


SI-JET Series

▶ SI-JET2-CON2 SI-JET2-D20

By way of the three red light beams, the SI-JET Spray Jet Monitoring System monitors the density and the symmetry around the opening angle of the spray jet. With the comprehensive SI-JET-Scope software the system can be parameterised under Windows®.

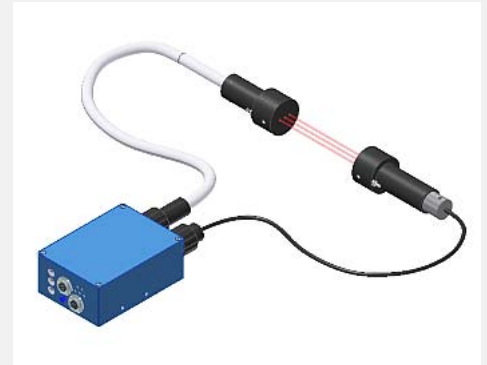
- Telecentric design enables a big transmitter/receiver distance
- Averaging (over 32000 values)
- RS232 interface (USB or Ethernet adapter is available)
- Windows® user interface
- Teachable by means of integrated teach button, PLC, or PC
- Insensitive to outside light due to clocked red light LED (100 kHz)
- Insensitive to dirt accumulation due to pressed air facility (at transmitter and receiver side)
- High dynamic range (due to light power adjustment of LED via RS232)
- High resolution (12-bit-A/D-converter)
- Fiber optics sensor suitable for use in the  range (EX-RL, zone 0)

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Design

Product name:

SI-JET2-CON2

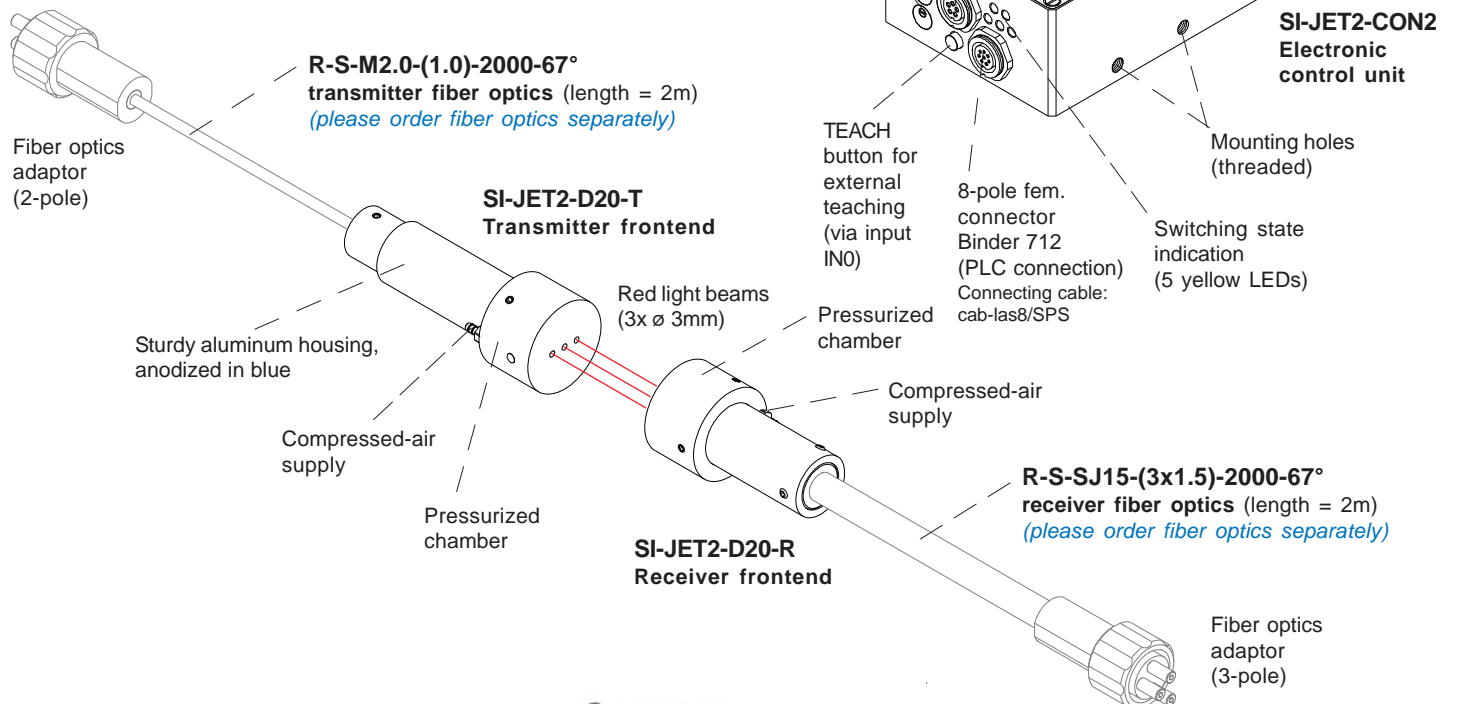
(electronic control unit, incl. Windows® PC software SI-JET-Scope)

SI-JET2-D20-T (transmitter frontend)

