex-switches 1 and 3 Hex-switch-positions | start / stop of closing stroke: Monitoring of the foot pedal antivalent | start / stop of closing stroke: soft-breaking when the foot-pedal was released | Start interlock for the rear lightgrid | overrun traverse control | Monitoring of protective doors / Emergency OFF equivalent switching |
|---|---|---|---|---|---|
| **8** | with | with | without | without | without |
| **9** | with | without | without | without | with |
| **A** | with | with | without | with | without |
| **B** | with | without | without | with | with |
| **C** | with | without | without | without | without |
| **D** | with | without | with | without | with |
| **E** | with | without | without | with | without |
| **F** | with | without | with | with | with |

| Hex-switches 2 and 4 Hex-switch-positions | EDM stop valves monitoring | slow speed traverse information | * switching over tolerance enhancement of the valve position monitors |
|---|---|---|---|
| **0** | without | without | + 0 ms |
| **1** | without | without | +100 ms |
| **2** | without | without | + 200 ms |
| **3** | without | without | + 300 ms |
| **4** | without | with | + 0 ms |
| **5** | without | with | +100 ms |
| **6** | without | with | + 200 ms |
| **7** | without | with | + 300 ms |
| **8** | with | without | + 0 ms |
| **9** | with | without | +100 ms |
| **A** | with | without | + 200 ms |
| **B** | with | without | + 300 ms |
| **C** | with | with | + 0 ms |
| **D** | with | with | +100 ms |
| **E** | with | with | + 200 ms |
| **F** | with | with | + 300 ms |

with monitoring of protective doors (inputs **antivalent**) / monitoring of the emergency off circuits (inputs equivalent)

| Hex-switches 1 and 3 Hex-switch-positions | start / stop of closing stroke: Monitoring of the foot pedal antivalent | start / stop of closing stroke: soft-breaking when the foot-pedal was released | overrun traverse control | EDM stop valves monitoring | Monitoring of the protective doors antivalent switching Monitoring of the Ernergency OFF equivalent switching |
|---|---|---|---|---|---|
| **0** | with | with | without | without | with |
| **1** | with | with | without | with | with |
| **2** | with | with | with | without | with |
| **3** | with | with | with | with | with |
| **4** | with | without | without | without | with |
| **5** | with | without | without | with | with |
| **6** | with | without | with | without | with |
| **7** | with | without | with | with | with |

| Hex-switches 2 and 4 Hex-switch-positions | slow speed traverse information | * switching over tolerance enhancement of the valve position monitors |
|---|---|---|
| **8** | without | + 0 ms |
| **9** | without | +100 ms |
| **A** | without | + 200 ms |
| **B** | without | + 300 ms |
| **C** | with | + 0 ms |
| **D** | with | +100 ms |
| **E** | with | + 200 ms |
| **F** | with | + 300 ms |

⚠ *** Attention!**
**Select always the shortest possible switching over tolerance enhancement of the valve position monitors!**

The Hex-switches must always be programmed in pairs (1 and 3, 2 and 4).
Within each pair, equal values must be programmed.

