Safety Load Monitor
SLS 801

Original
Manual

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1.   General description

The "Safety-relevant Switching Amplifier SLS 801" is a programmable switching device.

Under application of DIN ISO 13849, both the design concept and architecture of the safety-relevant zone on the SLS 801.02 serve to bring about a high level of safety integrity. The device complies with performance level PLd and category 4.

Up to four sensors can be connected up to the unit, two of which in each case are redundant to each other. On the SLS 801.01 the sensors transmit a strain-gauge signal in mV/V and on the SLS 801.02 a standard signal of 4-20 mA. They are powered with 24V DC from the SLS 801.

The device is operated by programming via a web browser in addition to individual setting and adjustment on the keypad. The SLS 801 is preferably used together with two redundant load sensors for overload protectors revealing a high level of safety integrity.
Depending on the number and type of the connected load sensors, monitoring is possible of individual, cumulative, differential and partial loads.

Outputting of the freely programmable load shut-off points takes place via six relays ("K1" … "K6") with N/O contacts. In addition, the device incorporates two error relay outputs "Error1" & "Error2". These error relays are not freely programmable and generate a "0" status in the event of a system error occurring. Force-guided relays on the SLS 801 serve to ensure maximum system safety in application.

Two analogue outputs and two digital interfaces are available for further use of the load signals on overriding systems.

2.   Functional description

CAUTION! Any operating processes or adjustments performed on the keypad of the SLS 801 via the web browser as well as changes made to the limit-set function by means of switching inputs IN1 to… IN8 will render the safety function inoperative for the duration of this work and the resetting phase as well as for a few seconds afterwards
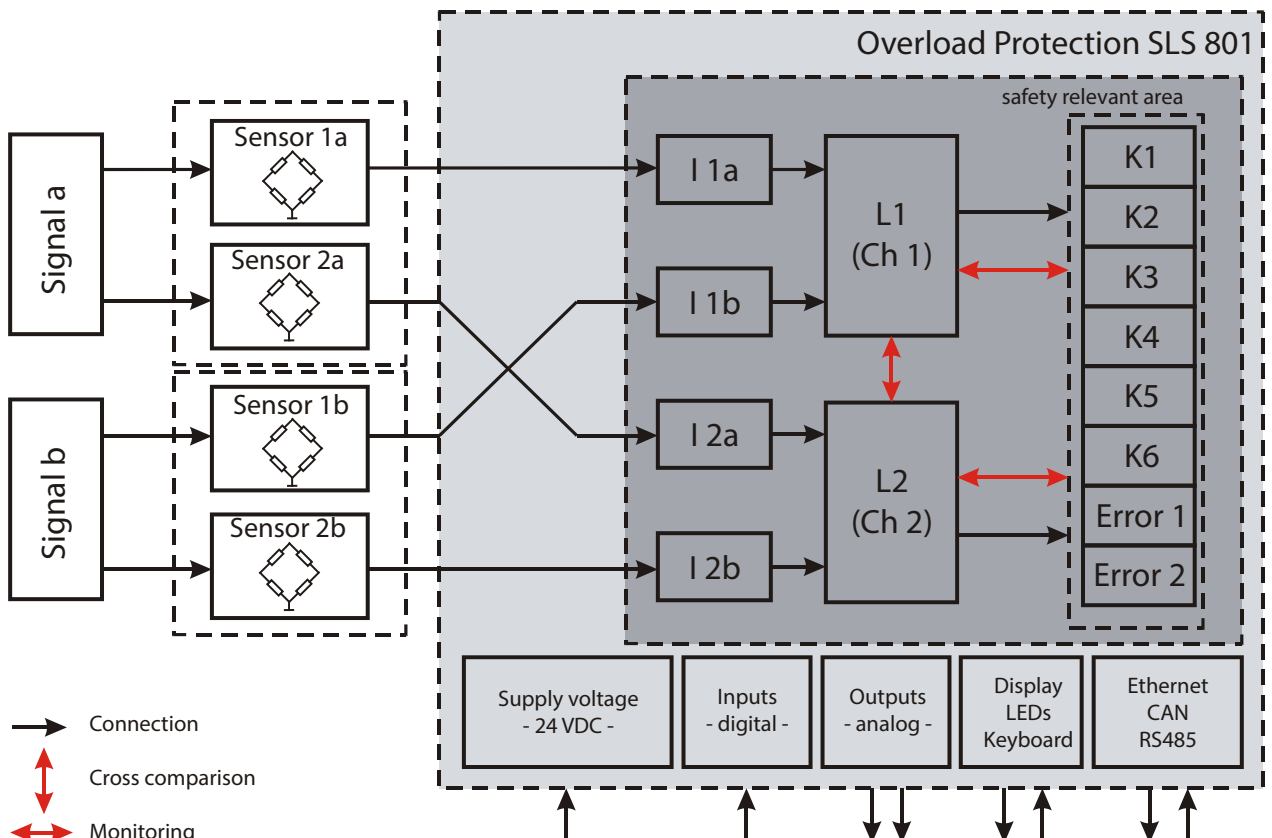

Figure 1 - Block diagram SLS 801

Applying a (load-)signal "a" – e.g. loading of a hoist unit "a" for example – two sensors 1a and 2a redundant to each other are acted upon (Figure 1). The measured values of these two sensors are applied to the SLS 801 – inputs "I 1a" and "I 2a". In the safety-relevant zone of the SLS801 evaluation of the sensor signals "1a" and "2a" takes place by means of two logic modules L1 and L2

- in respect of the load-governed switching points "K1" … "K6 that may have possibly undergone adjustment;
- in respect of the difference (tolerance value) Δ1a, 2a of the redundant signals that trigger "Error1" & "Error2" in the event of values being exceeded;
- in the event of a sensor error occurring such as cable rupture or short-circuiting, such errors then triggering "Error1" & "Error2".

The same procedure is followed where a (load-)signal "b" is present with corresponding measured values on sensors "1b" and "2b".

Likewise in the safety-relevant zone, where the second (load-)signal "b" is present, it is possible to conduct the sum of the signals – Σa, b as well as their difference Δa, b – to circuits "K1" … "K6". This makes it possible for instance to limit the cumulative load of a lifting device equipped with two hoist units.

In the safety-relevant zone monitoring not only takes place of output relays "K1" … "K6" and error relays "Error1" & "Error2, but also of the load sensors with respect of cable rupture and short-circuiting. Where use is made of redundant sensors, synchronisation is likewise monitored. The two logic control assemblies perform a cross-comparison. In the event of system errors occurring, the error relays will switch off. A sensor error on any input does not automatically lead to loss of function on the entire system. As a result of this functionality feature, a high level of safety is attained along with highest possible availability.

The following items are not in the safety-relevant zone of the SLS 801:
- the two analogue outputs – 0/10V and 4/20 mA respectively – for sensors from 1a to 2b or selected sums and differences;
- the LAN connection (RJ-45);
- the X1: CAN connection   / option PROFIBUS;
- the X2: RS 485 connection / option RS 232

3.   Dimensions

Dimensions   102 mm x 105 mm x 205 mm / 1 kg
Weight   approx. 1kg
Mounting   on mounting rail TS35
Connection   voltage supply   1.5 mm² screw terminals
                Switching outputs (relays)   1.5 mm² screw terminals
                Sensor inputs   1.0 mm² screw terminals
                Analogue outputs   1.0 mm² screw terminals
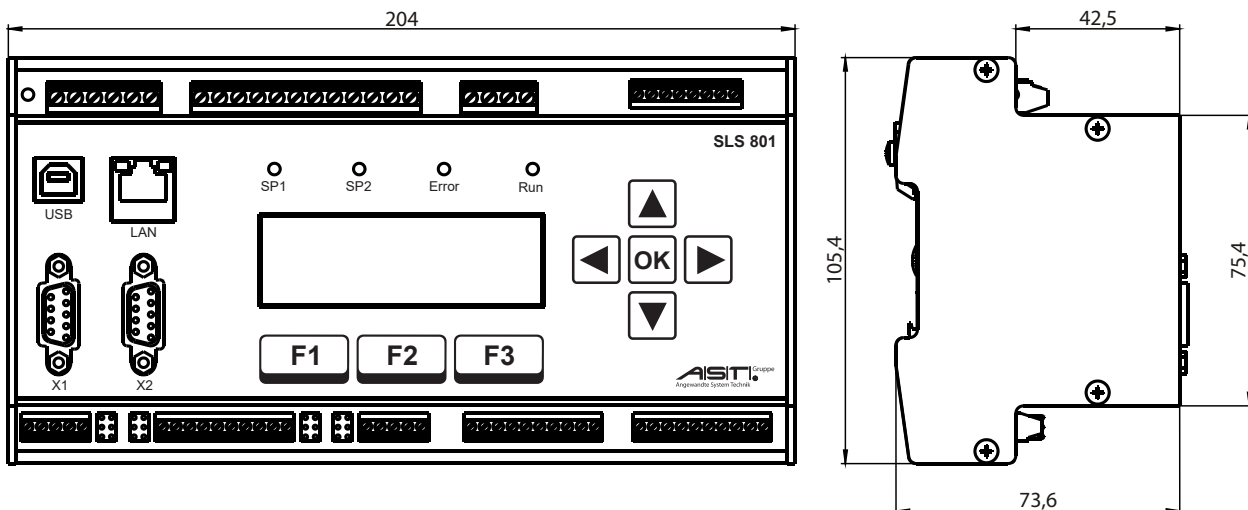   Switching inputs   1.0 mm² screw terminals