SI-JET2-D20-R (receiver frontend)

R-S-M2.0-(1.0)-2000-67° (transmitter fiber optics)

R-S-SJ15-(3x1.5)-2000-67° (receiver fiber optics)





Technical Data

Model	SI-JET2-CON2 (electronic control unit)
Voltage supply	+24VDC (± 10%), reversed-polarity protected, overload protected
Current consumption	typ. 200 mA
Operating temperature	-10°C ... 50°C
Enclosure rating	IP64
Housing material	Aluminum, anodized in blue (fiber optics adaptor: aluminum, anodized in black)
Housing dimensions	approx. 90 mm x 65 mm x 35 mm (without flange connectors or fiber optics adaptors)
Type of connector	Connection to PC: 5-pole fem. connector Binder 712, connection to PLC: 8-pole female connector Binder 712 Connection to fiber optic frontends: 2-pole adaptor at transmitter side, 3-pole adaptor at receiver side
Transmitter	Super bright LED (red, 650 nm), modulated 100 kHz
External teaching	by means of an integrated push-button or via input IN0
Switching state indication	by means of 5 yellow LEDs
Interface	RS232, parameterizable under Windows®
Averaging	adjustable under Windows: max. 32768 values
Outputs	OUT0 ... OUT4, digital (0V/+U _B), short-circuit-proof, 100 mA max. switching current; npn- or pnp-capable (bright- and dark-switching can be adjusted)
External teach input IN0	+U _B -Signal (min. pulse length 250 ms, max. pulse length 1000 ms)
Pulse lengthening	adjustable under Windows®: 0 ms .. 100 ms
Spray values memory capacity	non-volatile EEPROM with parameter sets for max. 31 spray values
EMV test acc. to	DIN EN 60947-5-2

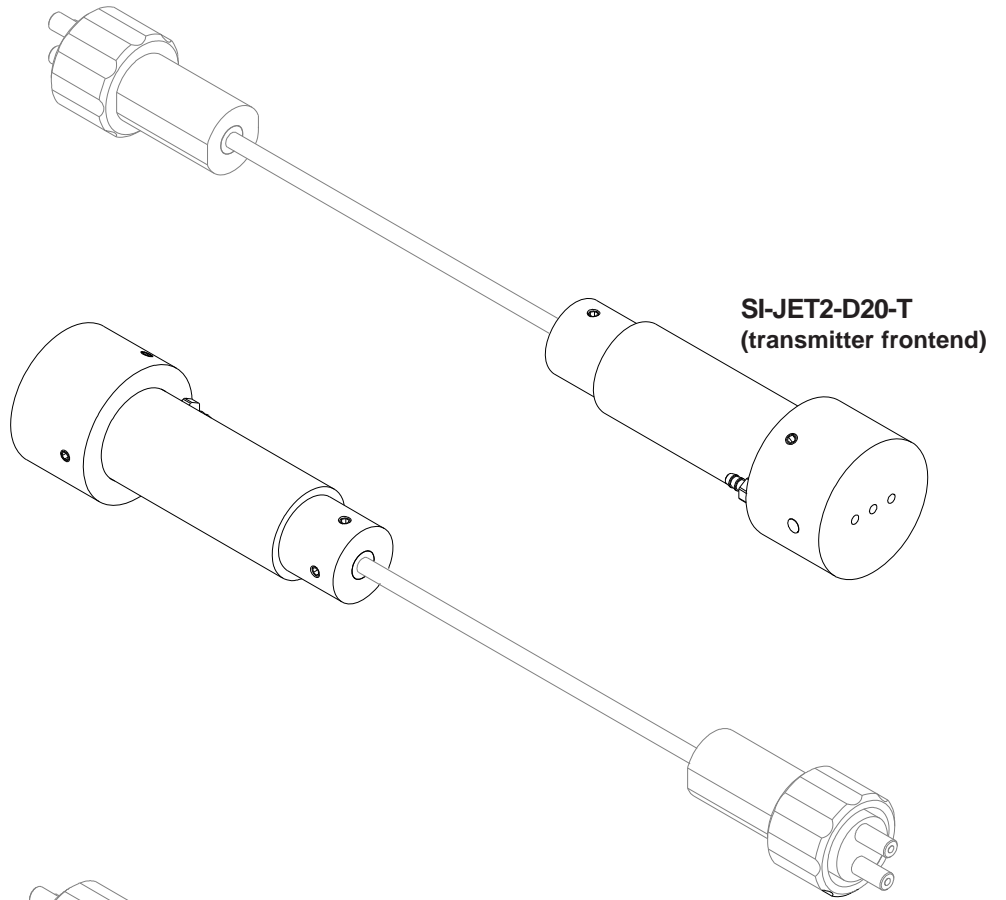
Model	SI-JET2-D20-T (transmitter frontend) + SI-JET2-D20-R (receiver frontend)
Working distance transm./receiver	typ. 30 mm ... 400 mm
Red light beam alignment	Telecentrical, typ. 3 x Ø 3 mm, distance between fiber bundles: 5 mm
Optical filter	Red light filter RG630
Beam divergency	typ. 10 mrad
Enclosure rating	IP 67
Working temperature range	-10°C ... +50°C
Storage temperature range	-20°C ... +85°C
Housing material	Attachment optics for transmitter and receiver optics: aluminum, anodized in black
Housing dimensions	Attachment optics for transmitter fiber optics: approx. 82 mm x Ø 30 mm Attachment optics for receiver fiber optics: approx. 57 mm x Ø 30 mm
Transmitter fiber optics (please order separately)	R-S-M2.0-(1.0)-2000-67°: 2 fiber optics connectors, silicone meta sheath, length approx. 2000 mm
Receiver fiber optics (please order separately)	R-S-SJ15-(3x1.5)-2000-67°: 3 fiber optics connectors, silicone meta sheath, length approx. 2000 mm
Pressed air connector	at transmitter and receiver side