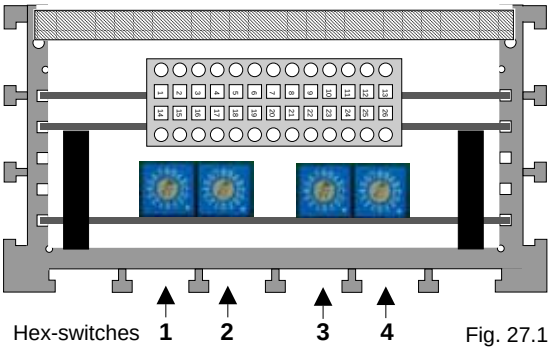



Fig. 27.1

## 2. Operating modes with additional Safety control (e.g.. Safety PLC **FPSC**)

| **Hex-switches 1 and 3** Hex-switch-positions | **start / stop of closing stroke** Monitoring of the foot pedal antivalent | **start / stop of closing stroke** inputs for release of closing stroke FUS / FUO | **overrun traverse control** | **Monitoring of protective doors / Emergency OFF** equivalent switching | **Hex-switches 2 and 4** Hex-switch-positions | **EDM Stop valve monitoring** | **slow speed traverse information** | *** switching over tolerance enhancement of the valve position monitors** |
|---|---|---|---|---|---|---|---|---|
| **0** | without | equivalent | without | without | **0** | without | without | + 0 ms |
| **1** | without | equivalent | without | with | **1** | without | without | +100 ms |
| **2** | without | equivalent | with | without | **2** | without | without | + 200 ms |
| **3** | without | equivalent | with | with | **3** | without | without | + 300 ms |
| **4** | with | antivalent | without | without | **4** | without | with | + 0 ms |
| **5** | with | antivalent | without | with | **5** | without | with | +100 ms |
| **6** | with | antivalent | with | without | **6** | without | with | + 200 ms |
| **7** | with | antivalent | with | with | **7** | without | with | + 300 ms |

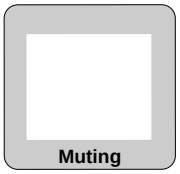
⚠ *** Attention!**
**Select always the shortest possible switching over tolerance enhancement of the valve position monitors**!

**example**:

| Hex switch | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Hex switch position | 3 | 1 | 3 | 1 |

| **Hex-switches 1 and 3** Hex-switch-positions | **start / stop of closing stroke** Monitoring of the foot pedal antivalent | **start / stop of closing stroke** inputs for release of closing stroke FUS / FUO | **overrun traverse control** | **Monitoring of protective doors / Emergency OFF** equivalent switching | **Hex-switches 2 and 4** Hex-switch-positions | **EDM Stop valve monitoring** | **slow speed traverse information** | *** switching over tolerance enhancement of the valve position monitors** |
|---|---|---|---|---|---|---|---|---|
| **3** | without | equivalent | with | with | **1** | without | without | +100 ms |

### Displaying of conditions by the Muting lamp




**lamp is out (flashing is hardly recognizable)** : during the closing movement the proitective field is at least partially avctivated

**lamp is constantly on**: The protective field of the AKAS® ist not activated. AKAS® only permits closing strokes in slow speed.

**The lamp is flashing slowly :** about once per second: EDM is not in Stop condition, or the rear reset button must be released, or the press brake must be opened completely in order to quit the slow speed range to enbable the triggering of SP = 0.

**The lamp is flashing rapidly:** about five times per second: AKAS® is in interlock state. Carry out a voltage reset.

### Displaying of conditions by the Ajustment control-LEDs

see also page 14

**LEDs are flashing slowly** about once per second: Press has successfully stopped at the cam during the overrun traverse test, only when the cam is free again, the OSSDs can be enabled again. The ajustment controll-LEDs are flashing slowly until the machine is not opened completely.

**AKAS®-LCF/SBM**
**E3, E1, E2**

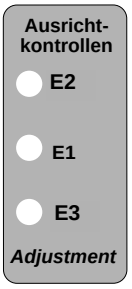
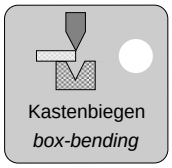
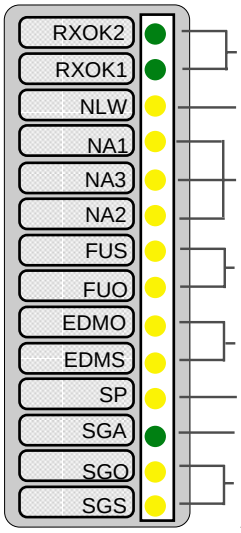