Figure 2 - Dimensions of SLS 801

4. Electrical connection
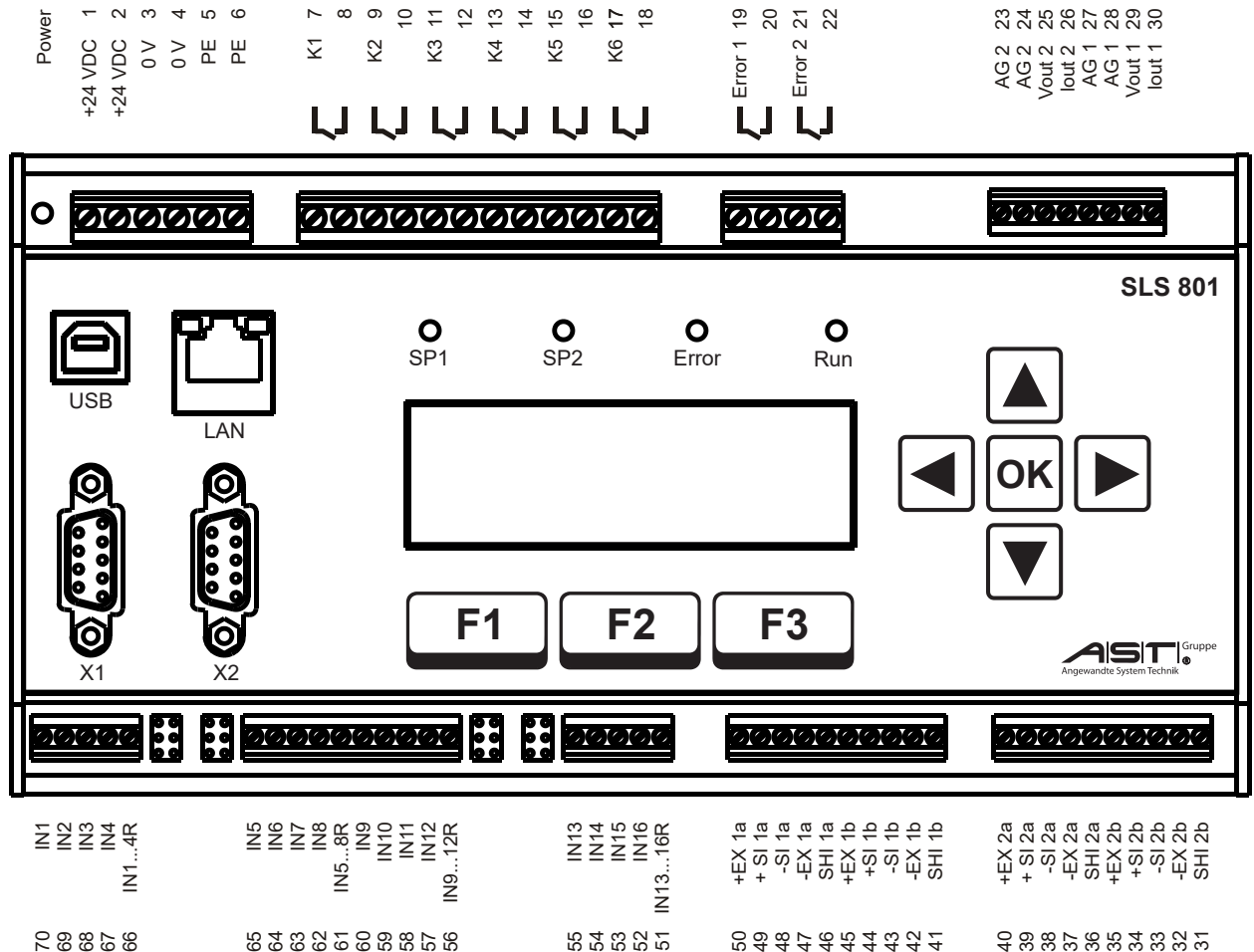
4.1. Connection diagram

Figure 3 - Position and designation of connections

4.2. Voltage supply 24V DC

The operating voltage is 18-36 V DC proceeding from a maximum power consumption of 15 VA. Operational readiness is indicated by means of an LED next to the 24 V AC connection. Conductors of up to 1.5 mm^2 can be connected up to terminal blocks 1 … 6.
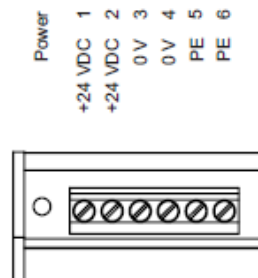
After the operating voltage has been applied, the green "power" LED will light up next to terminal 1 as well as the "Run" LED.

4.3. Sensor inputs I1a – I2b

A total of four sensor connections are available. Sensors 1a and 2a are "loaded" by signal a and sensors 1b and 2b by signal b. The sensor signals should be treated as redundant signals 1a to 2a and 1b to 2b. Conductors of up to 1.0 mm² can be connected up to terminal blocks 31 … 55.

Note: If only one signal is present, e.g. a hoist unit with a redundant measuring axis, observance of both measuring-axis channels as sensor 1a and sensor 2a must be regarded as mandatory. If the second signal b or sensors 1b and 2b are absent, special settings must be observed (refer to Chapter 6.4 Adjustment (load calibration)).

4.3.1. SLS 801.01

The SLS 801.01 is designed for DMS sensors having a signal output range extending from -5mV/V to +5mV/V. The bridge resistances may be from 350 Ω ... 1000 Ω.
Input stages "I 1a" und "I 1b" feed the DMS sensors with 5V, input stages "I 2a" und "I 2b" supplying the DMS sensors with 3.3V.
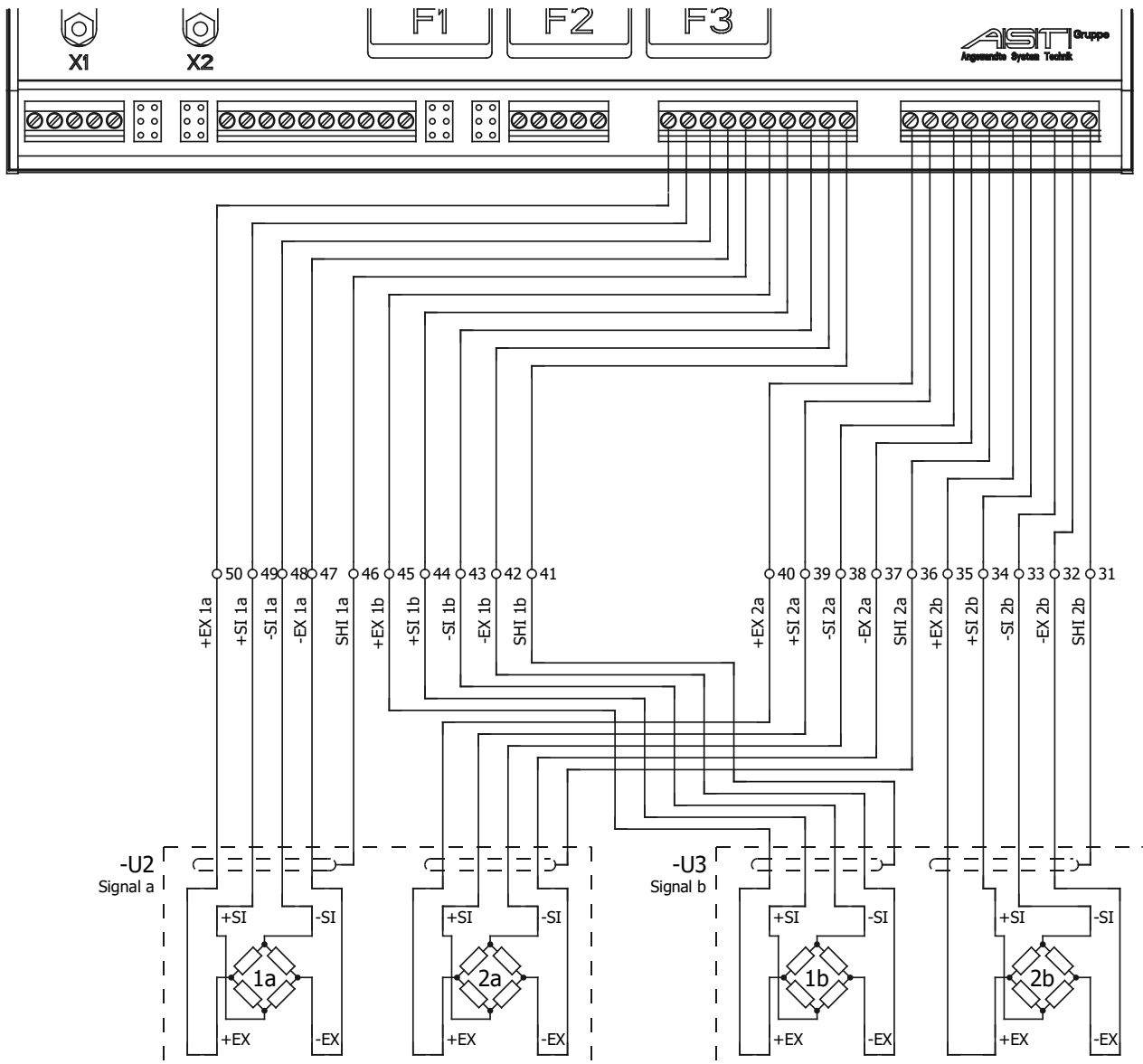

Figure 4 - Sensor inputs I1a – I2b (SLS 801.01)

4.3.2.   SLS 801.02

The SLS 801.02 is designed for DMS sensors with an integrated or external DMS amplifier having a standard signal output of 4-20mA.
The SLS 801.02 feeds the amplifiers with 24V DC, max. 25 mA. The input signal range without error message extends from 1.5mA to 24mA.

