Manual

OPSS-1 system

Optical Porosity Scanning System

Patent pending - DE 102.51.610.3

Patent applicated as well in China

Projected – Commissioned by

IPM - International Perforation Management
German-China-Thai high-tech engineering

Manufactured by

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Content

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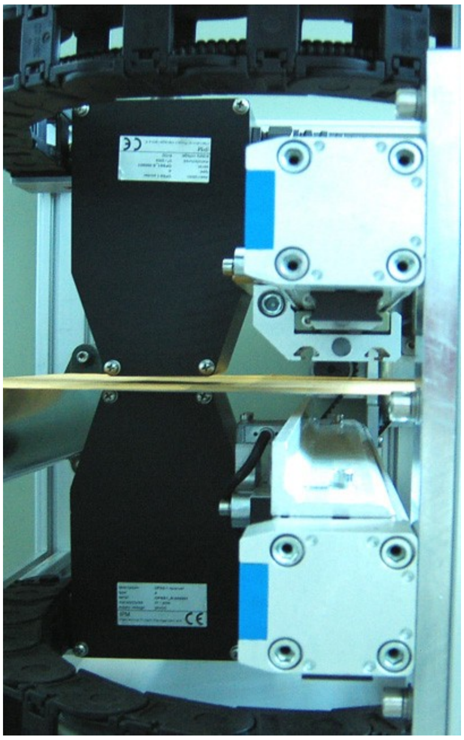
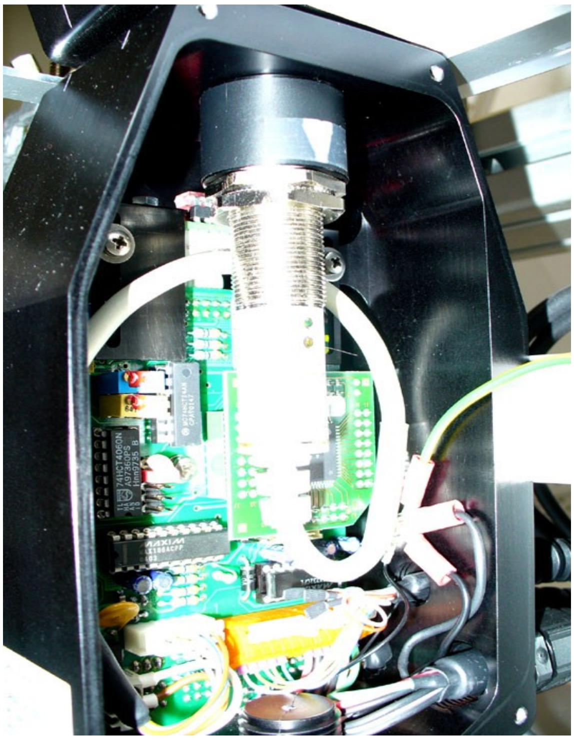




1 Introduction of optical online porosity control

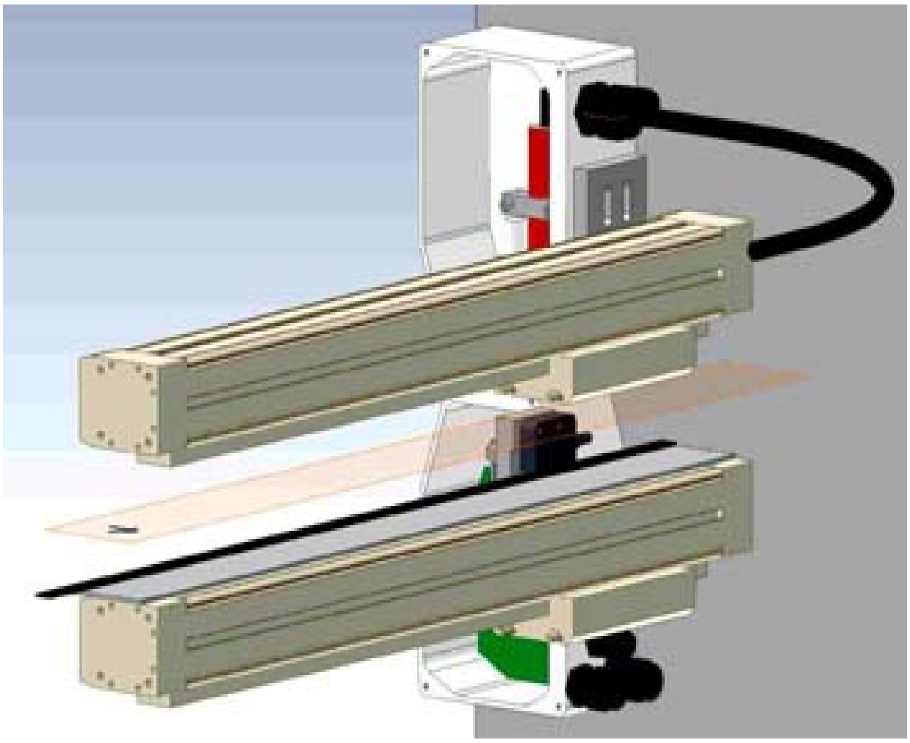
Optical online porosity control base on light transmission through the running perforated cigarette, tipping or plug-wrap paper web. A special light transmitter on one paper side and on their multiple detection system on the opposite of the web detects the position of perforation zones or rows and their porosities into the measuring gap of 3.0 up to 6.0 mm simultaneous.

The scanning of both sensor units across the running web allows the fully web width detection from 300 up 2000 mm by web speeds up to 600 m/min.