Sensor Frontends

SI-JET2-D20-T
Transmitter frontend

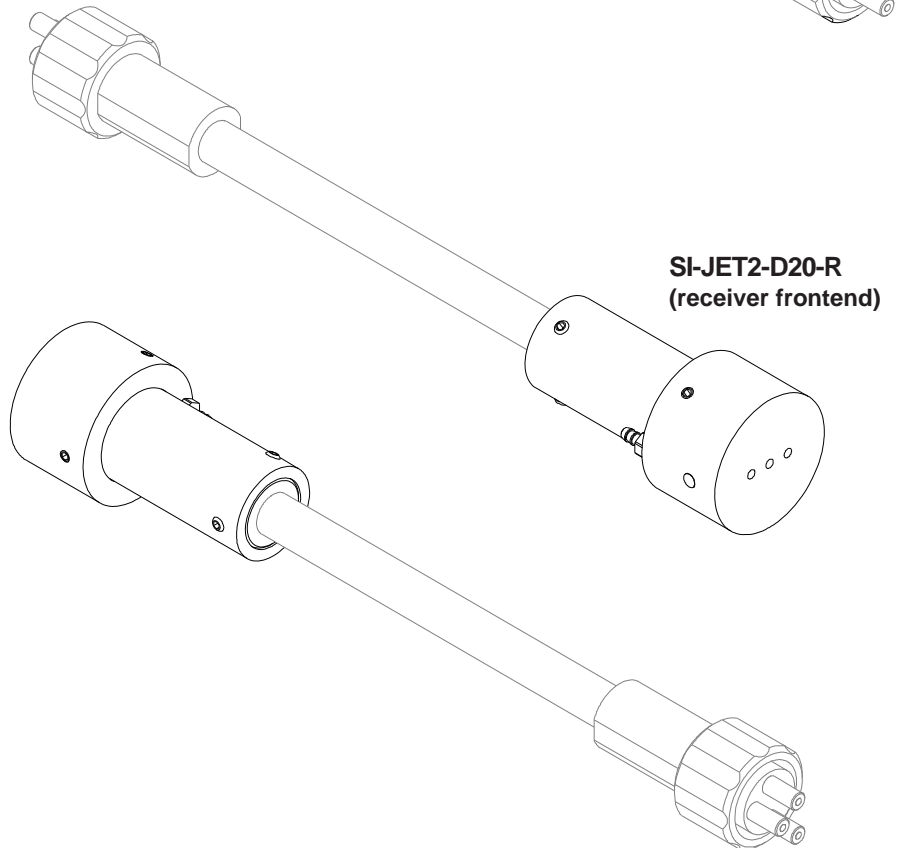
Picture shows also
transmitter fiber optics
R-S-M2.0-(1.0)-2000-67° (l=2m)
(please order fiber optics separately)



SI-JET2-D20-T
(transmitter frontend)

SI-JET2-D20-R
Receiver frontend

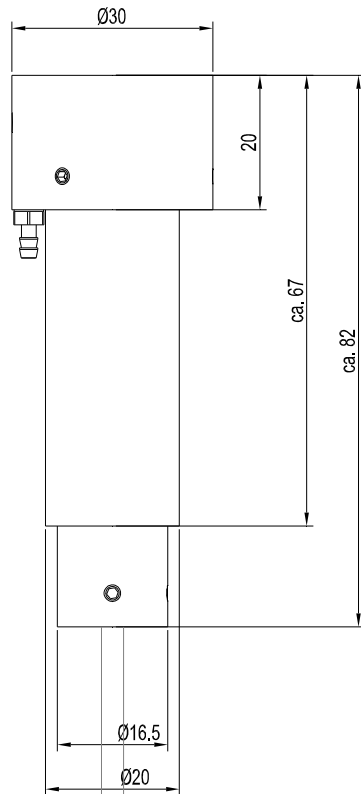
Picture shows also
receiver fiber optics
R-S-SJ15-(3x1.5)-2000-67° (l=2m)
(please order fiber optics separately)



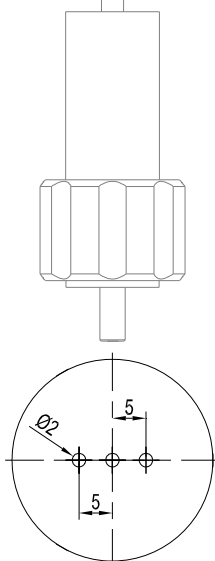
SI-JET2-D20-R
(receiver frontend)

