

## Product description

### Security System for **SPI redPower 500W to 1kW OEM** laser

Drawings: SPI 500-1000W K1 ( SPISCU11 / SPICTL11 / SPIBABK1 )  
SPI\_1KW BREAKOUT BOARD ( SPIBABK1 V3 )

System allows easy construction of OEM lasers under consideration of necessary security aspects for emergency off ( F-Stop ) and interlock (s).

SPISCU11 is 2-channel system with high security level as certified by DEKRA EXAM..

Security relay A and B as installed in the laser is monitored via feedback contacts.

Malfunction of relay causes power cutoff on diode banks.

**SPISCU11/SPICTL11:** DIN rail module: EN 50022 100 \* 110 \* 45mm

#### **Module SPISCU11:**

A: Monitoring of F-STOP, interlock and security relay A and B for contact faults or shorts.

B: Dual interlock circuit galvanically separated by optocouplers.

C: Dual emergency off circuit ( F-Stop ) galvanically separated by optocouplers.

D: F-STOP rearm key ( required to cancel F-STOP operation ).

E. Monitoring output of FAULT condition: 24V = no fault; 0V = fault.

F: Interlock status: door closed = 24V; door open = 0V.

G: General enable input: 0V or open = disable / 24V = enable system.

H: SPISCU11 status indications by LED's

I: Cabling by cage clamp connectors ( max.2.5mm<sup>2</sup> ).

K: External supply required: 24V min.2A ( SPISCU11 / SPICTL11 and 2 external safety relays located in the laser to cut power to the diode banks ).

L: All interface to SPS/PLC 24V shortproof

#### **Module SPICTL11:**

A: Simplified startup sequence of laser by only two SPS signals

B: Control signals to laser 5V TTL/CMOS

C: Error handling by SPS 24V

D: Manual Reflex Reset by push button. ( 7 reset pulses@100ms )

E: Automatic generation of required 7 reflex reset pulses if interlock ( door ) closes.

SPICTL11 generates all required 5V signals to start and stop operation of K1 and creates by a processor 7 times a 100ms reflex reset pulse to clear faults in the K1. All PLC input/output signals are 24V levels. Four 5V fault status signals generated by K1 are converted to 24 V level for the PLC.

#### **Laser Start sequence by PLC ( MODE 1 jumper ON ) [ upper jumper ]**

1. SPI START to 24V by PLC (ST3 Pin6 -- DB25 Pin6 )

2. SPI GO to PLC ( ST3 Pin18 -- DB25 Pin18 ). A 24V level signals laser is operational.

All required 5V signals to and from K1 are automatically generated!

( /enable, enable, ready, on request, on report ). Signal delay from above 1. to 2. is about 100ns. SPISCU11 FAULT and/or INTERLOCK (door open) a laser start is not possible.

**Laser Start sequence by PLC ( MODE 1 jumper OFF )**

1. SPI START to High (24V by PLC) ( ST3 Pin6 -- DB25 Pin6 )  
SPI START LED ON  
SPI /Enable and SPI enable led on if no fault
2. SPI READY High ( 24V to PLC ( ST3 Pin 21 --DB25 Pin 21 )  
SPI READY LED ON ( K1 no fault )
3. SPI ON REQUEST ( 24V by PLC ) ( ST3 Pin 20 -- DB25 Pin 20 )  
SPI ON REQUEST LED ON if interlock ( door ) closed.
4. SPI GO ( 24V to PLC ) ( ST3 Pin 18 -- DB25 Pin 18 )  
Laser now operational.

**REFLEX RESET:**

Two relays in the K1 to power diode banks are controlled by SPISCU11. Fault conditions in the laser, F-STOP ( emergency off ) or INTERLOCK ( door ) open both relays and cause a fault condition in the K1. To reset this fault condition, seven 100ms Reflex Reset pulses at 5V level must be sent to the K1. This pulse string can be sent several times.

**REFLEX RESET ( Mode 2 Jumper ON ) [ lower jumper ]**

Reflex reset pulse string is automatically generated if interlock ( door ) is closed. In addition this string can be initiated manually by PLC ( 24V ST2 Pin8 ) or by a reset button on ST2 Pin8.

**IMPORTANT NOTE:** Automatic release of reflex string by closing interlock ( door ) functions only if SPI START signal ( DB25 Pin 6 ) is low!!!!

**REFLEX RESET ( Mode 2 Jumper OFF )**

Automatic release of reflex string is inhibited. Only manual operation by PLC or reset button ( ST2 Pin 8 )

**Breakoutboard SPIBABK1: Din rail module ( EN50022 ) 125 \* 165 mm  
( Drawing SPIBABK1 V3 )**

Passive breakoutboard SPIBABK1 is designed to simplify implementation of SPI K1 laser systems. DIN rail unit is mounted adjacent to a SPISCU11/SPICTL11 module. Twelve 4PIN cage clamp connectors are plugged in the respective receptacles of the SPISCU11/SPICTL11 unit. Security module can be mounted to the left or to the right of the BAB.

**SPIBABK1 V2:**

A green led is used to indicate 24V on and fuse (2A) ok.

**SPIBABK1 V3:**

Led red Analog (AN) 0-10V ( intensity depends on analog voltage )

Led red Bias (BI) 0-10V ( intensity depends on analog voltage )

Led yellow (MO) Modulate 5V level to K1

Led green (ST) on (5V) SPI START to K1

LED green (5V) 5V/24V on and Fuse ok.

**Description of BAB connectors:**

**ST1: Cage clamp 6 Pin:**

Connection of F-STOP and general enable. General enable 24V can be supplied by PLC and/or a key switch.

**ST2: Cage clamp 8 Pin:**

Connection of interlock (door) and restart and reflex reset push button ( one button with two NO contacts.

**ST9: 24V output signals for status leds.**

**OPTION: ST5, ST7 cageclamp connector 2 Pin:**

Power down of main supply by additional relay and additional F-STOP contact. This option is normally not required.

**ST3: 26 Pin Header:**

Ribbon cable for a DSUB 25 Pin connector.

**ST6: Cage clamp 2 Pin:**

Connection of 24V auxiliary supply app. 2A

**ST8: 16 Pin Header:**

Ribbon cable for SUB-D 15 Pin female. Control of security relays in the K1.

**ST4: Cage clamp 3 Pin:**

Cold Plate A and B analog output. Control of K1 cooling. Output 100mV/ gradC

**LP1: 62 Pin HD SUB connector ( female ):**

Control signals to laser K1.