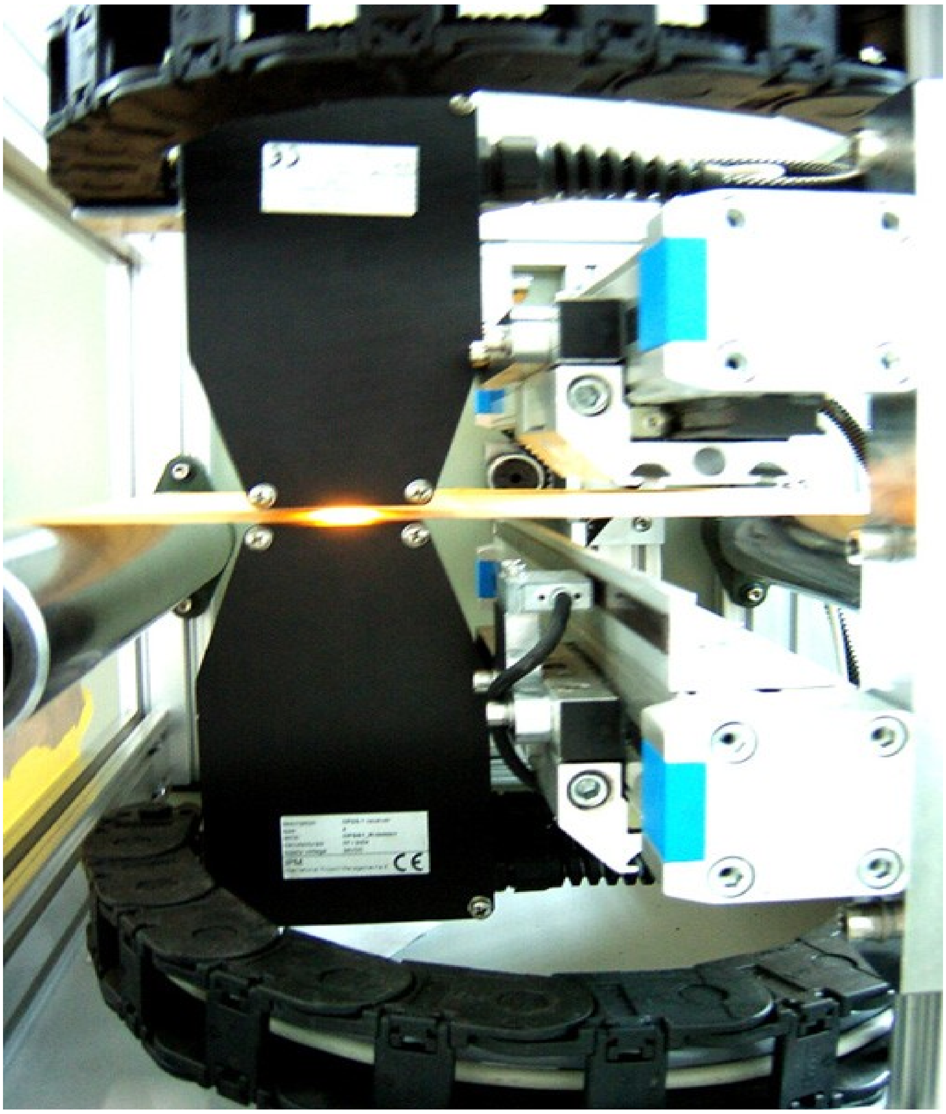
The OPSS-1 sensor system consist of a dual transmitter device which using a precise line laser and a monochromatic light source what's supplied by a flexible light fibre from a separate, remote controlled Halogen lamp device. The detector device works with a 64 pixel line sensor of real time perforation position monitoring and simultaneously a multi colour sensor system detect the optical envelope curves as a function of pneumatic porosity by three different wave lengths including the light intensity level. A intelligent micro controller control all input/output signals including their pre-calculation. A precise magnet resistive sensor detects in real time each position of the scanning system across the web width from 300 up to 2000 mm.

All necessary commands and the measuring data stream are exchange able via a fast serial link to the Master PC which process software handles all further data calculation as well visualisation for fully porosity/position controlling at electrostatic or laser perforation machines.
More details and information are described in chapter 10 - 12.

1.1 Working principle of the OPSS-1 scanner system



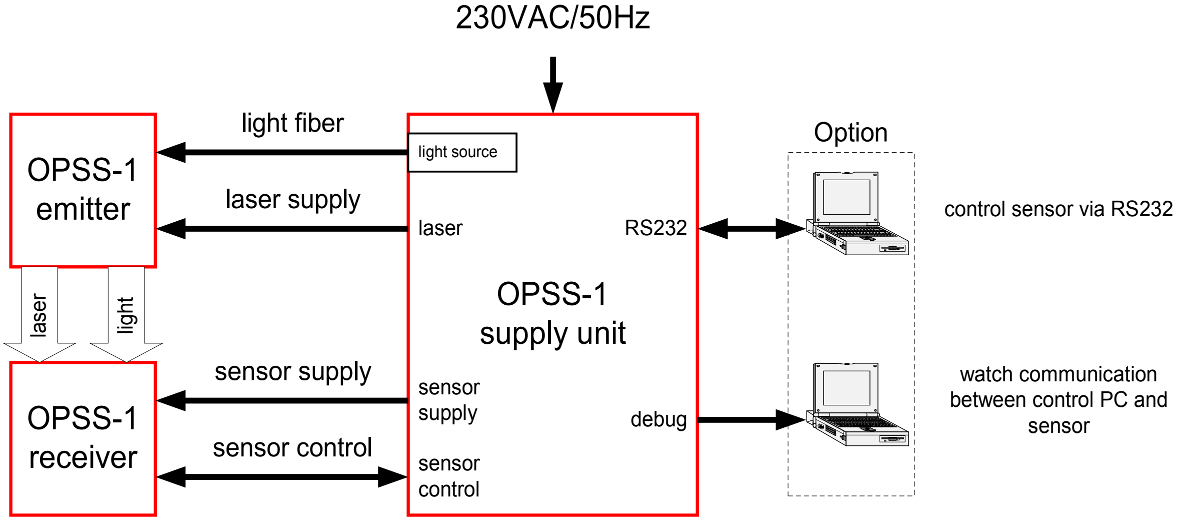
1.2 OPSS-1 scanner system on running tipping paper web