Dimensions

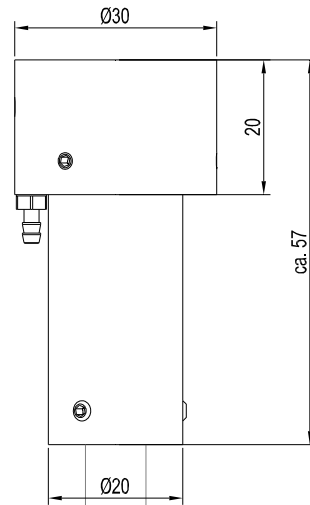
Transmitter frontend
SI-JET2-D20-T



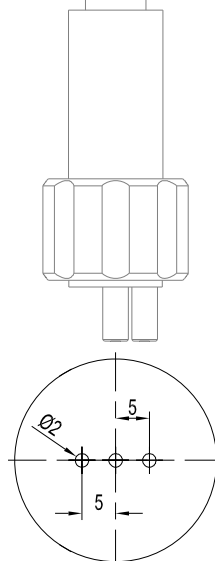
Transmitter fiber optics
R-S-M2.0-(1.0)-2000-67° (l=2m)
(please order fiber optics separately)



Receiver frontend
SI-JET2-D20-R



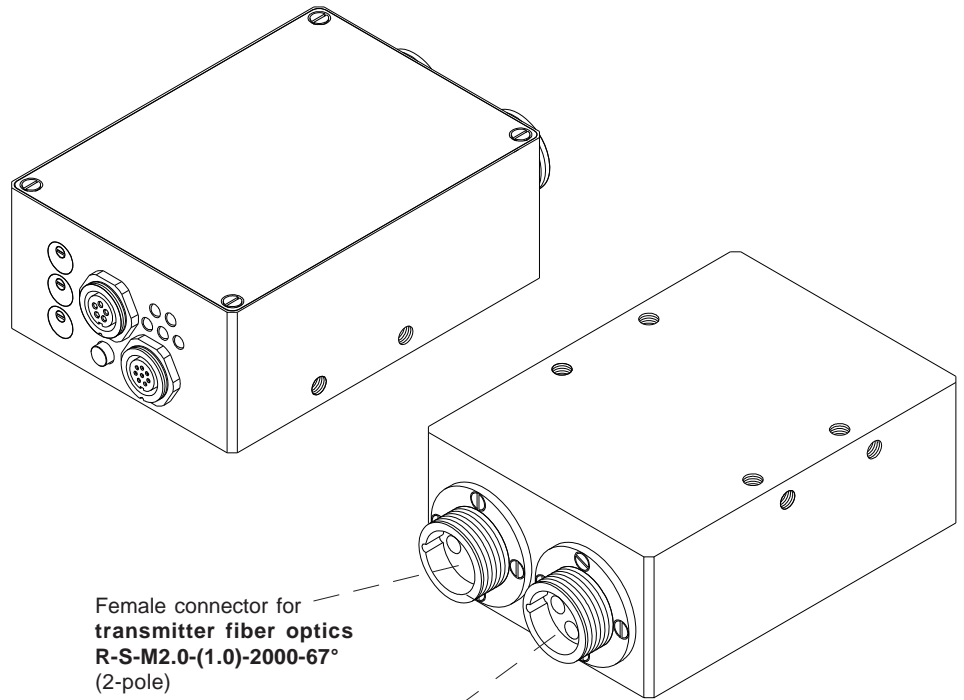
Receiver fiber optics
R-S-SJ15-(3x1.5)-2000-67° (l=2m)
(please order fiber optics separately)