Fig. 28.1

### Indicator LEDs




LED is on if box bending funktion is activated




| Indicator LEDs for in- and outputs | AKAS®- ...F |
|---|---|
| Outputs for release of rear stoppers | LEDs are lit if the rear stoppers are free * |
| Input for Overruntraverse controll | LED is lit if the cam is not activated |
| Inputs for control of protective grids or doors and emergency-off circuits | **equivalent protective door contacs:** LEDs are lit if all protective door circuits/ Emergency OFF circuits are closed. **antivalent protective door contacs:** NA1 and NA3 are lit, NA2 is dark if all protective door circuits/Emergency OFF circuits are closed |
| Inputs for press start / stop (release of closing stroke) | antivalent inputs: FUS is lit, FUO is dark if foot pedal is activated.<br>equivalent inputs: FUS /FUO are lit if foot pedal is activated. |
| Input for stop contactor control | EDMO is lit during STOP state<br>EDMS is lit during downward movement in fast speed |
| Input for safety point | SP is lit if safety point is reached |
| Output for demand for slow speed | SGA is lit if fast speed is permitted |
| Input for position control in slow speed | antivalent inputs: SGS is lit, SGO is dark during slow speed<br>equivalent inputs: SGS / SGO are lit during slow speed |

*** If the <u>lateral</u> protective doors are open:** all other protective doors / protective circuits must be closed. NA1 must be lit. NA2, NA3 must be dark if the protective door contacts are equivalent.

If the protective door contacts are antivalent, NA2 must be lit, and NA3 must be dark. If necessary check the contacts). IF the RXOK-LEDs are not lit, activate the RESET-Button(s). If the LEDs still remain dark, open and close all other protective doors / protective circuits , then activate the RESET-Button(s).

**If the <u>lateral</u> protective doors are closed:** all other protective doors / protective circuits must be equally closed. NA1 , NA2, NA3 must be lit if the protective door contacts are equivalent.

If the protective door contacts are antivalent, NA1 and NA 3 must be lit, and NA2 must be dark . (If necessary check the contacts). IF the RXOK-LEDs are not lit, activate the RESET-Button(s). If the LEDs still remain dark, open and close <u>all</u> protective doors / protective circuits , then activate the RESET-Button(s).

**Status messages, warnings and Error reports via the RS 232 serial interface**

The AKAS® displays messages by serial transfer via its RS 232 interface; transfer format: 9600 baud, 1 start bit, 8 data bits, 1 stop bit. The messages have even parity and will be repeated at least three times. The time gap between 2 messages is at least 100 ms. At the receiver, defective messages are gated, because only those messages are accpted that fulfil the following conditions: an even parity, successful reception of the message is provided if it is received at least 3 consecutive times and if its complete compatibility to one of the message possibilities indicated below is given.

There are different kinds of messages:

**- Information concerning the status** of the AKAS® or **handling directions** for the operator, here are Bit 0 and Bit 1 = 1,

- **Warnings** concerning errors that, if received three times one immediately after the other, may lead to the interlocking of the AKAS®, here is Bit 0 = 0 and Bit 1 = 1,

- **Error reports** of the interlocked AKAS® , here is Bit 0 = 1 and Bit 1 = 0.

**Status messages, handling directions for the operator (binary xxxxxx11)**

*background grey: other message or no message, if monitoring functions are partially cancelled*