2 OPSS-1 sensor system parts

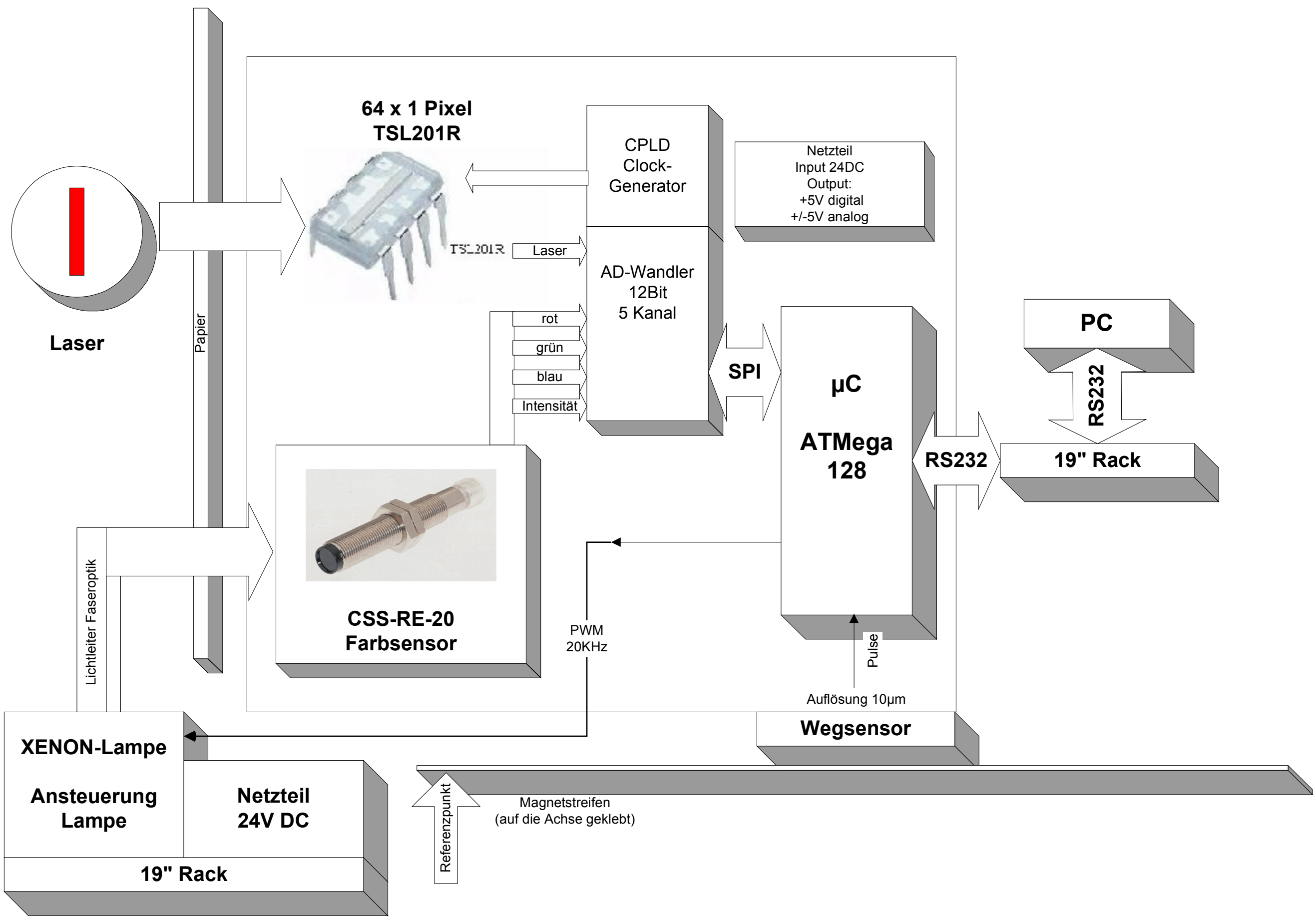
- 1x OPSS-1 supply unit (19”-Rack)
- 1x OPSS-1 emitter with integrated cable
- 1x OPSS-1 receiver with integrated cables
- 1x 230VAC cable
- 1x serial Sub-D cable, 9 pole male – 9pole female
- 1x documentation (paper & CD-Rom)

3 Overview of the OPSS-1 sensor system

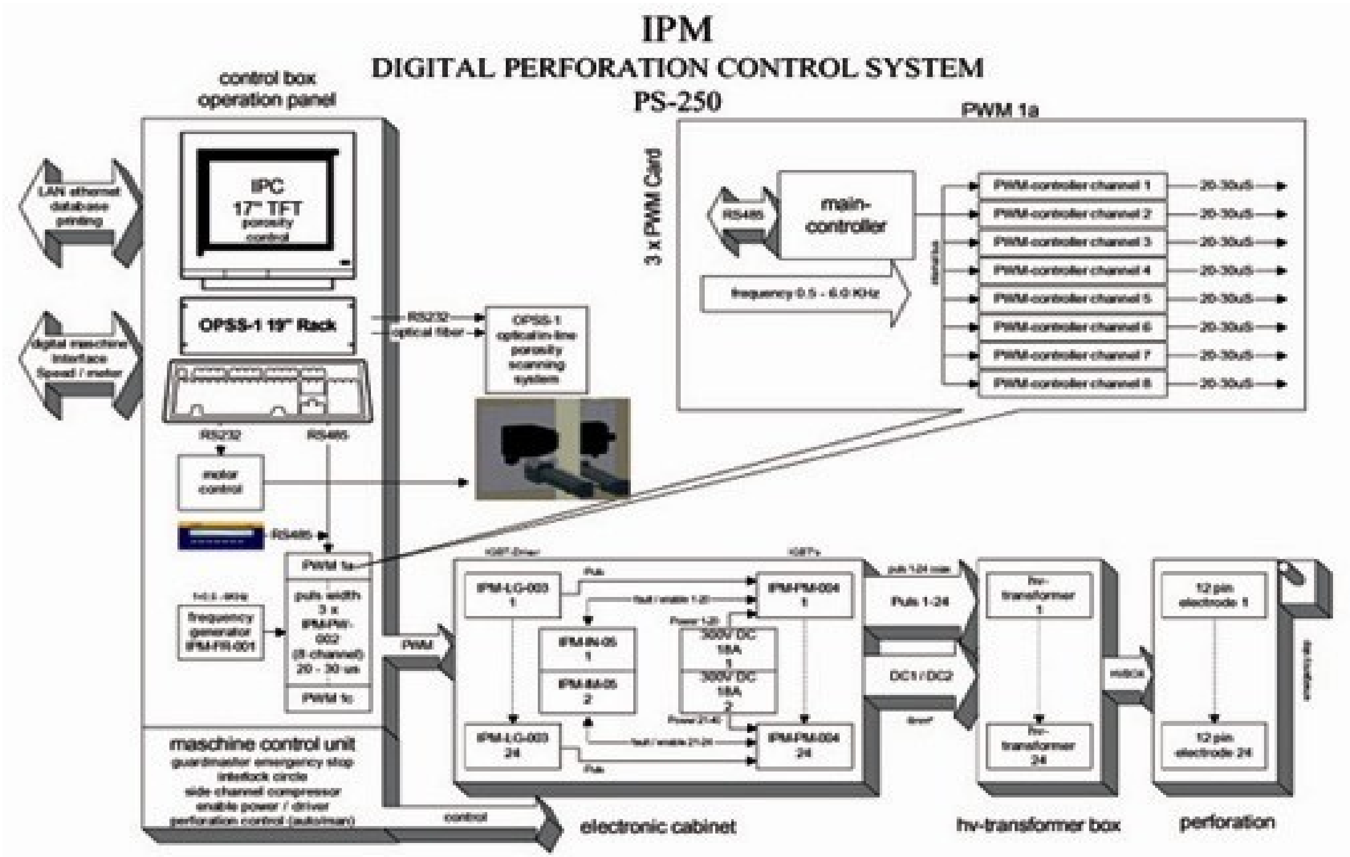


The main components are drawn in red.