All dimensions in mm

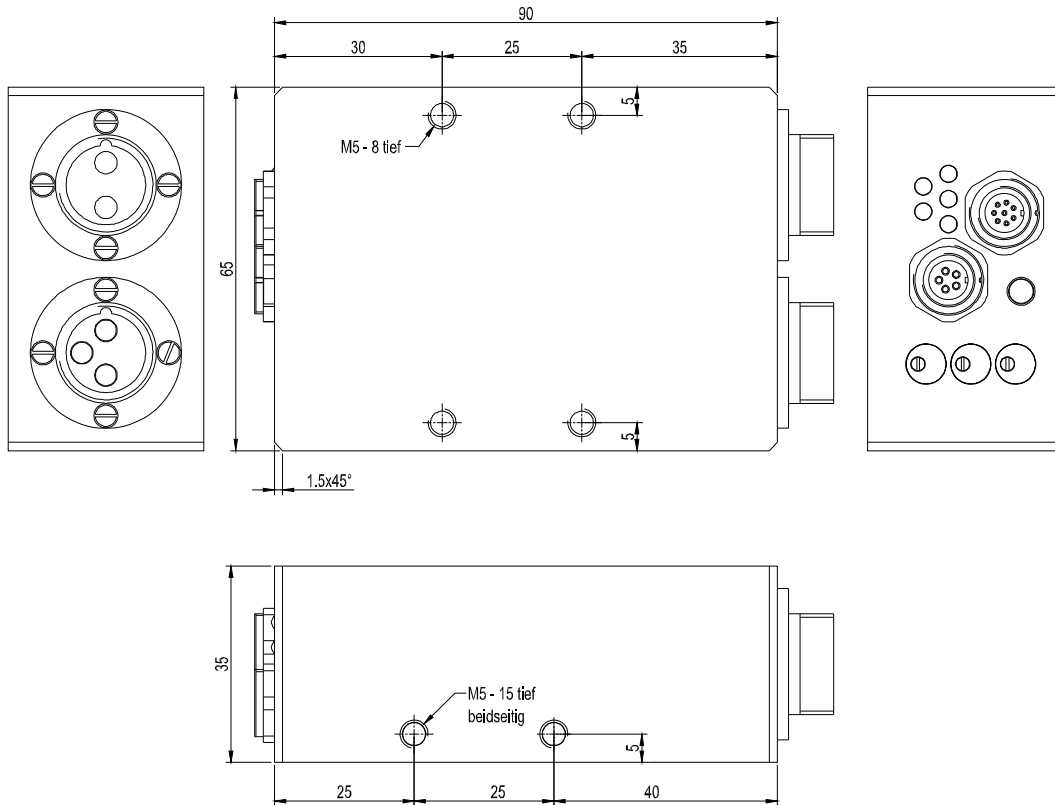
Dimensions

Electronic control unit
SI-JET2-CON2



Female connector for
transmitter fiber optics
R-S-M2.0-(1.0)-2000-67°
(2-pole)

Female connector for
receiver fiber optics
R-S-SJ15-(3x1.5)-2000-67°
(3-pole)



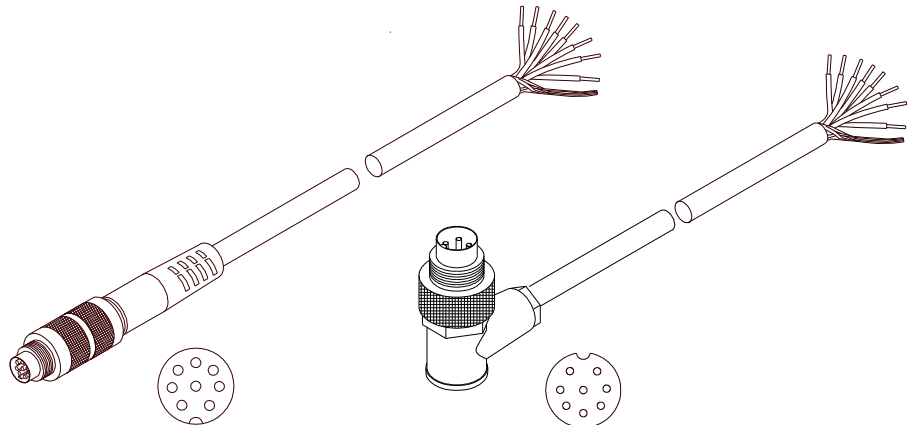
All dimensions in mm



Connector Assignment
**Connection SI-JET2-CON2 to PLC:
8-pole fem. connector Binder Series 712**

Pin:	Color:	Assignment:
1	white	GND (0V)
2	brown	+24VDC ($\pm 10\%$)
3	green	INO
4	yellow	OUT0
5	grey	OUT1
6	pink	OUT2
7	blue	OUT3
8	red	OUT4

Connecting cable:
cab-las8/SPS-(length)
cab-las8/SPS-w-(length) (angle type, 90°)
(standard length 2m)



cab-las8/SPS-...
(max. length 25m, outer jacket: PUR)

cab-las8/SPS-w-...
(max. length 25m, outer jacket: PUR)

**Connection SI-JET2-CON2 to PC:
5-pole fem. connector Binder Series 712**

Pin:	Assignment:
1	GND (0V)
2	TxD
3	RxD
4	+24V (+Ub, OUT)
5	not connected

Connection via RS232 interface at the PC:

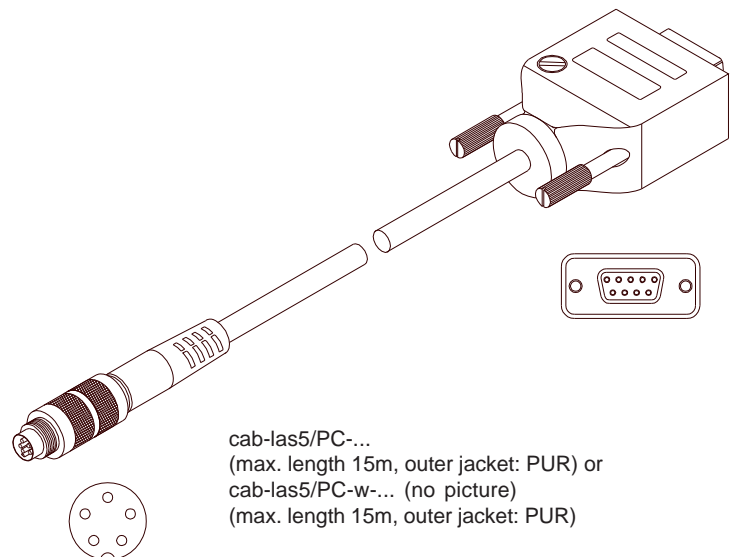
Connecting cable:
cab-las5/PC-(length)
cab-las5/PC-w-(length) (angle type 90°)
(standard length 2m)

alternative:
Connection via USB interface at the PC:

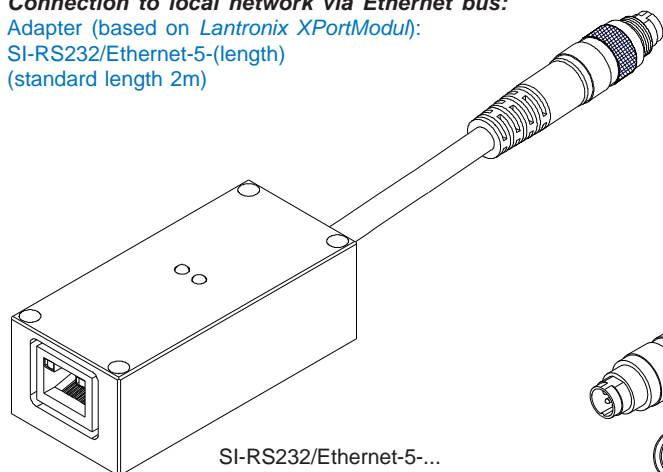
Connecting cable (incl. driver software):
cab-las5/USB-(length)
cab-las5/USB-w-(length) (angle type 90°)
(standard length 2m)

alternative:
Connection to local network via Ethernet bus:

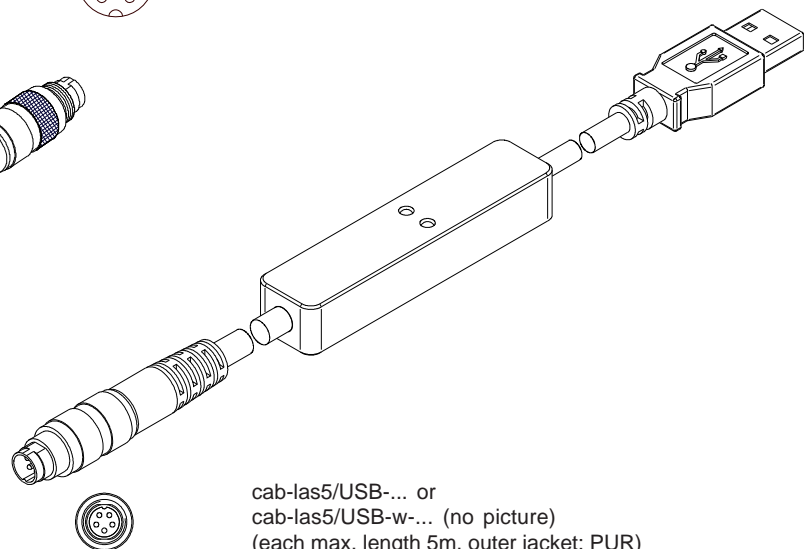
Adapter (based on Lantronix XPortModul):
SI-RS232/Ethernet-5-(length)
(standard length 2m)



cab-las5/PC-...
(max. length 15m, outer jacket: PUR) or
cab-las5/PC-w-... (no picture)
(max. length 15m, outer jacket: PUR)



SI-RS232/Ethernet-5-...
(length 0,5m, 1m, or 2m,
outer jacket: PUR)



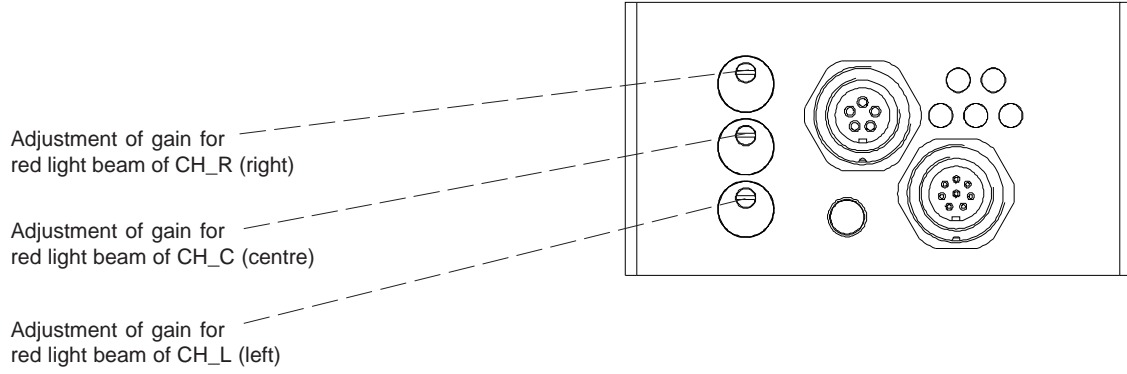
cab-las5/USB-... or
cab-las5/USB-w-... (no picture)
(each max. length 5m, outer jacket: PUR)



Settings

Potentiometer for adjustment of gain:

Rotation clockwise: Increase of signal





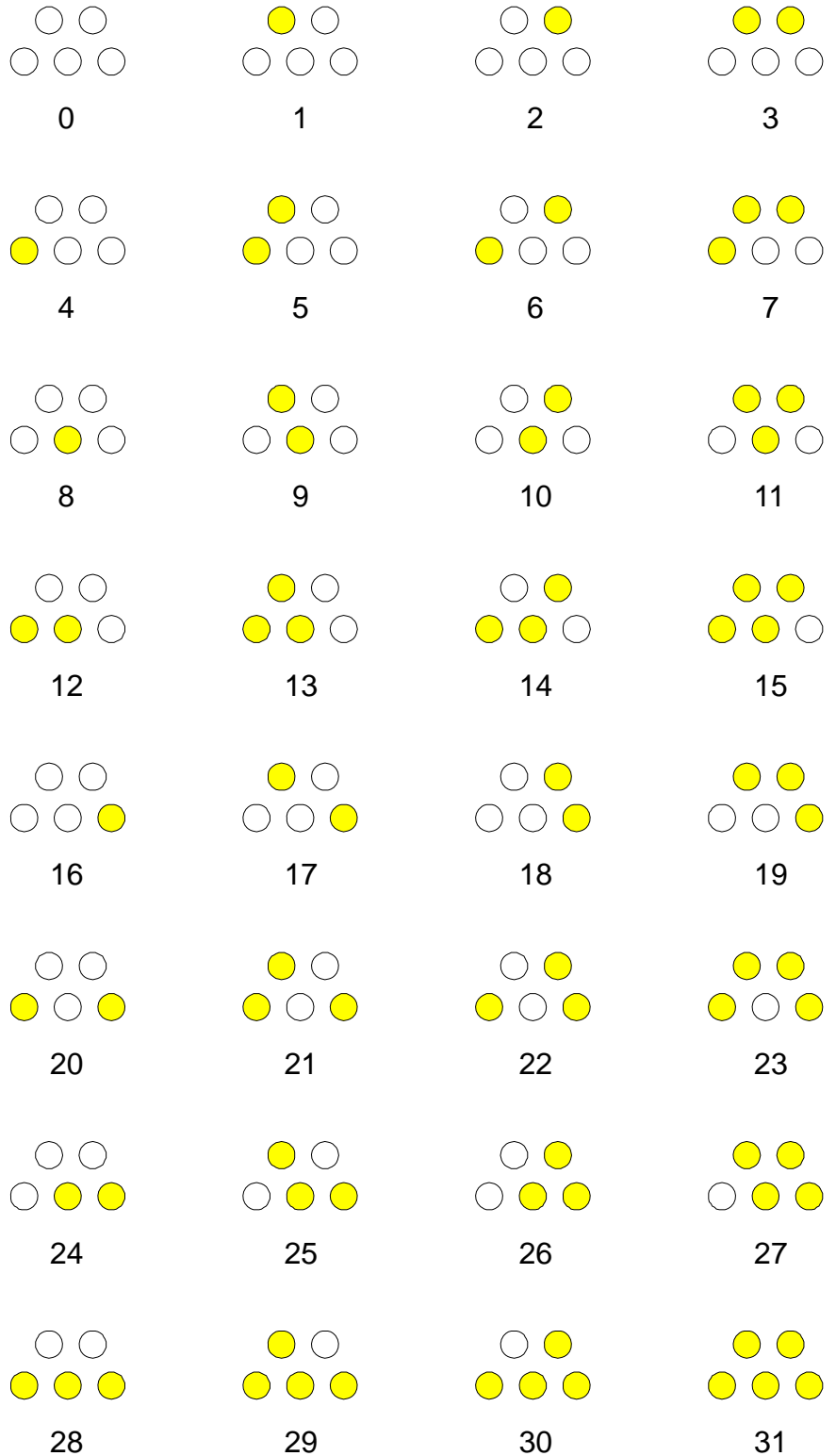
LED Display

LED display:

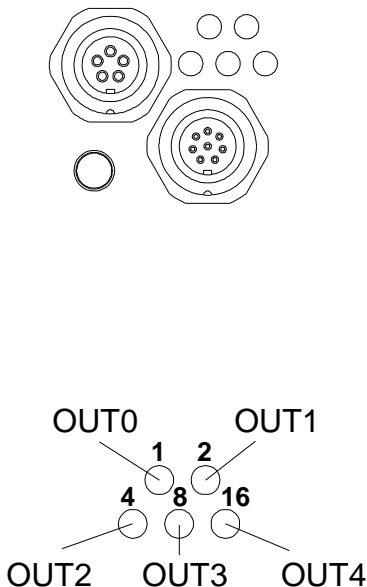
The line vector is visualised by way of 5 yellow LEDs at the housing of the SI-JET sensor. At the same time in the BINARY mode (OUTMODE BINARY) the line vector indicated on the LED display is output as 5-bit binary information at the digital outputs OUT0 to OUT4 of the 8-pole SI-JET/PLC female connector.



The SI-JET sensor is able to process a maximum of 31 line vectors (0 ... 30) in accordance with the corresponding lines in the TEACH TABLE. An "error" or a "not detected" is displayed by the lighting of all LED (OUT0 ... OUT4) digital outputs are set to HIGH-level).