Note: The "0V" connections of the respective sensors are bridged internally. If three conductors "UB", "OUT" and "OV" are available on each sensor, connections 32, 37, 42 und 47 must be left free.
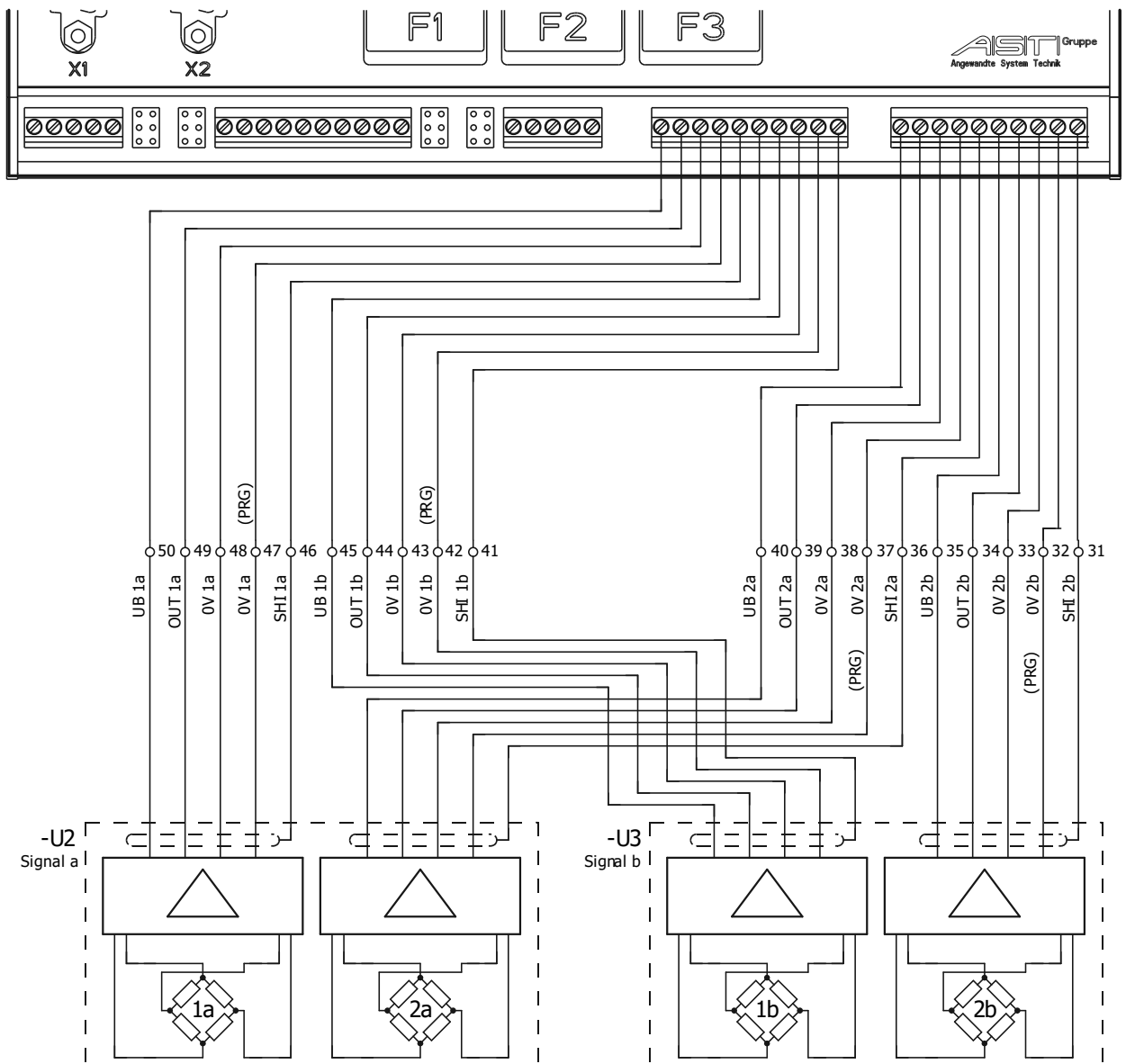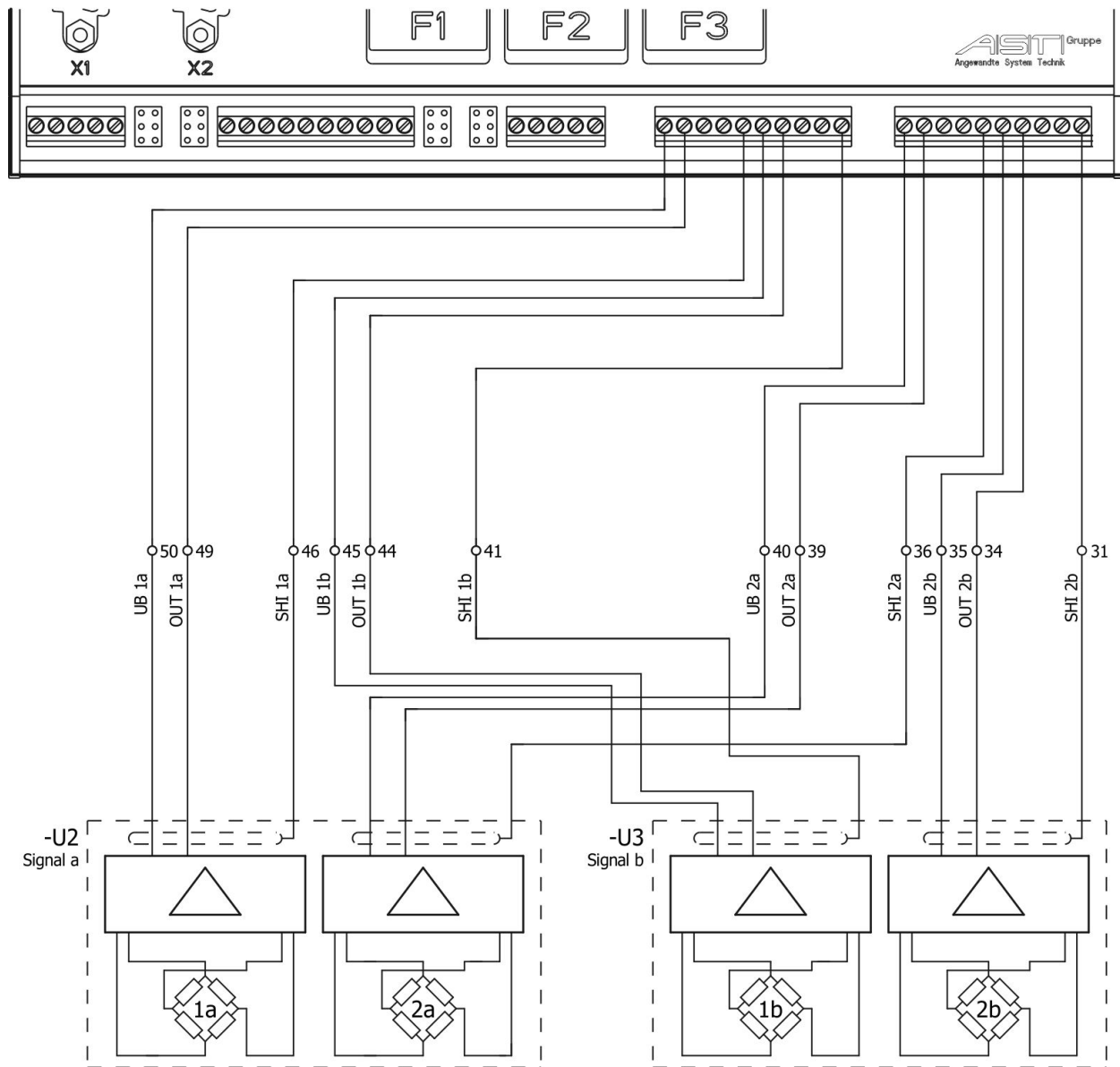

Figure 5 - Sensor inputs I1a – I2b (SLS 801.02)

Figure 6 - Sensor inputs I1a – I2b (SLS 801.02) - 2-wire connection

4.4.   Switching inputs IN1 … IN16

Sixteen optocoupler inputs are arranged in four groups each comprising four inputs.
Limit sets can be accessed to by means of inputs IN1 … IN8.
A static signal on the relevant input serves to provide access to the corresponding limit set: Via IN1, set "1" is defined as the current set. If no signal is present, the SLS 801 will operate with the limit set last displayed in Chapter 6.5 Limits (K1 … K6). If, by accident, more than one input is occupied by a signal, the SLS 801 will use that input having the lowest number.
For the load spectrum recorder, inputs IN14 und IN15 are employed for switching the "Raise/Lower" signals a and b.
A signal at input IN16 generates the RESET function on the device; also refer to Chapter 7 Errors and warnings.

Static signal on	Reaction on SLS 801
IN1	Accessing to limit set 1
IN2	Accessing to limit set 2
IN3	Accessing to limit set 3
IN4	Accessing to limit set 4
IN5	Accessing to limit set 5
IN6	Accessing to limit set 6
IN7	Accessing to limit set 7
IN8	Accessing to limit set 8
IN9	((unoccupied))
IN10	((unoccupied))
IN11	((unoccupied))
IN12	((unoccupied))
IN12	((unoccupied))
IN14	Startup / service-life counter, signal a
IN15	Startup / service-life counter, signal b
IN16	RESET function, also refer to Chapter on LED "Error"

Table 1- Inputs

Return of the keying pulse "direct" or "+24 V DC" or "0 V" is set by means of jumpers INx...xR. Conductors of up to 1.0 mm² can be connected up to terminal blocks 51 to 70.
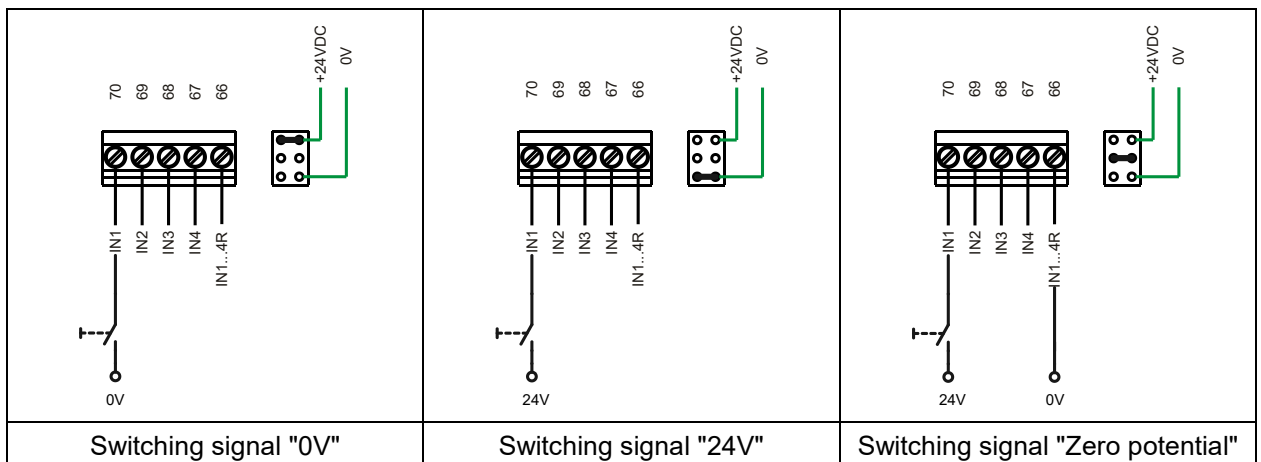

Switching signal "0V"	Switching signal "24V"	Switching signal "Zero potential"

Figure 7 - Examples illustrating return of keying pulse via jumpers (0V, 24V, zero potential)

Note: The jumper settings in Figure 7 apply to all groups **IN1…IN4 / IN5…IN8 / IN9…IN12 / IN13…IN16**
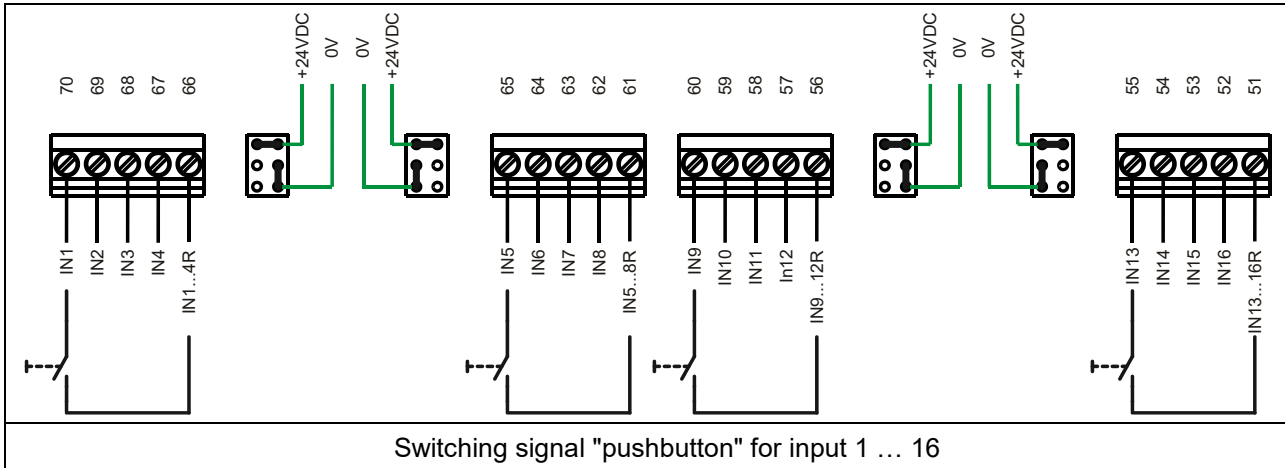
Figure 8 - Examples illustrating return of keying pulse via jumpers (pushbutton)

4.5. Analogue outputs V$_{out}$ and I$_{out}$

The SLS801 is equipped with two analogue output stages V$_{out}$1 and I$_{out}$1 / V$_{out}$2 and I$_{out}$2, each of which reveals a 4-20mA current output and a 0-10V voltage output. The analogue output stages can be freely assigned to the input signals and their respective linkages such as sum or difference formation (also refer to Chapter 6.3 Settings (scaling, interfaces, password)).
The maximum load of the current outputs is 390 Ω; the minimum load resistance for the voltage outputs must be 2 kΩ. Conductors of up to 1.0 mm^2 can be connected up to the terminal blocks.

4.6. Output relays and error relays K1 …K6 and Error1 & Error2

The SLS 801 is equipped with a total of eight switching outputs.

Within the scope of different applications, six output relays – K1 … K6 – are freely adjustable with respect to input signals and their respective linkages (also refer to Chapter 6.5 Limits (K1 … K6)).
No access is provided to the two error relays Error1 & Error2. These are only triggered in the event of system errors occurring on the facility, including sensor errors, or where deviations occur on redundant sensor signals 1a/2a and 1b/2b respectively within the scope of an adjustable variable (also refer to Chapter 6.4 Adjustment (load calibration)).

The switching relays are force-actuated N/O contacts; their switching status can be shown on the display.
The maximum switching voltage (DIN EN 60947-4-1 / EN 60947-4-1) is AC1: 250V/6A, AC15: 230V/3A, DC1: 24V/6A, DC13: 24V/5A/0,1Hz, UL 508: B300 / R300.
Conductors of up to 1.5 mm^2 can be connected up to terminal blocks 7 to 22.