3.1 Block configuration of sensor electronics



3.2 19" rack and its connections



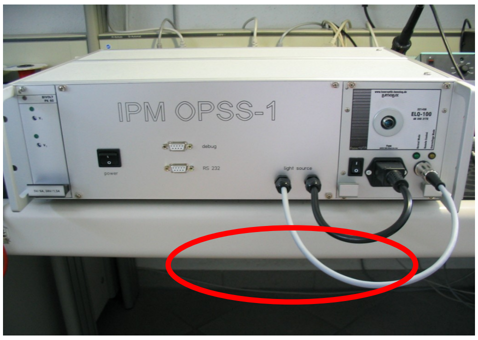
4 Required wiring and interfacing

ATTENTION :
Before you connect or disconnect any cables from the OPSS-1 be sure you have disconnected the line cord (230VAC) from the OPSS-1 supply unit!

1. Connect the cable with label “laser” to back connector “laser” **(1)** of the supply unit.
2. Connect the cable with label “supply” to back connector “supply” **(2)** of supply unit.
3. Connect the cable with label “control” to back connector “control” **(3)** of supply unit.

4.1 *Interface - RS232 – option RS-422 serial link*

To control the OPSS-1 with an external PC via RS232 connect a PC with standard serial SubD Dcable (9pole male – 9pole female) to the connector “RS232” in front panel of supply unit.



c

4.2 *Protection – cable leading advices*

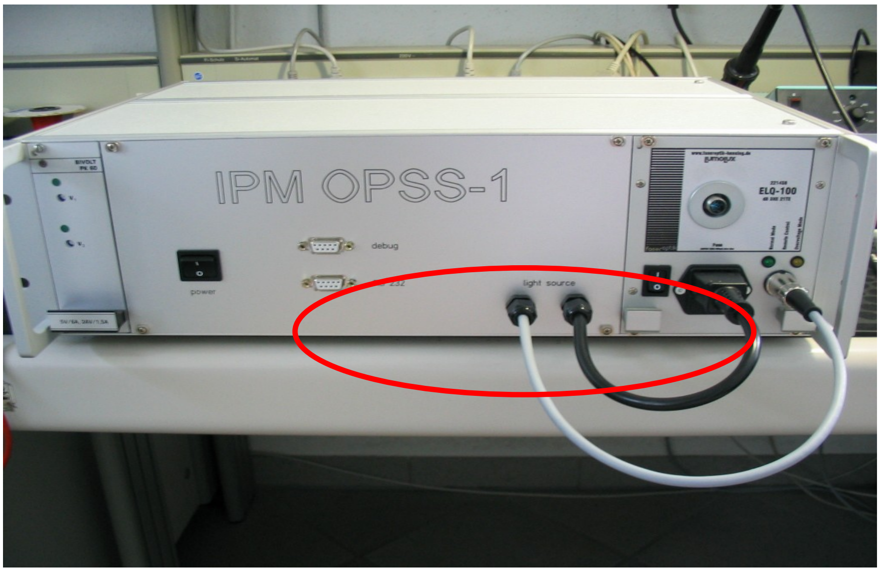
Concerning EMI protections for the serial link cable avoid any near cable leading to the stepping motor cable which should be shielded and grounded well.
Assure an international grounding standard for all power supplies including for the stepping motor devices without any electro magnetic influences to all OPSS-1 sensor control cables.

Furthermore avoid any near of magnetic elements and fields to the precise ASM magnet resistive positions sensor and there magnet strip on the scanning axe device.

5 Getting started

Before using of OPSS-1 System you have to wire all components together.

To turn on the system use the main switch in front panel of OPSS-1 supply unit. Be sure that the small switch of the light source is in ON-position too.



ATTENTION

If the OPSS-1-system is turned on the laser in the OPSS-1 emitter case is active. The strait downward from the top to the bottom sensor case operating line laser is normally not direct to see because the measuring gap of a wide of 3.0 or 5.0 mm protect them.

In any case : DO NOT look direct or in the reflected laser light !

Use special eye glasses - if necessary.

5.1 Halogen lamp

A special Halogen lamp 100W/15V operating air ventilated in the light cassette which is to see on the above picture. The lifetime of the remote controlled lamp is around 1500 operation hours. The lamp has a very stable operation mode through the remote control of the sensor internal micro controller unit. If the minimum of the lamp emission is reach the auto setup with the PSIG command will send an error.
For lamp exchanges please switch the power of 19" rack off, pull off the light fibre and light cassette, remove the lamp very carefully because the heat.
Set in the new ones in the right position, complete the unit and switch the power on again.
Do a new calibration procedure which is described in the below chapters.

5.2 Light fibre

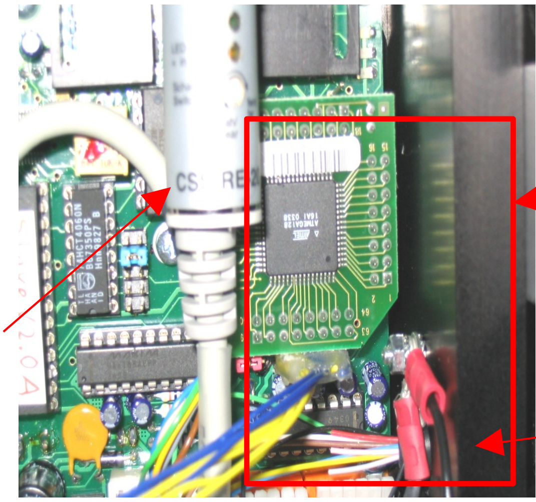
Treat and lead the flexible light fibre very carefully and avoid any small bend radius lower then 30 cm including the leading into the energy chain. As well in the front of the 19" rack and on the top or side feed-in place of the sensor case. Higher temperature then 65 Grad/C are also to avoid because their special inner plastic fibre bundle and protection tube.