| **message** transferred byte decimal | **operating mode** | **description** possible text in the display system | **handling directions** |
|---|---|---|---|
| 3 | | front reset button does not enable | verify reset button and cable leading to the normally closed contact of the foot pedal if interrupted |
| *3* | *antivalent foot pedal inputs without protective circuit monitoring* | *normally closed contact of the foot pedal does not enable* | *verify the cable leading to the normally closed contact of the foot pedal if interrupted* |
| *3* | *equivalent foot pedal inputs* | *error at the request for release of the closing stroke* | *check the equivalent switching lines going FUO and FUS . They are evaluated as "different"* |
| 7 | | Mutinglamp does not light up | see message 63 |
| 15 | | Stop at the overrun traverse cam | during overrun traverse test |
| *15* | *without overrun traverse control* | - | - |
| 23 | | open the press completely in order to quit the safety point range | if this message is displayed after every pressing and releasing of the foot pedal, check the SP connecting circuit for short circuits |
| 39 | | release foot pedal | |
| 43 | | overrun traverse OK | during overrun traverse test |
| *43* | *without overrun traverse control* | - | - |
| 51 | | rear reset buuton is defective or the EDM is not in Stop status | check rear reset button for short-circuits |
| *51* | *without EDM* | *rear RESET button is defective* | *check rear reset button for short circuit* |
| *51* | *without protective circuit monitoring* | *EDM is not in Stop Status* | *Check EDM Signals* |
| *51* | *without EDM and without protective circuit monitoring* | *wrong poetntial at EDMO or EDMS* | *check the connectors for short circuits* |
| 63 | | Mutinglamp does not light up | open the press completely. If this message is repeated at the following new stroke and the internal muting lamp does not light up,there is an internal error at the version that has no connection option of an external muting lamp. With the version with external connection option of an external Muting lamp, the connection KAST must be checked for short-circuits on -. |
| 83 | | overrun traverse too long | during overrun traverse test |
| *83* | *without overrun traverse control* | - | - |
| 95 | | overrun traverse mearuement has not been carried out | possible reasoin: the protective field is interrupted, or the protective circuit is interrupted, or the foor pedal is released, or no fast speed during the overrun traverse measurement, evtl. because the stroke for the oberrun traverse measurement has not been started by the UDC of the machine. Open the press completely and carry out a new stroke for the overrun traverse measurement. |
| *95* | *without overrun traverse control* | - | - |

**Status messages, handling directions for the operator (binary xxxxxx11)**

*background grey: other message or no message, if monitoring functions are partially cancelled*

| message transferred byte decimal | operating mode | description possible text in the display system | handling directions |
|---|---|---|---|
| 99 | | no overrun traverse test was carried out because of slow speed during overrun traverse test | set the switch-over point onto the normally required position, open the press until the machines reaches its UDC and carry out a new stoke for overrun taverse measurement |
| 111 | | interrupted protective circuit | Release all protective grids and Emergency off buttons |
| *111* | *no monitoring of the protective circuit* | *Internal error* | *if this is displayed again after the voltage reset, a verification by Fiessler Elektronik is necessary* |
| 119 | | error within the protective circuits, re-disable and enable them | open again all protective grids and Emergency off buttons and close them again so that a possible bad contact is activated again |
| *119* | *no monitoring of the protective circuit* | *Internal error* | *if this is displayed again after the voltage reset, a verification by Fiessler Elektronik is necessary* |
| 123 | | error within the protective grids, re-open and close them | re-open and close the protective grids so that a possible bad contact is activated again |
| *123* | *no monitoring of the protective circuit* | *Internal error* | *if this is displayed again after the voltage reset, a verification by Fiessler Elektronik is necessary* |
| 135 | | lateral protective grids are open, i.e. protection by AKAS® is cancelled, activate RESET | Press can close only in slow speed |
| *135* | *no monitoring of the protective circuit* | *Internal error* | *if this is displayed again after the voltage reset, a verification by Fiessler Elektronik is necessary* |
| 139 | | error within lateral grids or Emergency-OFF-button, open and close them once more | open and close again all lateral protective grids and all Emergency-OFF-buttons so that a possible bad contact is activated again |
| 147 | | error within rear grids or Emergency-OFF-button, open and close them once more | open and close again all rear protective grids and all Emergency-OFF-buttons so that a possible bad contact is activated again |
| *147* | *no monitoring of the protective circuit* | *Internal error* | *if this is displayed again after the voltage reset, a verification by Fiessler Elektronik is necessary* |
| 159 | | Emergency OFF actvated | re-enable emergency OFF button |
| *159* | *no monitoring of the protective circuit* | *Internal error* | *if this is displayed again after the voltage reset, a verification by Fiessler Elektronik is necessary* |
| 163 | | rear protective grid is open | close rear protective grid |
| *163* | *no monitoring of the protective circuit* | *Internal error* | *if this is displayed again after the voltage reset, a verification by Fiessler Elektronik is necessary* |
| 175 | | lateral and rear protective grids are open | close all protective grids |
| *175* | *no monitoring of the protective circuit* | *Internal error* | *if this is displayed again after the voltage reset, a verification by Fiessler Elektronik is necessary* |
| 183 | | activate reset button for the rear protective grid | reset must be actvated after the openring and closing of the protective grids |
| *183* | *no monitoring of the protective circuit* | - | - |
| 187 | | open the press after overrun traverse test | Press has successfully stopped at the cam during the overrun traverse test, only when the cam is free again, the OSSDs can be enabled again The ajustment controll-LEDs are flashing slowly until the press brake is not opened completely. |
| *187* | *no monitoring of the protective circuit* | - | - |
| 195 | | box bending function is selected | - |
| 207 | | bending of flat sheet metal | - |
| 215 | | muting | AKAS@ provides only indirect protection by permitting the closing movement only in slow speed |
| 219 | | foot pedal is released | during the closing movement, the foot pedal was released |
| 231 | | interruption of the protective field | during the closing movement, the protective field was interrupted |
| 235 | | activate emergency-OFF-reset of the grids | after the opening and closing of a protective grid, a reset must be carried out |
| *235* | *no monitoring of the protective circuit* | - | - |
| 243 | | key switch is activated | Disable key switch. If the same message remains displayed, there is a risk of short-circuiting of the normally open foot pedal contact. |