4.7. Digital interfaces LAN, X1 and X2

The basic version of the SLS 801 makes provision for three interfaces for data exchange or for data transmission.

LAN (RJ-45):   Programming of SLS 801 via a browser.
X1 (9-Pin-SUB-D):   CAN interface.
X2: (9-Pin-SUB-D):   RS485 interface (optional RS232 interface)
                cyclical output of measured values as ASCII string.

4.7.1 Pin assignment CAN interface

PIN	Function
1	((unoccupied))
2	((unoccupied))
3	CAN-L
4	CAN-GND
5	((unoccupied))
6	((unoccupied))
7	CAN-H
8	((unoccupied))
9	((unoccupied))

Table 2– X1 – Pin assignment CAN interface

4.7.2 Pin assignment RS485 interface / optional RS232 interface

PIN	Function
1	((unoccupied))
2	((unoccupied))
3	485-B
4	((unoccupied))
5	485-GND
6	((unoccupied))
7	((unoccupied))
8	485-A
9	((unoccupied))

Table 3– X2 - Pin assignment RS485 interface

PIN	Function
1	((unoccupied))
2	232-TX
3	232-RX
4	((unoccupied))
5	232-GND
6	((unoccupied))
7	((unoccupied))
8	((unoccupied))
9	((unoccupied))

Table 4– X2 - Pin assignment optional RS232 interface

5. Displays and indicators

5.1. Functions of keys

5.1.1. Function keys

F1   F2   F3

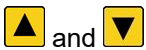The SLS 801 is set to the operating or programming status by means of function keys F1, F2 and F3.

Note: The functions of the respective keys F1 … F3 is indicated in the bottom line of the display matrix.
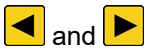
5.1.2. Cursor keys

Further displays and operations take place using the cursor keys.

Simultaneously pressing the keys:

▲ and ▼   Information about network addresses ((also refer to Chapter 5.3.2 Operating display / network for browser accessing).

◄ and ►   Adjustment menu for sensors and switching points (also refer to Chapter **Fehler! Verweisquelle konnte nicht gefunden werden. Fehler! Verweisquelle konnte nicht gefunden werden.**).
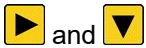
► and ▼   Operating display useful life for load spectrum recorder (also refer to Chapter 5.3.3 Operating display for load spectrum recorders (LSR))

Note: Simultaneously pressing the cursor keys occurs only in the operating display sensor signals (also refer to Chapter 5.3.1 Operating display / sensor signals 1a, 1b, 2a, 2b and switching contacts.

The sensor-signal operating display is returned to by actuating key **F3** and/or key **ok** according to what is indicated in the display.
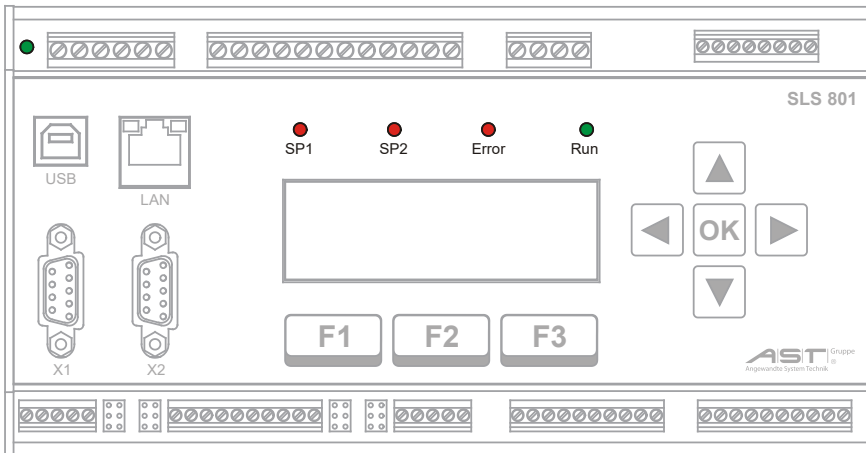
5.2. LED indicators

Figure 9 - Position of LEDs

Power: 24-VDC- supply voltage

Run: SLS 801 ready for operation

> **CAUTION:** The SLS 801 cannot be returned to the operating status (LED **Run** lights [F3] up **green**) until the causes of failure have been eliminated and the device has been restarted by means of the **Reset** key. or input IN16.

SP1/SP2: signalises that at least one contact is open "K1" … "K6"

Error: system error. At least one error relay "Error1" or "Error2" is open.

5.2.1. LED "SP1" und "SP2"

The LEDs "SP1" and "SP2" signalize that at least one contact "K1" … "K6" is open. These correspond to the settings specified in Chapter 6.5 Limits (K1 … K6) and can be queried by means of the operator actions given in Chapter 5.3.1 Operating display / sensor signals 1a, 1b, 2a, 2b and switching contacts.

LED SP1:   This references to Signal/hoist **a** when K1, K3, K4, K5 trigger.

LED SP2:   This references to Signal/hoist **b**, when K2, K3, K4, K6 trigger.

> **Note:** The LEDs SP1 or SP2 will send a signal when both logic units L1 oder L2 signal any exceeding or falling-below of the switching thresholds has been detected (refer to Chapter. 6.5 Limits (K1 … K6)).

5.2.2. LED "Error" and error messages

The LED "Error" function displays a system error or deviation of redundant sensor signals among each other. At the same time an error display will appear, for example as follows:

```
FATAL-ERROR!
Ch 1:  SF:0D / HW:08
Ch 2:  SF:2D / HW:00
   IP   Flags   Reset
```

Figure 10 - Error messages display

Pressing the **ok** key facilitates switching between L1/L2 and the measured-value display.

Pressing key **F2** **Flags** makes it possible to display selected error flags.

Actuating keys **◄** or **►** facilitates swapping between the display of the error flags Ch1/2 and HW flags (hardware flags).

In the Chanal 1 (L1/Ch1) display mode additional displaying of the flag values is possible indicating voltage supply errors/sensor errors (V-Exc-Flags 1/2).

```
Error-Flags - Ch 1
a:0    b:0    S:0    D:0
KV_Set:0    KV_Err:1
           Ch 2    Exit
```

Figure 11 – Errorflags Canal 1 (Ch1)

```
HW-Flags - Ch 1
a:0    b:0
V-Exc:0
  V-Exc   Ch 2    Exit
```

Figure 12 – Hardwareflags Canal 1 (Ch1)

Pressing **F1** **V-Exc** and the keys **◄** or **►** makes it possible to display flags indicating voltage supply errors (V-Exec-Flags 1) as well as individual sensor errors (V-Exc-Flags 2).

```
V-Exc-Flags 1
12V:0    5V E/V:0
3.3V E:0    3.3V V:0
                Exit
```

Figure 13 – Flags indicating voltage supply errors (V-Exc-Flags 1)

```
V-Exc-Flags 2
Sens 1a:0    Sens 1b:0
Sens 2a:0    Sens 2b:0
                Exit
```

Figure 14 – Flags indicating sensor errors (V-Exc-Flags 2)

Key to the different flags:

12V:	Voltage supply/relay
5V E/V:	Voltage supply/sensor supply voltage / Channel 1 (L1/Ch1)
3.3V E	Sensor supply voltage / Channel 2 (L2/Ch2)
3.3V A	Supply voltage / Channel 2 (L2/Ch2)
Sens 1a:	Sensor 1a (calibration/signal out of specification or wire breakage)
Sens 1b:	Sensor 1b (calibration/signal out of specification or wire breakage)
Sens 2a:	Sensor 2a (calibration/signal out of specification or wire breakage)
Sens 2b:	Sensor 2b (calibration/signal out of specification or wire breakage)

Further information on error messages/causes and their elimination will be found described in Chapter 8 Instructions in the event of failure occurring.

5.3.   Matrix display 4 x 20 characters

The four-line matrix display indicates operating statuses and signals as well as serving as a display when configuring the SLS 801.

5.3.1.   Operating display / sensor signals 1a, 1b, 2a, 2b and switching contacts

Following application of the operating voltage and the connection of operable sensors, sensor signals 1a and 1b are displayed, processed by logic unit L1 = Ch1.

```
Run   -   Ch   1
1a:      3.2   t
1b:      1.7   t
  S/D       Ch  2     Rel
```

Figure 15 - Operating display / sensor signals

Actuating cursor keys ◀ or ▶ switches to the % display and back again.

Key **F1** (**S/D)** indicates the sum **S** and difference **D** of the current sensor signals.

Actuating key **F2** **Ch 2** switches the display to the values of the signals processed by logic unit L2 (sensor signals 1a / 1b to 2a / 2b).

Key **F3** **Rel** indicates the status of the output relays **K1 … K6** (e.g. "K1: 0" - K1 closed; "K5: 1", K5 open) as well as error relays Error1 & Error2.

```
K1:   0    K4:   0    E1:   0
K2:   0    K5:   1    E2:   0
K3:   0    K6:   0
                          Exit
```

Figure 16 - Operating display – Switching contacts

5.3.2. Operating display / network for browser accessing

Information on the network addresses and other details can be obtained from the operating display of the sensor signals by pressing keys ▲ and ▼ simultaneously.
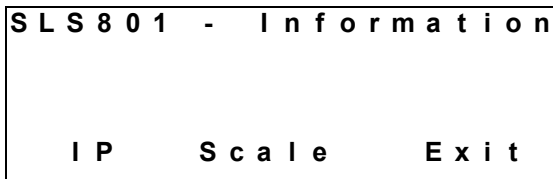
```
S L S 8 0 1  -  I n f o r m a t i o n



   I P      S c a l e      E x i t
```

Figure 17 - SLS801 – Information

Actuating key **F1** IP serves to display network information including the IP address of the device, by means of which it is possible to access to the SLS 801 via a browser.
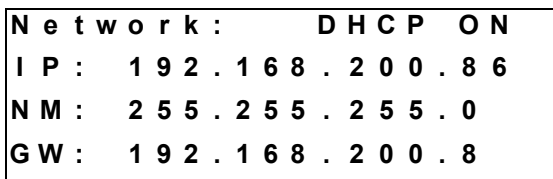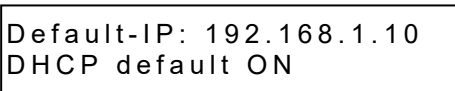
```
N e t w o r k :      D H C P   O N
I P :   1 9 2 . 1 6 8 . 2 0 0 . 8 6
N M :   2 5 5 . 2 5 5 . 2 5 5 . 0
G W :   1 9 2 . 1 6 8 . 2 0 0 . 8
```

Figure 18 - Network information

```
D e f a u l t - I P :  1 9 2 . 1 6 8 . 1 . 1 0
D H C P  d e f a u l t  O N
```

This can also be assigned by a linked-up network server if the value "DHCP = On" is set (also refer to Chapter 6.2 Status (information).
If no DCHP Server is found in the network, the IP address will have been set as a factory default.

Default login data: **admin/admin**.

Pressing the **ok** button will return you to menu "SLS801 – Information".

Key **F2** **Scale** indicates the 100% values (also refer to Chapter 6.3 Settings (scaling, interfaces, password)) of signals a and b, as for example hoist unit "a" and hoist unit "b".
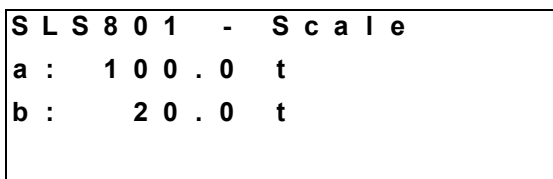
```
S L S 8 0 1  -  S c a l e
a :   1 0 0 . 0   t
b :    2 0 . 0   t


```

Figure 19 - Scaled values for signal a and signal b

Pressing the **ok** button will return you to menu "SLS801 – Information".