6 Firmware Update of micro controller

To update the firmware of the main controller in OPSS-1 receiver-case you either can change the whole controller adapter PCB (IC6, Atmega 128-16AI) or perform a flash-update via RS232.

6.1 Change of main controller

1. Switch OPSS-1 system off
2. Open OPSS-1 receiver-case
3. Disassemble colour-sensor
4. Pull out the controller adapter PCB
5. Plug in new controller adapter PCB. Attention should be paid to the right position of the adapter!
6. To assemble colour sensor again see chapter 8 for details



6.2 *Flash Update via RS232 serial link*

1. Turn off OPSS-1 system
2. Connect a PC to OPSS-1 sensor
3. Copy the files “FlashLoader.exe” and “OPSS1_mainXXX.hex” to your hard disc to directory “C:\OPSS-1” (maybe you have to create this directory first)
4. Set the System in Boot-loader-Mode – Version 010 - no jumper function

Open program “FlashLoader.exe” as command with firmware filename as parameter - see).

Figure 1

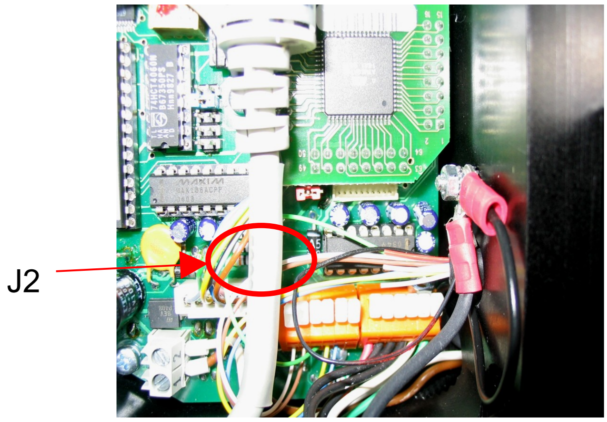
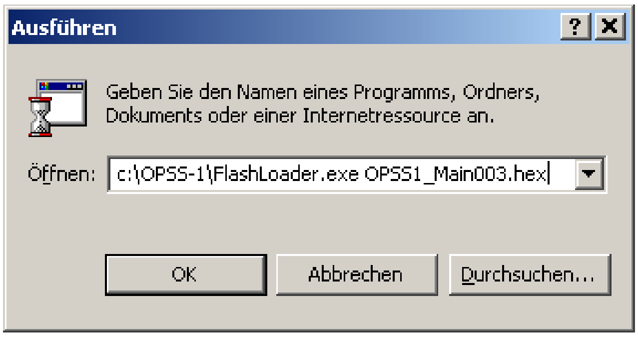


Figure 2



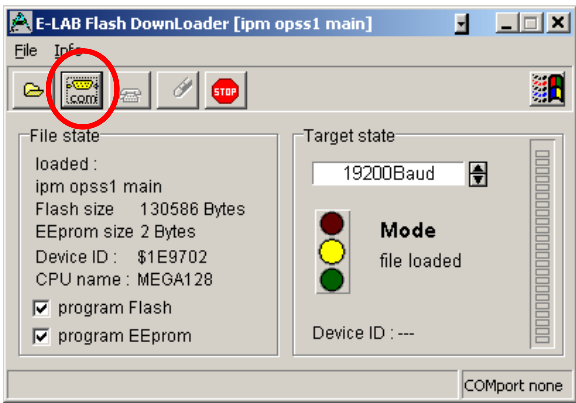
Bootloader Mode

You can enter this mode in two ways:

1. Set Jumper J2 in the receiver-case (figure 1) and switch on the system (remove after update!)
2. Send the command ‘Bootloader’ from Hyperterminal and quit the terminalprogramm.

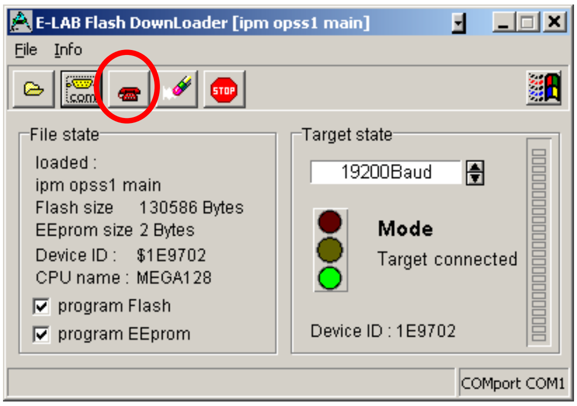
Figure 3

5. The following window appears (Figure 3)
6. Press button “com”



7. If controller connected correctly, the window (see Figure 4) will show the message **“Target connected”**. Otherwise the error box **“Target not found”** appears.
8. Press the “phone”-button to flash the firmware to controller. This will last a few seconds (see the blue progress bar, Figure 5).

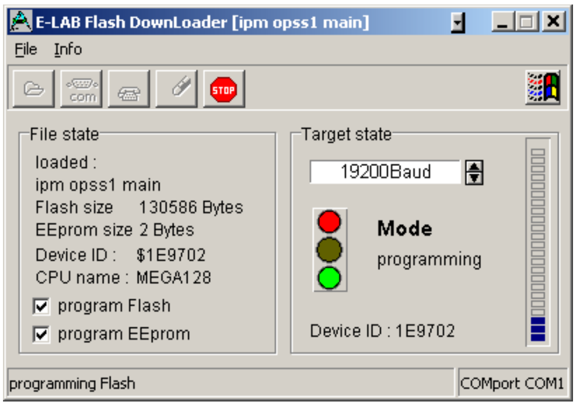
Figure 4



⚠ **ATTENTION**

It is strongly required that the system is powered while flash update procedure is active.