In the DIRECT mode (OUTMODE DIRECT HI or OUTMODE DIRECT LO) the maximum numbers of line vectors to be taught is 5 (no. 0, 1, 2, 3,4).



„Error“
or
„not detected“





Measuring Principle
Measuring principle:

With the help of a super-bright red-light LED modulated light is aligned in parallel in the collimator optic unit. A suitable aperture technology ensures that three beams of red light (\varnothing 3 mm each, 5 mm distance to each other) leave the transmitting branch of the transmitter, and at the receiving side are again directed onto three receiving optical-fibers by mean of 3 apertures with suitable receiving optics.

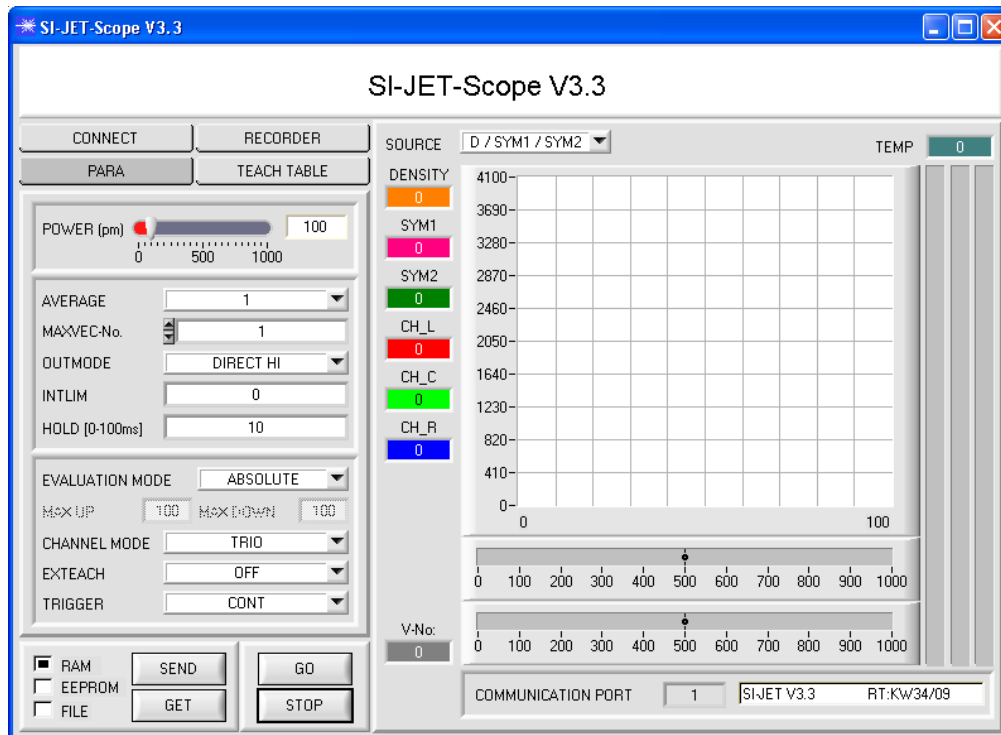
By means of the optoelectronic detectors, the three light signals are converted into three electronic signals and are digitised by way of 12-bit-A/D-converters. When a spray jet now crosses the path of the three red light beams, the respective light beams are attenuated due to light absorption and/or light deflection at the droplets contained in the spray jet. The degree of attenuation of the respective signal is a measure for the droplet contraction at the place of the light beam.



Parameterization
Parameterization under Windows® with software SI-JET-Scope:

The following three measurands are picked up and monitored in the production process by the SI-JET spray jet monitoring system:

- Spray jet density (average of the 3 red light parts CH_L, CH_C, CH_R)
- Symmetry 1 (the two outer channels are put into proportion to each other)
- Symmetry 2 (Symmetry 1 is put into proportion to the centre channel)

**Evaluation modes:**

The SI-JET can be operated with two different evaluation modes.

ABSOLUTE: The absolute status of the three channels CH_L, CH_C, and CH_R is used for evaluation.

RELATIVE: The current status of the three channels CH_L, CH_C, and CH_R relative to their maximum values in the last 60 seconds is used for evaluation.

TEACH process:

The teach process can be performed either with the parameterisation software, by way of the teach input (IN0 PIN3 green at the cab-las8/SPS cable), or by means of the switch at the housing. When teaching is performed through the IN0 input, the tolerance values for density and symmetry must first be stored once in the EEPROM of the control unit with the help of the parameterisation software. Before input IN0 is activated, the status to be taught must be present at the sensor front-end, i.e. spraying must first be switched on, and then IN0 must be set to +24V.

The current status is taught to as many rows in the Teach Table as have been selected under MAXVEC-No. Classification is performed by way of different set tolerances.



Data Recorder

Function of the data recorder:

The SI-JET-Scope software features a data recorder that makes it possible to save a certain number of data frames. The recorded file is saved to the hard disk of the PC and can then be evaluated with a spreadsheet program.

The created file has eight columns and as many rows as data frames were recorded. A row is structured as follows: Date and time, CH_L, CH_C, CH_R, DENSITY, SYM1, SYM2, TEMP.