5.3.3. Operating display for load spectrum recorders

Provision is made for load spectrum recorders (LSR) for displaying the service life of hoist unit a (signal a) and hoist unit b (signal b) computed in accordance with FEM Directive 9.755.

For this purpose, a signal is evaluated second-by-second, proportional to 0…100% loading of the respective hoist unit where this is operated and saved in a totalizing memory.

The contents of this totalizing memory constitute the actual service usage S. This can be displayed both in hours as actual service usage S and as a percentage % as consumed service usage $V = S/D$.

Note: All inputting of the theoretical service usage D and the starting value for actual service usage S is carried out employing a web browser (Chapter 6.6 Load spectrum recorder (LSR)).

Actuating keys ▶ and ▼ simultaneously on the sensor-signal operation display (also refer to Chapter 5.3.1 Operating display / sensor signals 1a, 1b, 2a, 2b and switching contacts) switches the system to the service-life indicator on the operation display (also refer to Chapter 6.6 Load spectrum recorder (LSR).

```
SLS801  -   LSR
SIG.a:   - - -
SIG.b:   RUN
SIG.a    SIG.b   EXIT
```

Figure 20 - Operation display – Load spectrum recorders

Fig. x indicates that the service life in respect of signal b is totalled. Example, an operating signal coming from hoist unit b).

No operating signal is shown to be coming from hoist unit a.

Press key **F3** to exit from the display.

By actuating key **F1** it is possible to access to information on service life pertaining to signal a (hoist unit a).

```
LSR  -  Signal  a
D[h]:  1200
S[h]:   123
V[%]:    10,2
```

Figure 21 - Service-life display – Signal a

Press key **ok** to exit from the display.

5.4.   Configuration via keypad

Note: If configurations are initiated via the web browser, the respective setting facilities by LCD / keypad will be blocked so as to prevent operating errors.

Simultaneous actuation of the ◄ and ► keys from the sensor-signals operating display makes it possible to carry out readjustments to the sensor signals 1a, 2a, 1b and 2b in respect of zero load (0%) and full load (100%) as well as changes to the switching points. A precondition for this is that the configuration has previously been carried out via the web browser.
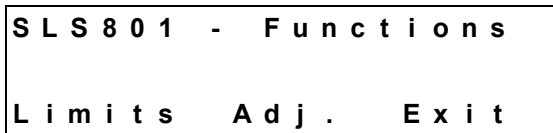
```
S L S 8 0 1  -  F u n c t i o n s


L i m i t s    A d j .    E x i t
```
*Figure 22 - Function menu*

F1 **Limits:**   Menu for setting the limits on the current limit set (refer to 5.4.1 Limits).

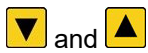**F2** **Adj.:**   Adjustments menu for setting zero load and final value (refer to 5.4.2 Adjustment).

5.4.1.   Limits

In the "Limits" menu, the display on the SLS 801 shows only the values of the current limit set. This will have been accessed to previously by means of an input signal or determined in accordance with Chapter 6.5 with the "Limit set" function.
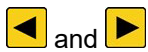
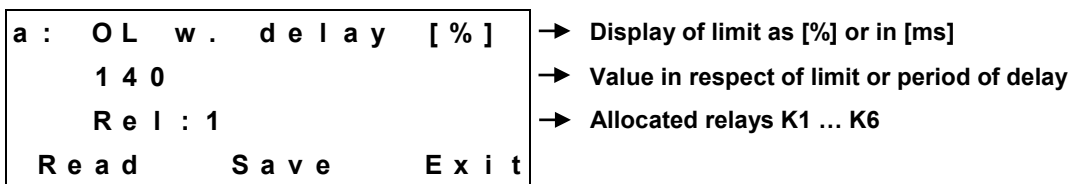◄ and ►   Selection of limit value.

▼ and ▲   Changes to the relevant limit value.

ok   Completion of changes on the display!

Otherwise it is not possible to obtain information on any other switching points using the ◄ or ► keys.

The display essentially replicates the information on the "Limits" specified in Chapter 6.1.4.

```
a :   O L   w .   d e l a y   [ % ]    →  Display of limit as [%] or in [ms]
      1 4 0                             →  Value in respect of limit or period of delay
      R e l : 1                         →  Allocated relays K1 … K6
 R e a d      S a v e      E x i t
```
Figure 23 - Display of switching point (where any load exceeds 140% in respect of signal a, relay 1 (K1) will switch with a time lag in the de-energized state).

```
a :   O L   w .   d e l a y   [ m s ]
      1 0 2 5
      R e l : 1
 R e a d      S a v e      E x i t
```
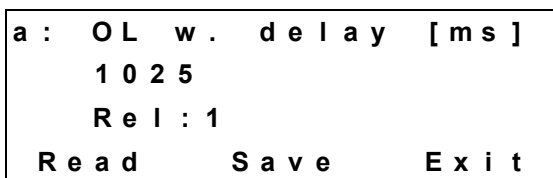*Figure 24 - Display of switching delay (where a switching condition is fulfilled in respect of signal a, relay 1 (K1) will switch in the de-energized state if that switching condition is still fulfilled after 1025 milliseconds.)*

Note: Allocation of the switching relays can only be set via the web browser!

5.4.2. Adjustment

The sensors to signal a or to signal b are accessed to in the Adjustments menu.
In accordance with *Fehler! Verweisquelle konnte nicht gefunden werden.* below the sensor signals 1a and 2a need to be adjusted block-wise.

```
A d j u s t m e n t


S i g a        S i g b        E x i t
```

Figure 25 - Adjustments menu / Selection of sensor signal a or b

```
A d j u s t m e n t  -  S i g .   a
1 a :    3   t
2 a :    2   t
  > 0 <       1 0 0 %      E x i t
```

Figure 26 - Adjustments menu / Sensor 1a and sensor 2a

F1 **>0<:** Adjustment of zero load **>0<**. For this purpose signal a needs to be in the load-free state (hoist unit a: without any load)!

F2 **100%:** Adjustment of full load **100%**. Signal a must generate a 100% load (hoist unit a: 100% load)!

Caution!: Actuating **F1** **>0<** and **F2** **100%** sets the values immediately. The save function does not take place until the Adjustments menu has been exited! **F3** **Exit**.

**F3** **Exit:** Exiting the Adjustments menu and prompting to save adjustment – "Save Adjustment?"

F1 **(Adj.):** Repetition of adjustment process.
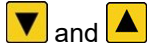**F2** **(Yes):** Saving of readjusted values.
F3 **(No):** Exiting the menu without saving the values.

Adjustments in respect of sensors 1b and 2b of signal b are carried out in the same way.

In addition, the tolerance values for sensor 1 / 2a and sensor 1b / 2b can be adjusted.
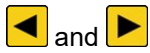
◄ and ►   Selection sensor 1a / 2a or sensor 1b / 2b

▼ and ▲   Change in the respective tolerance value

ok   Must be pressed to complete the changes to the display!
Otherwise it is not possible to switch between sensor 1 / 2a and sensor 1b / 2b.

```
A d j u s t m e n t   -   T o l . v a l
S e n s o r   1 a / 2 a   [ % ]
      2 0
  R e a d        S a v e        E x i t
```

Figure 27 - Adjustmentmenu – tolerance value sensor 1a/2a

F1 **(Read):** Reading actually saved tolerance values

F2 **(Save):** Saving the newly hired temporary tolerance values

F3 **(Exit):** Exiting of menu without saving the temporarily set tolerance values

Note: In case of faulty adjustment is displayed on the LCD display "*Adjustment not OK*!". In this case, the adjustment bits have to be checked and, if necessary perform a calibration (refer to chapter. 6.4 Adjustment (load calibration)).

6.   Configuration via web browser

The configuration routine is accessed to via the browser by means of the IP address specified under Chapter 5.3.2 Operating display / network for browser accessing genannten IP-Adresse (Figure 18 - Network information).

The SLS801 Overload Protection Device has been operably tested under the following operating systems:
- WindowsXP   → Web-Browser Chrome, Firefox, Opera, Internet-Explorer
- Windows7/8/10   → Web-Browser Chrome, Firefox, Opera

6.1.   Setting the IP address on the PC for use with a directly connected device

If the SLS801 is not connected via a network but directly to a PC, the following settings must be made.
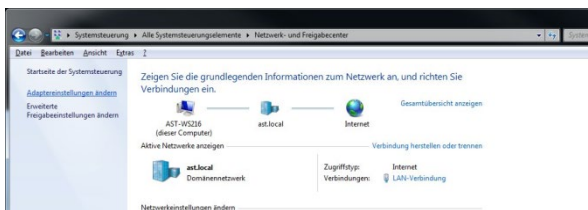
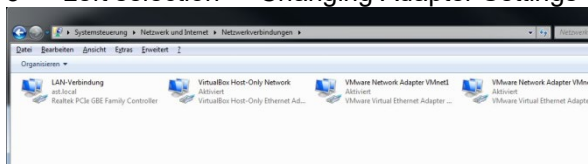Als Default-IP-Adresse verwenden die Geräte SLS 801 die 192.168.1.10.

Windows 7   **Windows 10**

1.   Start -> Control Panel   1.   Start -> Settings -> Windows- Settings -> Network and Internet
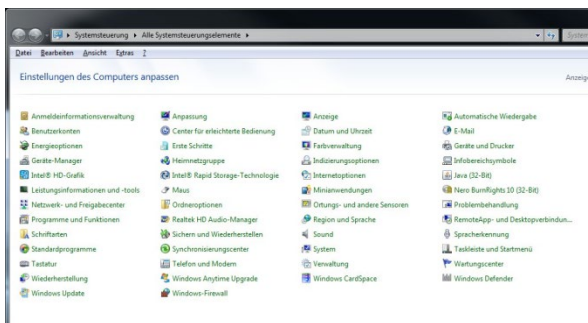
2.   Network and Sharing Center   2.   Ethernet -> Changing Adapter Options

continue under point 4.

3   Left selection -> Changing Adapter Settings
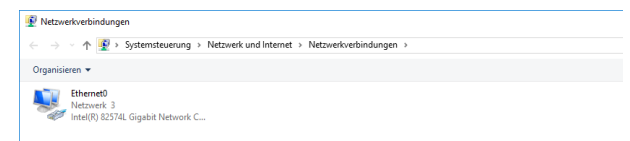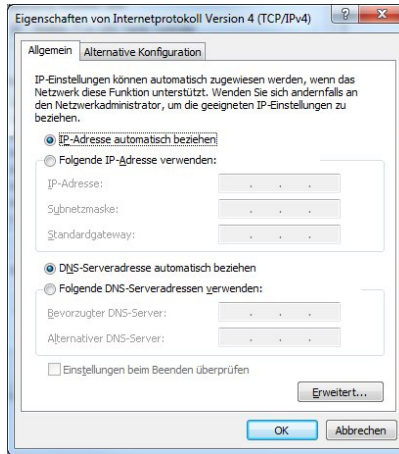
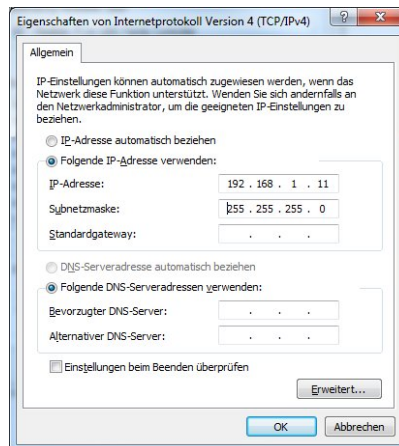4   Right mouse button -> -> Properties (if network adapter is used)
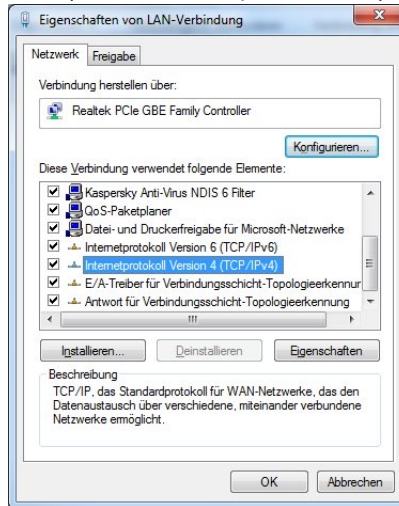
5   Internet Protocol Version 4 (TCP/IPv4) -> features

Entering a fixed IP address
In the controller, "Obtain IP address automatically" is set.
Please change to "Use the following IP address" and enter e.g. an IP address 192.168.1.11 and
the net mask 255.255.255.0.