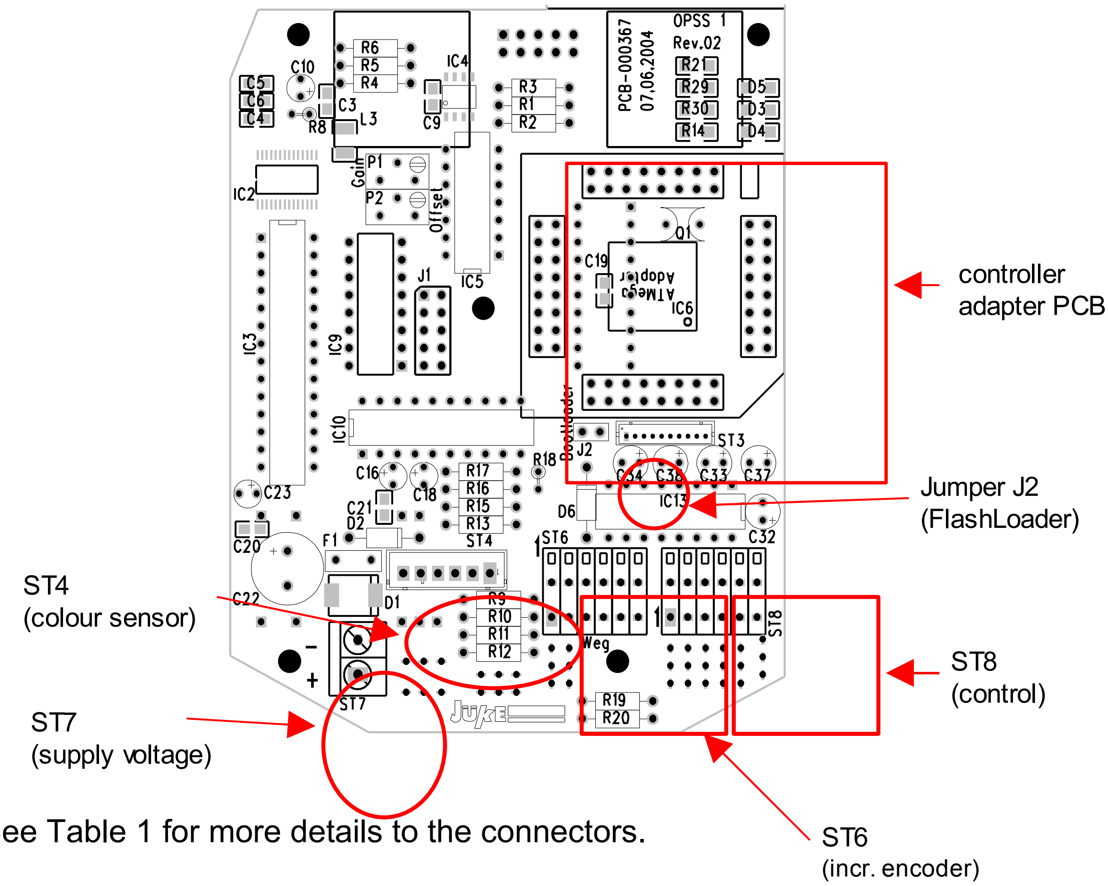
Figure 5



9. Turn off OPSS-1 system.
10. Remove jumper J2 – before the Version 010
11. After turn on OPSS-1 system again the controller will reboot with new firmware.
12. **The last Firmware version is number 0.11 dated February 2007**

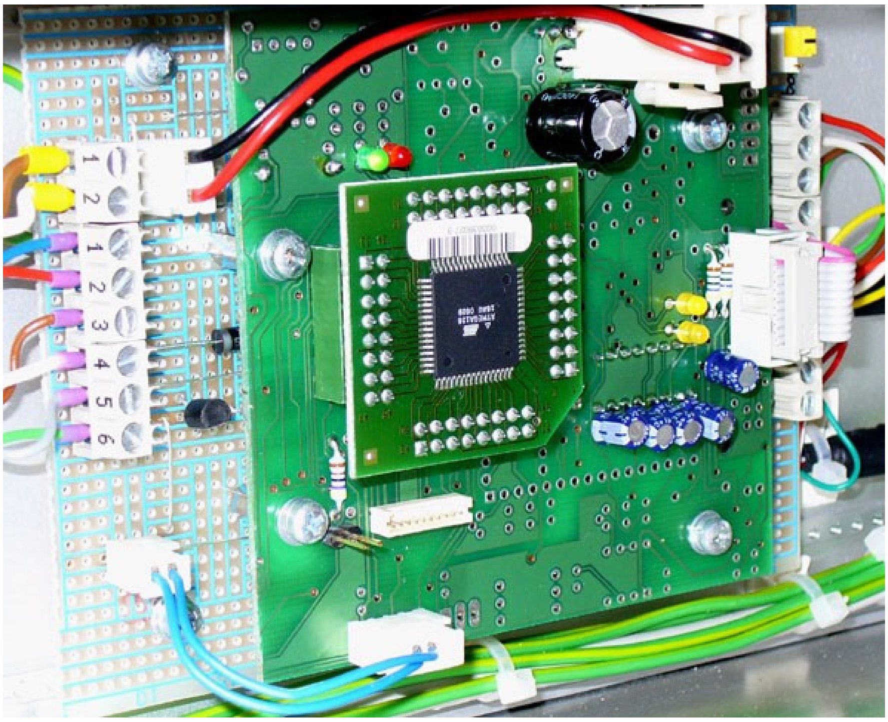
7 OPSS-1 receiver PCB

7.1 Overview and configuration



See Table 1 for more details to the connectors.

Debugger function for data monitoring – front sub 9-D – see chapter 9.2

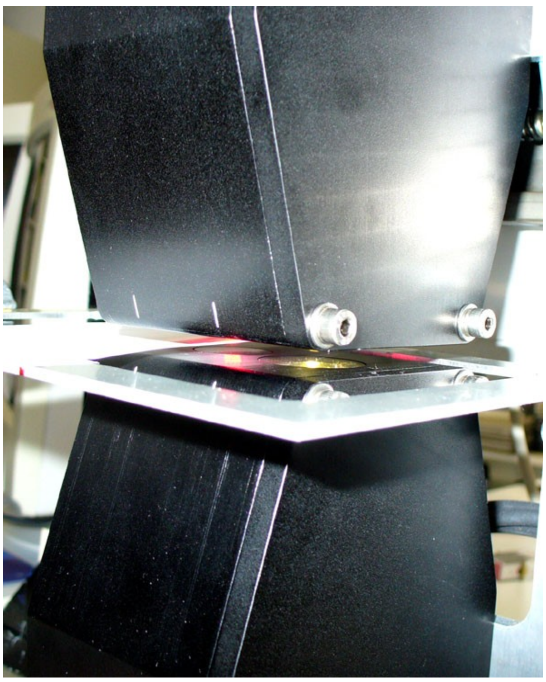


7.2 *Connectors and pinning*

Table 1

Connector	Signal	Cable colour
Colour sensor		
ST4-1	+24V	brown
ST4-2	GND	blue
ST4-3	signal red (0..10V)	rose
ST4-4	signal green (0..10V)	yellow
ST4-5	signal blue (0..10V)	green
ST4-6	signal intensity (0..10V)	grey
Incremental encoder		
ST6-1/2	+5V	white
ST6-3/4	GND	brown
ST6-5/6	Channel B	green
ST6-7/8	Channel A	yellow
ST6-9/10	Ref Z	blue
Supply voltage		
ST7-1	+24V	brown
ST7-2	GND (24V)	white
Control		
ST8-1/2	TXD	red
ST8-3/4	RXD	black pair with red
ST8-5/6	SGND	black pair with green
ST8-7/8	PWM (to light source)	black pair with white
ST8-9/10	Feedback (from light)	white
ST8-11/12	GND	green