**Warnings (binary xxxxxx10) error reports (binary xxxxxx01)**

*background grey: other message or no message, if monitoring functions are partially cancelled*

**Warnings issued when several consecutive malfunctions occur that lead to an interlocking of the AKAS@ with displayed error reports. The interlocking status can be cancelled only by a voltage reset.**

| **Warning** transferred decim. byte | **error** transferred decim.byte | **operating mode** | **description** possible text in the display system | **reason for the error** |
|---|---|---|---|---|
| 6 | 5 | | EDM does not respond even though the OSSDs are released | If this happens during fast sped: valve position monitors do not switch in fast speed position or at an interruption in the EDMS circuit. If this happens during Muting: EDMS and EDMO are both at + 24 V |
| *6* | *5* | *no monitoring of the protective circuit* | - | - |
| 10 | 9 | | slow speed signal error | When switching over from fast speed into slow speed, at SGO remains+ 24 V |
| *10* | *9* | *with additional safety PLC (e.g.* **FPSC***)* | *slow speed signal error* | *When swithcing over vom fast speed into slow speed, the triggereing of the SGS and the SGO is antivalent instead of equivalent* |
| 18 | 17 | | machine stops at the overrun traverse cam/ cam switch does not conduct | in the case of "warning": open press completey, in the case of "error": check cable and cam switch |
| *18* | *17* | *overrun traverse control* | - | - |
| 30 | 29 | | no complete slow speed position in the Muting status | This message is displayed when the stroke is started in slow speed range or with a slow speed request SGA = 0 and if there is no complete switchover of the slow speed position monitors into slow speed. Check the SGA line for interruptions and check also the slow speed position monitors and their lines. |
| 86 | 85 | | Problem release of the rear stoppers | line short circuiting of one RXOX circuit with another line |
| *86* | *85* | *no monitoring of the protective circuit* | *internal error* | *if this is displayed again after the voltage reset, a verification by Fiessler Elektronik is necessary* |
| 90 / 102 | 89 / 101 | | Problem fast speed -- slow speed request | line short circuiting of the SGA circuit with another line |
| 106 | 105 | | fast speed/slow speed signals are faulty in stop status | during operation without safety PLC, both EDMS and EDMO are at + 24 V at the same time in stopped status. |
| *106* | *105* | *with additional safety PLC (e.g.* **FPSC***)* | *fast speed/slow speed signals are faulty in stop status* | *The triggering of the SGS and the SGO is antivalent instead of equivalent* |
| 114 | 113 | | OSSD- error | line short circuiting of the OSSD circuits with other lines |
| 126 | 125 | | short circuit of the the muting lamp line | only possible at the version with external Muting lamp, otherwise: internal problem |
| 130 | 129 | | problem at request for higher switchover point: | line short circuiting of the HUSP circuit with other lines |
| 142 | 141 | | Muting lamp should not light up, release box bending button | short circuit in box bending button or line short circuiting of the KAST circuit with other lines |
| 150 | 149 | | problem at pressing of foot pedal | line short circuiting of the foot pedal circuits FUO and FUS with other lines |
| 166 | 165 | | Hex switches deadjusted | Readjust the Hex switches onto the selected operating mode, then carry out a voltage reset. If the error repeats itself, a repair by Fiessler Elektronik is necessary. |