The settings for the default gateway and DNS server can remain empty. Exit with "OK".

Note: After changing the IP address, it may take a few minutes for the system to use it and connect to the device.

6.2.   Status (information)

After the configuration routine has been accessed to via the browser, the following image will appear:

Figure 28 - Status information (SLS801.01)

The "Channel information" section contains the signals of sensors 1a, 1b, 2a and 2b arranged according to the SLS 801 internal logic units L1 and L2.

In the event of an error occurring, the causes of failure can be determined by pressing the "Error Status" button (also refer to Chapter 7.2 Status of relays Error1 & Error2).

Actuating the "Relay Status" button displays the status of contacts K1 … K6 (also refer to Chapter 7.1 Status of relays K1… K6).

6.3. Settings (scaling, interfaces, password)

By accessing to the "Settings" window it is possible to display and modify the current data.

Any changes made to data are sent to the device by pressing the OK button.

Figure 29 - Settings, basic settings

Measurement scale settings

Entry of 100% values of <u>signal a</u> and <u>signal b</u>. This might be for example the rated loads of hoist unit a and b. The 100% reference value in respect of all sums and differences is that value visible in <u>sum a, b.</u> Values can only be entered as whole numbers.

> **Note:** If only one hoist unit is available, the button marked *switch to <Only signal a>* is pressed. Afterwards signal a (hoist unit a) needs to be readjusted. For this purpose the SLS 801 immediately switches over to the Adjustment Mode as soon as the *switch to <Only signal a>* button is pressed

Switching back to two signals (hoist units) is effected by pressing the button in the same place marked *Switch to <Both Signals a, b>*. Here again, after pressing this button, the device will switch over immediately to the Adjustment Mode.

Analogue output settings

The analogue outputs are allocated to the logic units L1=Ch1 and L2=Ch2. The <u>type</u> selection must correspond to the connections as specified under Chapter 4.5. The reference value for <u>signal</u> – when selecting sensors _a and _b – is the 100% value entered above in respect of signal a and signal b. When selecting Sum or Diff. the 100% value is <u>sum a, b</u> computed above.

CAN settings (X1)

When setting the cyclical value output – "**Values out" to ON** – outputting of the following values takes place on the CAN interface together with the configured interval – "**Values out interval**". Output-interval settings are possible from 50…5000 ms.

Two CAN telegrams with different CAN IDs are sent with the **float** values of sensors 1a and 1b or sensors 2a and 2b.

ID send (base):

DLC	B0	B1	B2	B3	B4	B5	B6	B7
8	*1a_float*	*1a_float*	*1a_float*	*1a_float*	*1b_float*	*1b_float*	*1b_float*	*1b_float*

ID send (base+1):

DLC	B0	B1	B2	B3	B4	B5	B6	B7
8	*2a_float*	*2a_float*	*2a_float*	*2a_float*	*2b_float*	*2b_float*	*2b_float*	*2b_float*

RS485/RS232 settings (X2)

„Values out":

„On – Meas" – outputting takes place of the following formatted ASCII telegram on the serial interface cyclically with the configured interval – "Values out interval".

"1a:%s 1b:%s S1a1b:%s D1a1b:%s 2a:%s 2b:%s S2a2b:%s D2a2b:%s\r\n"

In the configured scaling these values are transmitted with decimal places and unit of measurement.

"On - LSR" is set, the values of the load collective counters are output cyclically as float values with the following telegram (20 bytes). Available from FW-V1.0.7.0.

STX – LEN – LKZa(S) – LKZa(V) – LKZb(S) – LKZb(V) – CSum – ETX

STX (1 Byte):	2 / 0x02
LEN (1 Byte):	16 / 0x16
LKZx(Y) (16 Byte):	4x float-values
CSum (Byte):	1´s complement of the 4 LKZ-values
ETX (1 Byte):	3 / 0x03

„On - DAxy" for a digital large digit display

On – DA55-4 for a digital large numeric display with 4 digits
On – DA55-5 for a digital large numeric display with 5 digits
On – DA55-6 for a digital large numeric display with 6 digits

The following individual values sensor are available for selection *a, b, Σa+b, Σa-b*.

„Values out interval":

Output-interval settings are possible from 1…240 s (4 Min.).

Security settings

Factory default *Security settings (Login admin)*

User name (not changeable)	**admin**
Password	**admin**
Master password	**1803**

An existing password is deleted by erasing the contents of fields *Password* and *Password confirmation* and then entering the *Master password*.

In the current firmware versions no password is set, the above data are valid in older firmware versions, if appropriate.

6.4.   Adjustment (load calibration)

This is where adjustment of the SLS 801 to the sensors essentially takes place.

Accessing to the "Adjustment" window will display the current data on "Sensor characteristics".
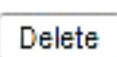
Button	
Start	Release of "Adjustment" feature for changes and calibrations. The header "Adjustment active" appears.
OK	Filing of entered values in respect of *Sensor characteristics* in the safety-relevant zone.
Save	Saving of entered values – and calibrations where applicable – from the temporary memory buffer to the safety-relevant zone.
Exit	Exiting this menu without taking over the entered values; the current data in the safety-relevant zone will then be retained.
Delete	Exiting this menu without taking over the entered values; in this case the factory default setting will be taken over in the safety-relevant zone. In mode "Only a signal" may not be available!

Table 5 - Buttons Adjustment

Sensor characteristics
Indication of the sensor characteristics at maximum anticipated load – signal "a" (hoist unit a) and signal "b" (hoist unit b).

Tolerance value
Indication of permissible deviation of redundant signals in excess of which the contacts Error1 & Error2 will open.

Load calibration
Calibration of sensors 1a, 2a and 1b, 2b takes place here, separated after loading with signal "a" (hoist unit a) and signal "b" (hoist unit b).

Figure 30 - Adjustment, adjustment of SLS 801 according to sensor characteristics (SLS 801.01)

SLS801 - Configuration

| Status | Settings | Adjustment | Limits | LSR | Config |

Adjustment

Start | Save | Exit | Delete

Note: Press the "Save" button to use the adjustment!

Adjustment status

Sensor characteristics

Input sensitivity

| Sensor 1a | 4..20 ▼ [mA] | Sensor 1b | 4..20 ▼ [mA] |
| Sensor 2a | 4..20 ▼ [mA] | Sensor 2b | 4..20 ▼ [mA] |

Tolerance value (2...100% - Related to Sum a,b with weighting!)

| Sensor 1a/2a | 10 [%] | Sensor 1b/2b | 9 [%] |
| (10 t) | | (2 t) | |

OK

Load calibration

	Real load	**Sensor 1a**		**Sensor 2a**	
Signal a	100 [t]	-	-	-	-

> 0 < | Load

Load calibration
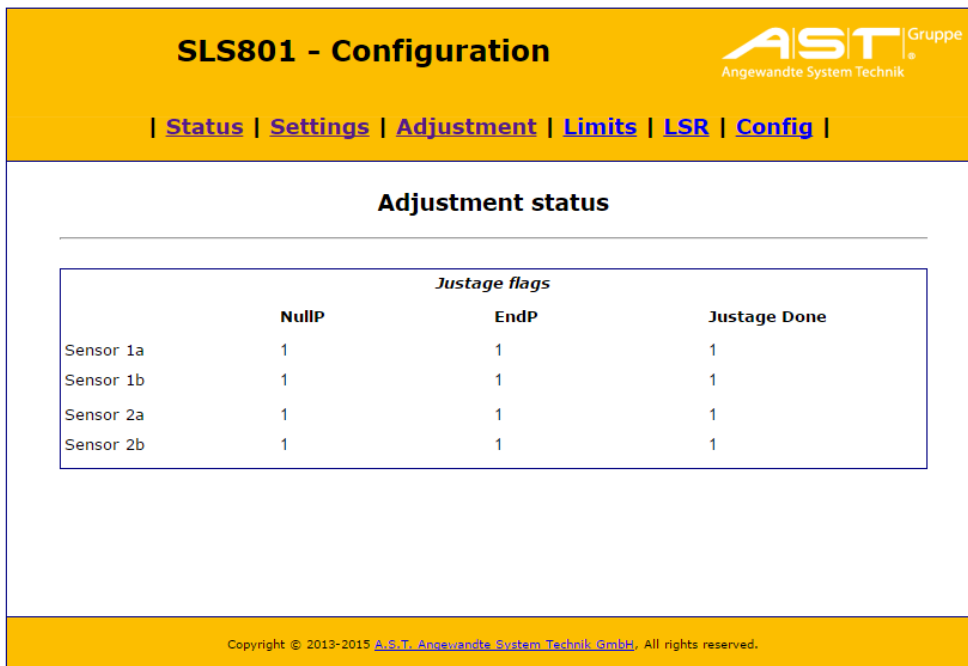
	Real load	**Sensor 1b**		**Sensor 2b**	
Signal b	20 [t]	-	-	-	-

> 0 < | Load

Figure 31 - Adjustment, adjustment of SLS 801 according to sensor characteristics (SLS 801.02)

6.4.1. Adjustement status
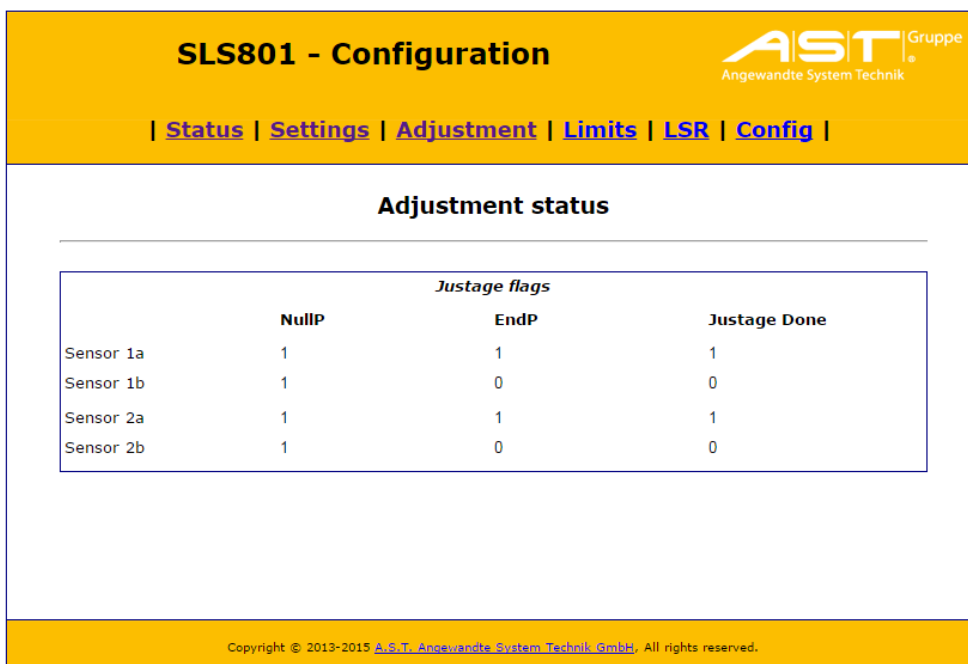
Via the „*Adjustment status*" link it is possible to check whether all necessary steps have been performed and completed for adjustment.