Sensor cases – light fibre supply – view through the measuring gap



8 Colour sensor

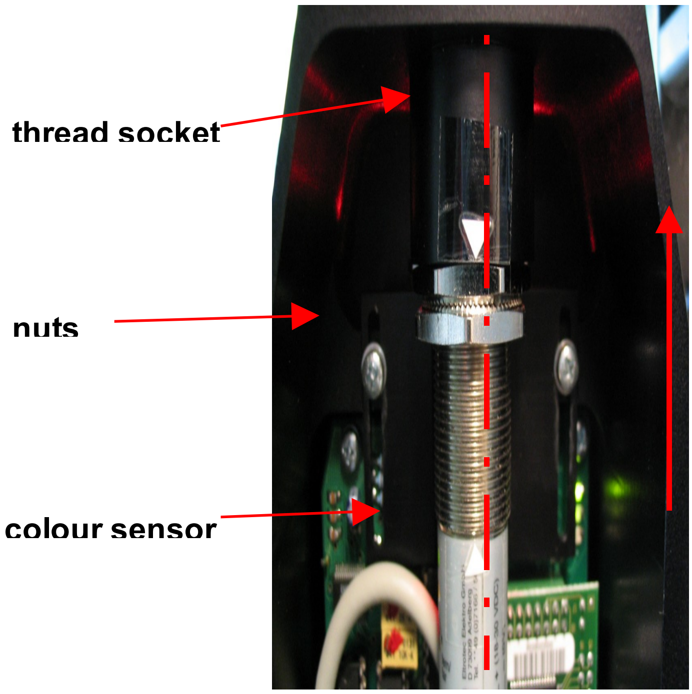
8.1 Adjustment

1. Adjust the potentiometer of the colour sensor CSS-RE-20 (mounted in OPSS-1 receiver-case) to maximum level in position “far” (see Figure 6).

Figure 6

Figure 7

2. Screw manually the colour sensor as far as possible into the thread socket.
3. Align the white arrows on the thread socket and the sensor together.
4. Tighten the two nuts of the sensor.



Connect the colour sensor with
the 6pole JST-plug to socket ST4 in OPSS-1 receiver PCB (see PCB overview in chapter 7.1).

9 Connections

9.1 Control with external PC via RS232 serial link

To control the OPSS-1 with an external PC via RS232 you need to connect the PC to the OPSS-1 supply unit.

There are two possibilities to control the OPSS-1 by a PC:

1. Terminal program like Windows HyperTerminal
2. Test software and porosity raw data visualisation by OPSS-1 FRONTEND program (on CD-Rom)

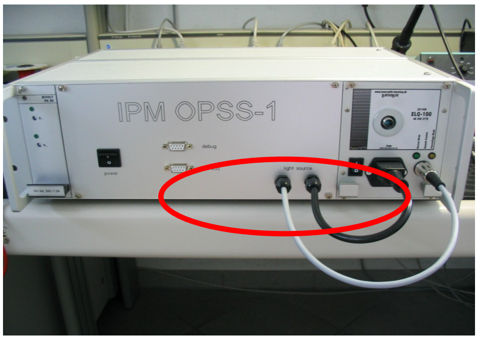
If you use a Terminal program the following settings are required:

Baud rate:	38400 bit/s up Firmware version 009 – dated 16/3/2005
Data bits:	8
Parity:	None
Stop bits:	1
Handshake:	None

Other serial Baud rates are possible: 19.200, 28.800, 57.600, 76.800, 115.200 and 230.400 bit/s by version 0.10 or 0.11.

The available instruction set to control the OPSS-1 is available on the delivered CD-ROM..

9.2 Debugging of communication between OPSS-1 and PC



To watch the communication between OPSS-1 system and a PC connected to front-connector “RS232” you can connect another PC/Notebook to the front-connector “debug”. With a standard terminal program like Windows Hyper Terminal and the interface configuration described in chapter 9.1 you can watch the data flow of the control connection. Lines beginning with “PC” indicate the data from PC, lines beginning with “SL” indicate the data from OPSS-1.

Notice:

This function is not applicable in raw data mode, where mass-data will be transferred between OPSS-1 and PC.

9.3 RS-422-serial link – option

Option of additional bi-directional RS-422 fast link with cable lengths up to 100 meters.

More information on request.