| 170 | 169 | | invalid Hex switch position | Turn HEX switch into a permitted position |
| 198 | 197 | | external transmitter signals are received | The transmitter is triggered although the foot pedal is released, or a transmitter from another AKAS® focuses the receiver. This must be prevented by adequate constructional measures. |
| interlocking without prior warning | 201 | *with additional safety PLC (e.g.* **FPSC***)* | *unequal slow speed connections* | *This error happens only during the operating mode "for connection to safety PLC" if the signals at the SGO and the SGS are not exactly the same.* |
| interlocking without prior warning | 237 | | *disable key switch - voltage reset* | *The key switch ot the front reset switch have been activated when the foot pedal was pressed, or there is an error within the foot pedal, or the front reset button does not close.* |
| 246 | 245 | | internal error | If this message is displayed immediately after a voltage reset, there is an EMC problem or an internal failure of the appliance. |

# Service

If you have questions that cannot be answered by reading this operation instruction manual, please contact us directly.

When calling, please have the following dara ready:

-Exact unit type and model
-Serial number(s)
-Symptom of the malfunction and/or fault description

Fiessler Elektronik GmbH & Co. KG
Kastellstraße 9
D-73734 Esslingen

Phone: 0711 / 91 96 97 - 0
Fax: 0711 / 91 96 97 - 50
E-mail info@fiessler.de

# Maintenance

The transmitter- and receiver lenses should be cleaned with a soft cotton swab at least once a month.
The spindle of the support should be lubricated with machine oil after 6 months.
The press brake protection systems AKAS® are maintenance-free with the exception of the supports.
On request by the customer, Fiessler Elektronik GmbH & Co. KG carries out the acceptance test and annual inspections.
In addition, seminars providing customers with training in annual inspections are held at regular intervals.

# Warranty

The company Fiessler Elektronik GmbH & Co. KG refuses to accept any warranty claims if the device has been opened or if it has been modified.

## Returning a unit

If, in the case of default, the necessity of returning the unit to Fiessler Elektronik arises, it will be very advantageous for a fast default diagnosis if the following topics are observed and observed:

-exact description of malfunction:
-did you frequently notice malfunctions at the machine where the light curtains are installed?
-any defaults or malfunctions in the past?
-etc..
-which operating mode has been used with this unit?

The more exactly the malfunction is described, the more accurate and faster we can determine it and repair it.

**AKAS® accessories (electronic equipment)**

| part designation | order code |
|---|---|
| AKAS® Muting System w. integrated overrun traverse control AMS/N, complete (incl. 2 magnetic sensors with 10m & 5m cables, 1 magnetic tape) | **AMS/N/K** |
| Safety double foot pedal FL2-528ZSD4-U | **FS2-528ZSD4-U** |
| AKAS® Foot pedal for box-bending function | **AKAS/Ped** |

**Electrosensitive protective equipement** The press brake protection AKAS® is an electrosensitive protective device (ESPE).
ESPE is characterised by the fact that a hazardous motion becomes interrupted or prevented if the **light beams** produced between the transmitter and receiver unit are interrupted.