Figure 32 – Adjustment status – Adjustment completed

Figure 33 – Adjustment status – Adjustment wrong

Meaning of various flags:

1 = OK / 0 = not OK

NullP: Adjustment zero point (Button „> *0* <")
EndP: Adjustment final point or adjustment with load (Button „*Load*")
Justage Done: Completion of adjustment (Button „**Save**")

6.5.   Limits (K1 … K6)

Accessing to the "Limit set" window displays the current settings in respect of switching points K1 … K6 for that limit set that is currently in use.

Figure 34 - Limits

Button	
Start	Release of "Limits" for changes. The header "Limits active" is displayed.
Lim it set 1 ⌄	Accessing to a limit set as that currently due for editing.
Read	Repeated reading of limit sets and display of current values. Corresponds to Start button.
OK	Saving of displayed limit set in a temporary memory buffer.
Save	Saving of limit sets placed from the temporary memory buffer into the safety-relevant zone and transfer of the current limit set to the SLS function.
Exit	Exiting this menu without taking over the limit values in the safety-relevant zone.

Table 6 – Buttons Limits

eight limit sets can be defined under "***Limits***".

Allocation of the contacts takes place to the signals (hoist units) and not to the sensors.
Depending on the allocation, the contacts will open if overload and/ or underload conditions prevail.

A delay of up to 5 seconds can be entered for the opening action (inputting in ms). If the signal falls back below the switching point within this delay period, the Open command will be cancelled.

"**Enable change with dig. Inputs**" allows the disabling or enabling of the limit switching by means of digital inputs 1 ... 8.

Die Eingabe der Schaltpunkte **"Value"** erfolgt in **%** und bezieht sich auf den Nennkennwert "Final Value" (*siehe* 6.3 Settings (scaling, interfaces, password)*)*

Note: The relays K1 to K6 switching when one of the logic units L1 or L2 signal any exceeding or falling-below of the switching thresholds has been detected

Note: No hysteresis is implemented in the SLS 801. With a suitable setting of the switching point and the delay time, a slightly unstable input signal can be compensated for.

6.6. Load spectrum recorder (LSR)

Accessing to the "*LSR*" window displays the following image:

Figure 35 - Load spectrum recorders

Theoretical service usage data D are entered in the *Theoretical values* field in respect of signals a and b (hoist units a and b) as well as the starting values pertaining to actual service usage S of the respective signals.

The values are saved by pressing the ⎡Save⎤ button.

The *Runtime values* field displays the following:
- - Mode: RUN if one hoist unit is active, i.e. the service usage is computed
- - S [h]:   actual service usage
- - V [%] :   consumed service usage

Note: For the load spectrum recorder input I 1a and the signal / hoist b input I 1b are used for signal / hoist a.

6.7.   Config

By accessing to the "Config" window it is possible to record and document the current data.

For this purpose it is necessary to press the button marked "*Generate current config file*". This immediately creates a *config.txt* and *config.bin* files including the date and time stamp of the PC used for accessing to the SLS 801.
The *config.txt* file records all relevant settings/data for operating the SLS 801.
The *config.bin* binary file is suitable for recovering the settings.

> **Caution!** Exiting the "Config" window and accessing to this anew will result in the last config.txt file being deleted so that a new one needs to be generated by pressing the Generate current config file button.

Saving the *config.txt* and *config.bin* files is performed by the user in the usual manner.

Figure 36 – Config

It is possible to select a binary file by means of the button "*Datei auswählen*"/"*Select file*" and to send it to the SLS 801 by pressing the "*Send*" button. A check is carried out of the device type and checksum of the binary file. After the binary file has been successfully loaded without any errors, the settings can be saved on the SLS 801 by means of the button "*Write config to device*"

> **Note:** The length of the file name for recovery of the settings must not be allowed to exceed 31 characters..

7. Warnings / Error messages

7.1. Status of relays K1… K6

The status of relays K1 … K6 as well as Error1 & Error2 is queried by means of the browser, Chapter 6.2 Status (information)), link "Relay status". The relay-flags window that opens displays the status of the contacts corresponding to the settings specified in Chapter 6.5 Limits (K1 … K6).

Figure 37 - Relay flags (0 - closed, 1 - open: Switching condition fulfilled in accordance with Chapter 6.5).

7.2. Status of relays Error1 & Error2

In the event of a system error or similar situation occurring causing the LED Error to light up **red**, the error-flags window is opened by means of the browser, Chapter 6.2 Status (information), link "*Error status*".

Figure 38 - Error flags (0 - closed, 1 - open: Error message)

Error messages of the red marked flags are triggered by errors, failures and redundancy tolerances having been exceeded. Trouble-shooting and fault elimination must proceed externally to the SLS801. The most common causes of failure are ruptured or pinched cables and defective sensors. Following elimination of the fault or after carrying out replacements or implementing of other courses of action relating to the sensors, the system will be ready for operation again after having been restarted.

Error messages in the blue shaded flags are triggered by failures, tolerances having been exceeded or other situations in the safety-relevant zone of the SLS801. In such cases, the device should always be replaced!

In case of an error all relays (K1 bis K6 und Error1 / Error2) release for signaling!

Caution! The SLS 801 can only be returned to the operating state (LED Run lights up **green**) after the causes of failure have been eliminated and the device has been started up with key **F3** - Reset or input IN16.

8. Instructions in the event of failure

The most common instances of failure are likely to be "Sensor error" (refer to Chapter 8.3 and "Redundancy deviation" (refer to Chapter 8.2) and "adjustment errors" (refer to Chapter 8.4) as shown in the Table 7 and Table 8 appearing below. Allocation to Ch1 and Ch2 is of no significance.

8.1. Error overview

> **Note:** Any error flags that are set are always identified by "**1**", the non-fault state being indicated by a "**0".**

8.1.1. Error overview / Sensor errors

	Failure	Remedy
SF:x**D**	Signal/hoist unit **a**: sensor error.	Check cable connection for short-circuiting / rupture. Check sensors.
SF:x**E**	Signal/hoist unit **b**: sensor error.	Check cable connection for short-circuiting / rupture. Check sensors.
SF:2**0**	Signal/hoist unit a or signal/hoist unit b: redundancy deviation has been **temporarily** too high.	Chapter 6.4 / Check / adjust tolerance value.
SF:2**1**	Signal/hoist unit **a**: redundancy deviation **permanently** too high.	Chapter 6.4 / Check / adjust tolerance value.
SF:2**2**	Signal/hoist unit **b**: redundancy deviation **permanently** too high.	Chapter 6.4 / Check / adjust tolerance value.

Table 7 - Examples of sensor errors

The applicable HW-values for all errors listed in Table 7 are always **HW=00**.

8.1.2. Error overview hardware error/adjustment error

Code	Failure	Remedy
HW:x**8**	Supply voltage(s) for sensors / Sensor errors.	Check cable connection for short-circuiting or rupture. Check sensors. Check supply voltages.
HW:x**3**	Adjustment has not attained completion for signal/hoist **a und b** (2-Chanel-Mode)	Carry out adjustment (Chapter 6.4 Adjustment)
HW:x**2**	Adjustment has not attained completion for signal/hoist **b** (2-Chanel-Mode)	Carry out adjustment (Chapter 6.4 Adjustment)
HW:x**1**	Adjustment has not attained completion for signal/hoist **a** (2-Chanel-Mode)	Carry out adjustment (Chapter 6.4 Adjustment)
HW:x**1**	Adjustment has not attained completion for signal/hoist **a** (1-Chanel-Mode)	Carry out adjustment (Chapter 6.4 Adjustment)

Table 8 – Examples of hardware failure/adjustment errors

The applicable SF-values for all errors listed in Table 8 are always optional **SF=xx**.

> **Note:** Communication errors involving logic units L1/L2 are atypical and are shown as **SF=00 / HW=00** (refer to Chapter (refer to Chapter 8.5.).

The following chapters contain information on errors that occur along with their respective indications in the LCD display as well as on the status website.

8.2.   Redundancy error

This error can occur by briefly exceeded the signal tolerances (refer to Chapter 6.4 Adjustment (load calibration)), but also by permanent different strain of the redundant signals of a hoist.

8.2.1.   Redundancy error during operation

The measurement channels 1 and 2 (L1/L2 bzw. Ch1/Ch2) are in the error mode.

```
F A T A L - E R R O R !
C h   1 :    S F : 2 D   /    H W : 0 0
C h   2 :    S F : 2 D   /    H W : 0 0
     I P       F l a g s      R e s e t
```

Figure 39 – Redundancy error operation – Display (error display)

With the key [F2] **Flags** can be displayed the individual error information.

The key [ok] can be used to change between the error display and measurement display

```
E r r o r !   -   C h   1
1 a :      1 9 1 . 0    t
1 b :       1 3 . 6    t
   S / D        C h   2       R e l
```

Figure 40 – Redundancy error operation – Display (measurement display)

Error status			
Comm. - Channel 1	Error	/ SF=2D	HW=00
Comm. - Channel 2	Error	/ SF=2D	HW=00
Relais status			
Relais	RelOut=00	RelIn=00	

Figure 41 – Redundancy error operation - Status

Error flags - Safe (SF)							
	Sens. a	Sens. b	Sum	Diff	KV-Set	KV-Err	KV-To	Rel
Channel 1	1	0	1	1	0	0	0	0
Channel 2	1	0	1	1	0	0	0	0

Figure 42 – Redundancy error operation – Error-Flags

This error with **SF = 2D / HW = 00** denotes a redundancy error about the signal / hoist **a**.

The discrepancy sensor 1a/2a is more than set tolerance of e.g. 10%.
Affected are each also sum 1a/1b / sum 2a/2b and difference 1a/1b / difference 2a/2b.

	Channel information	
Channel 1	Error	
Sensor 1a	191.0 t	191 %
Sensor 1b	13.6 t	68 %
Sum 1a/1b	204.6 t	170 %
Diff 1a/1b	177.4 t	148 %
Channel 2	Error	
Sensor 2a	165.2 t	165 %
Sensor 2b	13.7 t	68 %
Sum 2a/2b	178.9 t	149 %
Diff 2a/2b	151.5 t	126 %

Figure 43 – Redundancy errorr operation – measurement values

8.2.2. Redundancy error during the start

The measurement channels 1 and 2 (L1 / L2 / Ch1 / Ch2) remain in wait-mode.

```
W a i t !   -   C h   1
1 a :       1 1 . 1   t
1 b :       4 1 . 1   t
    E r r       C h   2       R e s e t
```

Figure 44 – Redundancy error Start – Display (Measurement display)

With the key **F1** **Err** can be displayed for the individual error information (refer to Chapter 7.1).

```
E r r o r - I n f o r m a t i o n
C h   1 :   S F : 0 6   /   H W : 0 0
C h   2 :   S F : 0 6   /   H W : 0 0
            F l a g s       R e s e t
```

Figure 45 – Redundancy error Start - Display (Error display)

	Error status		
Comm. - Channel 1	Error	/ SF=06	HW=00
Comm. - Channel 2	Error	/ SF=06	HW=00
	Relais status		
Relais	RelOut=00	RelIn=00	

Figure 46 – Redundancy errorr Start - Status

Error flags - Safe (SF)							
	Sens. a	Sens. b	Sum	Diff	KV-Set	KV-Err	KV-To	Rel
Channel 1	0	1	1	0	0	0	0	0
Channel 2	0	1	1	0	0	0	0	0

Figure 47 – Redundancy error opration - Error-Flags

This error with **SF = 06 / HW = 00** denotes a redundancy error about the signal / hoist **a**.

The discrepancy sensor 1b/2b is more than set tolerance of e.g. 10% (refer to Chapter 6.4).
Affected is the sum 1a/1b and sum 2a/2b.

Channel information		
Channel 1	Wait	
Sensor 1a	11.2 t	11 %
Sensor 1b	41.1 t	205 %
Sum 1a/1b	52.2 t	44 %
Diff 1a/1b	29.9 t	25 %
Channel 2	Wait	
Sensor 2a	2.9 t	3 %
Sensor 2b	36.9 t	184 %
Sum 2a/2b	39.7 t	33 %
Diff 2a/2b	34.0 t	28 %

Figure 48 – Redundancy error Start – measurement values

8.3.   Sensor errors

This type of error can be caused for example by wire breakage on +SI b (terminal 44).

The error is identified by **SF=xx / HW=08**.

The measurement channels 1 and 2 (L1/L2 /Ch1/Ch2) are in error mode.

```
F A T A L - E R R O R !
Ch  1:   SF : 0E  /   HW : 08
Ch  2:   SF : 0E  /   HW : 00
    IP    Flags      Reset
```

Figure 49 – Sensor error - Display (error display)

Actuating key [F2] **Flags** an key [F1] **V-Exc** makes it possible to display the individual error informations to supply errors.

```
HW-Flags  -  Ch 1
a:0      b:0
V-Exc:1
  V-Exc    Ch 2    Exit
```

Figure 50 – Sensor error - V-Exc Channel 1 (Ch1)

Whit keys [◀] or. [▶] can the flags to supply common / sensor errors (V-Exec Flags 1) and to individual sensor errors (V Exc flags 2) are displayed.

```
V-Exc-Flags 2
Sens 1a:0    Sens 1b:1
Sens 2a:0    Sens 2b:0
                Exit
```

Figure 51 – Flags Sensor error (V-Exc-Flags 2)

8.4.   Adjustment errors

This type of error is caused by the device not having been adjusted or following deletion of an adjustment or as a result of the adjustment for both signals / Hoists a and b not having been carried out or completed. The error is identified for example by **SF=xx / HW=03** in 2-channel mode.
The measurement channels 1 and 2 (L1/L2 / Ch1/Ch2) remain in wait-mode.

```
Wait!  -  Ch 1
1a:      20.4  t
1b:       1.5  t
  Err    Ch 2    Reset
```

Figure 52 – Adjustment error / Start – display (measured-value display)

By actuating key [F1] **Err** it is possible to display the error information (refer to Chapter. *7.1*)).

```
Error-Information
Ch 1:  SF:0F  /  HW:03
Ch 2:  SF:0F  /  HW:03
            Flags    Reset
```

Figure 53 Adjustment error / Display (error display)

By actuating key [F2] **Flags** it is possible to display the error information and

with the keys [◀] or. [▶] to changed between SF- and HW-error flags.

```
SF-Flags  -  Ch 1
a:1    b:1    S:1    D:1
KV_Set:0    KV_Err:0
            Ch 2    Exit
```

Figure 54 – Adjustment error – SF-error flags Channel 1 (Ch1)

```
HW - F l a g s   -   C h  1
a : 1    b : 1
V - E x c : 0
  V - E x c    C h  2    E x I t
```

Figure 55 – Adjustment error – error flags Channel 1 (Ch1)

With the key [F2] **Ch 2** can changed between the individual error information from channel 1 and channel 2.

```
S F - F l a g s   -   C h  2
a : 1    b : 1    S : 1    D : 1
K V _ S e t : 0    K V _ E r r : 0
            C h  1    E x i t
```

Figure 56 – Adjustment error – SF- error flags Channel 2 (Ch2)

```
HW - F l a g s   -   C h  2
a : 1    b : 1


            C h  1    E x I t
```

Figure 57 – Adjustment error – HW- error flags Channel 2 (Ch2)

Error status			
Comm. - Channel 1	Error	/ SF=0F	HW=03
Comm. - Channel 2	Error	/ SF=0F	HW=03
	Relais status		
Relais		RelOut=00	RelIn=00

Figure 58 - Adjustment error / Start – Status

After the adjustment function has been accessed to, the LCD will indicate whether adjustment is erroneous or free of errors.

```
A d j u s t m e n t
A d j u s t m e n t   n o t   O K !


            E x i t
```

Figure 59 – Adjustment erroneous

```
A d j u s t m e n t
A d j u s t m e n t   O K !


            E x i t
```

Figure 60 – Adjustment free of errors

8.5.   Communication errors / Logic units L1/L2

This type of error is caused by faults occurring in communication with the logic units L1/L2 (Ch1/Ch2).

The error is identified by an error message **SF=00 / HW=00**.

```
Start-ERROR!
Ch 1:  SF:00  /  HW:00
Ch 2:  SF:00  /  HW:00
                Reset
```

Figure 61 – Communication error – Display (Error display)

Figure 62 – Communication error – Status

If the error continues to occur after a "*Reset*", this points to a hardware defect on one or both of the logic units L1/L2.

9. Technical data

Sensor inputs		SLS 801.01 for DMS sensors	SLS 801.02 for 4 ... 20mA sensors
Input signal range (+Si/-Si) Impedance range Excitation voltage (+Ex/-Ex) Conversation rate ADU	Ω VDC Sps	-5,0mV/V ... +5,0mV/V Bridge resistance: 350 ... 1000 5.0 resp. 3.3 480	4mA ... 20mA Load resistance: 22 24 ± 10% 480
Supply voltage		LED display	
Operating voltage Maximum power consumption Terminal block, wire size (maximum)	VDC W mm²	18 ... 36 max. 15 Screw terminal up to 1.5	
Switching inputs IN 1 ... 16			
Opto coupler groups 4 x 4 Return lines per jumpers "IN___R" Terminal block, wire size (maximum)	mm²	"direct" or "+24VDC" or "0V" Screw terminal up to 1.0	
Switching outputs K1 ... 6 and Error 1...2		LED display	
Guided contacts Switching voltage / contact current Switching power Datarate Electrical lifetime Mechanical lifetime Terminal block, wire size (maximum)	1/ s cycles cycles mm²	DC1: 24V/2A DIN EN 60947-4-1 and 60947-5-1 60mW ... 50 W(VA) 80 100.000 > 10^6 Screw terminal up to 1.5	
Analog outputs			
2x current output / max. load resistance OR 2x voltage output signal / minimum load Datarate Terminal block, wire size (maximum)	mA / Ω V / kΩ 1/s mm²	4mA ... 20mA/ 350Ω 0V ... 10V/ 2kΩ 20 Screw terminal up to 1.0	
Digital interfaces			
Ethernet X1: RS 485 alternative RS 232 X2: CAN		RJ45 / parameterization 9-pole SUB-D 9-pole SUB-D	
Load spectrum recorder - LSR			
Input values Time basis Output values	h h	D: theoretical service usage S: starting value, consumed service usage 1/3600 indicated in display	
Display / keypad			
Display LED Keypad		4-line LED display, 16 characters per line 7 LED status displays Keypad: cross cursor, three function keys F1 ... F3	
Environmental conditions			
Operating temperature range Storage temperature range	**°C** **°C**	-20 ... +60, relative humidity <95% at 40°C -25 ... +70, relative humidity <95% at 40°C	
EMI resistance EMI transmission Vibration resistance Shock resistance		DIN EN 61000-6-2 DIN EN 55011-B DIN EN 60068-2-6 DIN EN 60068-2-27/-29	
Construction		Metal housing for DIN-Rail	
Weight Dimensions (W x H x D) Mounting Environmental protection EN 60529	kg mm	1 102 x 105 x 205 on mounting rail TS35 IP 40	

10. Project planning assistance

Button *Settings* (scalings)		**Final Value** (100% Load)	**Decimal places** (0 od. 1)	**Unit** (N, kN, kg, t)
Meas. scale set.	Signal a hoist unit a			
	Signal b hoist unit b			

Analog out set.		**Type** (4..20mA od. +/- 10V)	**Signal** (a, b, Σa+b, Δ |(a-b)|)
	Analogue output 1		
	Analogue output 2		

Button *Adjustment* (adjustment)		**Signal / hoist unit a** Sensor 1a Sensor 2a		**Signal / / hoist unit b** Sensor 1b Sensor 2b	
Sensor characteristics	Input sensitivity (mV/V oder mA)				
	Tolerance value (%)				
Load calibration	Zero load (no entry)				
	Test load				

Button *Limits* (switching points)		**Value** (%)	**Delay** (ms)	**K1**	**K2**	**K3**	**K4**	**K5**	**K6**
Signal a (referencing to 100% load capacity a)	Overload w. delay								
	Underload w. delay								
	Overload								
	Underload								
Signal b (referencing to 100% load capacity b)	Overload w. delay								
	Underload w. delay								
	Overload								
	Underload								
Σ(a+b) (Referencing to 100% cumulative load)	Overload w. delay								
	Overload								
Δ |(a-b)| (Referencing to 100% cumulative load)	Overload w. delay								
	Overload								

Button LSR (load spectrum recorders)		**Signal / hoist unit a**	**Signal / hoist unit b**
	Theoretical service usage D (h)		
	Starting value / actual service usage S (h)		

11. EC declaration of conformity

A.S.T. - Angewandte System Technik GmbH
Mess- und Regeltechnik

AST|Gruppe
Angewandte System Technik

EG-Konformitätserklärung
EC Declaration of Conformity

No. 20/16

Hersteller: Manufacturer:	A.S.T. - Angewandte System Technik GmbH Mess- und Regeltechnik
Anschrift: Adress:	Marschnerstraße 26, 01307 Dresden Bundesrepublik Deutschland
Produkt- bezeichnung: Product description:	Sicherheitslastschalter SLS 801 Safety Load Monitor SLS 801

Das bezeichnete Produkt stimmt in der von uns in Verkehr gebrachten Ausführung mit den Vorschriften folgender Europäischer Richtlinien überein:
The product described above in the form as delivered is in conformity with the provisions of the following European Directives:

2014/30/EU Richtlinie des Rates zur Angleichung der Rechtsvorschriften der Mitgliedsstaaten über die elektromagnetische Verträglichkeit.
Council Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility.

Die Konformität mit der Richtlinie 2004/108/EG wird nachgewiesen durch die Einhaltung folgender harmonisierter Normen:
Conformity to the Directive 2004/108/EC is assured through the application of the following harmonised standards:

Störfestigkeit: Interference resistance:	DIN EN 61000-6-2:2006-03
Störaussendung: Emitted interference: :	DIN EN 61000-6-3:2011-09 EN 55011:2011-04

Dresden, den 08.09.2016

i. A. Heinrich

gez. Dr.-Ing. Gerd Heinrich
Qualitätssicherung / Quality assurance