**Safety category 4** The AKAS® fulfils the safety class 4, in compliance with EN 954.
Devices of safety category 4 are self-monitoring electrosensitive protective devices (ESPE) and represent the highest safety class among the ESPE

**Self-monitoring** The electrosensitive protective device (ESPE) switches automatically into the "safe state" when it is faulty.

**Standard Installation range** Maximum distance between transmitter and receiver is 6 m ( For longer range please get in contact with Fiessler Elektronik or your local dealer).

**Overrun** The part of the hazardous motion still taking place after interrupting the light beam.

**Overrun traverse** The distance covered during the overrun (e.g. by the ram of a press).

**Overrun period** The duration of the overrun traverse.

**Response time** The time that elapsed after light beam interruption until the switching action occurs.

**Valve or contactor control** Before every release of the output contacts the contactor control is checking whether the switching elements connected (relays, contactors or valves) have been released. A renewed release of the output contacts is only possible if the switching elements connected have been released. Thus a dangerous failure of switching-elements (relays, contactors or valves) caused by the hazardous motion is prevented.

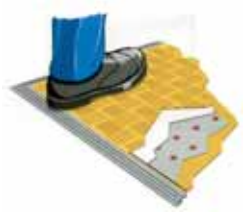
**Start interlock** After initial operation or after a power supply interruption a renewed "enabling" is blocked by the start interlock.The renewed release of the switching unit is only possible by closing and opening of the start entry.

**Restart interlock** The restart interlock prevents any automatic releasing of the switching outputs after an interruption and re-enabling of the light beam (e.g. when penetrating the light beam).

**Muting** Short-time safe by-pass of the press brake protection AKAS® during material movement, i.e. during a plate bending process.

**Box-bending** By-pass of the receiver unit **E1**, during a box-bending process.

## other Safety products



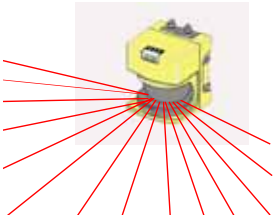
Saftety Mats

Safety-Footpedal

Parametricable Saftetycontrol FPSC

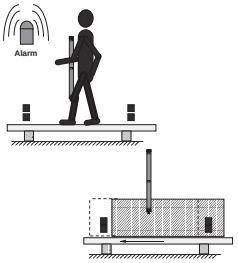
Press Brake Protection System AKAS

Safety-Light-Curtain

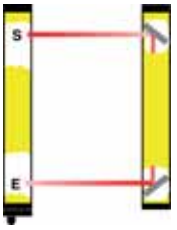


Proximity Laser Scanner

Single-Safety-Beam




Safety-Light-Grid with muting function




Safety-Light-Grid

## Service

As a special feature for training our customers, Fiessler Elektronik offers one-day safety workshops. Our service team provides you with expert advice and information for the reliable integration of our safety equipment into your machine.

### HOMOLOGATIONS

In order to ensure and maintain the high quality level of the Fiessler safety products, a quality control security system has been established early. Fiessler Elektronik holds the DIN ISO EN 9001 Certificate and, thanks to the company-owned EMC laboratory, all products must pass a inspection without exception before they leave the company. All safety equipment comply with the applicable national and international standards. Development and Design is made in close cooperation with the German employer`s liablility insurance associations. All homologations are obtained only after having passed strict tests by the German surveyor organisation TÜV.

CE BG zugelassen TÜV ZERT UL LISTED Ex

### AWARD OF APPRECIATION

for exemplary performance in the development of the press brake protection system AKAS.
The award was bestowed upon Fiessler Elektronik by the ministry of trade and commerce of the federal state of Baden-Württemberg.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Fiessler Elektronik has respresentations in all major industrial