10 Sensor control, commands, operating

10.1 Instruction sets and commands

command ASCII	feedback OPSS 1	error	Description and comments
PC»	**OPSS1»**		
#27			**'ESC' - abort command - ENTER confirm**
RAW	RAW OK **FOR TEXT only**	NO REF	raw-data-mode, every 0,1mm one frame – tool program for envelope curves **without laser position data**
RAWL	RAWL OK **FOR TEST only**	NO REF	raw-data-mode, every 0,1mm one frame – tool program for envelope curves **with laser position data**
RAWA	RAWASCII OK Send data to Hyper Terminal **FOR TEST only**		Raw-data-mode in ASCII code, HEX-Data format of position, red, green, blue, intensity, REAL-Mode by low scanning speed up to 50 mm/Sec. Testing of geometrical alignment of X,Y and Z axis
RAWMM	Send data to Hyper Terminal **FOR TEST only**		test of ASM magnet resistive position sensor in real time, HEX data format output by full scanning speed without paper into the gap
RAWI	Send data in ASCII Format **FOR TEST + OPERATION**		ASCII data output of real position (in mm) and intensity (in HEX data) by full scanning speed
SCANI	Send data in ASCII Format **FOR TEST + OPERATION**		data output of each zone and each non-perforated gap of the sum intensity – non calculation of colour values, by full scanning speed
REF	feedback - REF OK		pickup the **base reference position of the magnet-resistive ASM system** by low scanning speed up to 50 mm/Sec.
SETREF	Opposite command to REF		set reference position of the ASM system in reference and **order of the scanning system**
PPOS	SEARCH PPOS PPOSL=-xxxx.xmm PPOSR=-xxxx.xmm	NO REF	searching the left and right paper edge beginning on the reference point
ZONES	SEARCH ZONE ZONEn=-xxxx.x/-xxxx.xmm Space -xxxx.x/-xxxx.xmm ZONEn=-xxxx.x/-xxxx.xmm ENDZONE	NO REF NO PPOS	searching ALL positions of perforation zones and calculate the distances between
PMESS	PMESS ZONEn=xxxxxx GAP xxxxxx ZONEn=xxxxxx	NO REF NO PPOS	measure the porosity envelope curves of all zones and spaces between - **transmit the integral values** **Integral values in order of the formula**
PSCAN	PSCAN ZONEn=xxxx.x CU ZONEn=xxxx.x CU ZONEn=xxxx.x CU MW =xxxx.x CU	NO REF NO PPOS	measure all zones, calculate and transmit the **porosity in C.U.** of each zone **AFTER CALIBRATION with SETKALIBCU** the average value will calculate and transmit
POFFSET	POFFSET GAP=xxxxxx MWGAP=xxxxxx	NO REF NO PPOS	scanning all spaces between the zones and without texts contours or lines by a full scanning speed (left - right - left) the average value of the non-perforated area will be calculated and transmitted

PZONExx	PZONE xx ZONE n xxxx.x CU ZONE n xxxx.x CU ZONE n xxxx.x CU	NO REF NO POS NO ZONE	continuously measurement of **ONE zone** position the sensor with the scanner system to one zone centre and start the measurement with the command
PTEST	TEST ZONE 1 RED=xxx% GREEN=xxx% BLUE=xxx% INTENS=xxx% ZONE 2 RED=xxx% GREEN=xxx% BLUE=xxx% INTENS=xxx%	NO REF NO POS NO ZONE	measure and calculate the value of the colour-part of the sensor in % of the working range Sensor head has to be positioned to the zone centre 1 It will be done for Zone 1 (needs 1 sec. at the zone) and as well for Zone 2 Sensor head has to be positioned to the zone centre 2
PSIG	PSIG RED=xxx% GREEN=xxx% BLUE=xxx% INTENS=xxx%	NO REF NO POS NO ZONE	Scan and positioned the **Sensor head with the LIGHT MARK to the zone centre 1.** The lamp will be regulated to the blue colour value in % which level is setup before with the **parameter EE_Lamp-blue** Auto-Level-setting of the light intensity!
ZONES?	ZONEn=-xxxx.x/-xxxx.xmm GAP -xxxx.x/-xxxx.xmm ZONEn=-xxxx.x/-xxxx.xmm ENDZONE	NO REF NO PPOS	transmit ALL zone positions which were found with the Zone command
PARA?	PARAMETER OPSS-1 EE_Kennung: 28 EE_LaserTime: 70 EE_LaserLevel: 50 EE_ZoneLevel: 256 EE_MaxHoleDis: 500 EE_Lamp-blue: 70 EE_LampPWM: 255 EE_MeasureOffset: 10 EE_SensorOffset: 260 EE_ParaRed: 1 EE_ParaGreen: 1 EE_ParaBlue: 1 EE_ParaIntens: 1 MWPoro_Paper : 254933		Send system parameters to the master PC **Reading mode only !**
KALIB?	KALIBRATION-TAB: ZONE 1= 33 ZONE 2= 33		Send the calibration-factor-table to the master PC for each zone there is one factor **Reading mode only !**

SETPARA	 SET PARAMETER OPSS-1 EE_LaserTime: 70 EE_LaserLevel: 50 EE_ZoneLevel: 256 EE_MaxHoleDis: 500 EE_Lamp-blue: 70 EE_LampPWM: 200 EE_MeasureOffset 10 EE_SensorOffset 260 EE_ParaRed 1 EE_ParaGreen 1 EE_ParaBlue 1 EE_ParaIntens 1 EE_MWPaper 100		**Enter the system parameter – setting mode !** **other options** **……. 120** **…….. 60** **…….. 200** **……. 80 %** **…….. 150** **2** **…….1 – 100 - up to 100 % factor Paperoffset**
SETKALIB	 SET KALIBRATION-TAB: ZONE 1 = 41 ZONE 2 = 41 ZONE 3 = 41 ZONE 4 = 41		Enter the calibration factor for each zone **manual entering of calibration factor !** here e.g. 41
SETKALIBCU	 **SET KALIBRATION IN CU:** ZONE 1 = 412 ZONE 2 = 422	 NO REF NO POS NO ZONE	Enter the **REAL C.U. value of each zone - calibration** will be calculated automatically PMESS command has to be done before ! here e.g. 422 C.U.
BOOTLOADER	Boot loader active! **for updating only**		Software-Update without jumper setting

10.2 Command sequence from master PC process software or via Terminal software for testing

Splash screen

```
OPSS1 Version 0.0X …… 0.11
No Error
READY
```

Search reference position of ASM sensor – ONE TIME – DO NOT PASS IT AGAIN

```
ref
SEARCH REF
REF OK
READY
```

Set reference position – opposite REF – DO NOT PASS that position again

```
setref
ZERO OK
READY
```

Search both edges of the paper web

```
ppos
SEARCH PPOS
PPOSL=    2.7mm
PPOSR=126.9mm
READY
```

Search all perforation zones and calculate the space between

```
zones
SEARCH ZONE
ZONE 1=   16.4/   18.8MM
GAP                          23.9/
39.9MM
ZONE 2=   45.0/   47.6MM
GAP                          52.9/
68.9MM
ZONE 3=   74.3/   76.8MM
GAP                         81.5/
97.5MM
ZONE 4=  102.3/  104.8MM
ENDZONE
READY
```

<u>Lamp test</u> on zone one and two
sensor positioning to zone 1 + 2
measure the actual light intensity through zone 1 + 2
JUST FOR TESTING

```
ptest
TEST
ZONE 1
RED= 42%
GREEN= 42%
BLUE= 67%
INTENS= 50%
LAMP: 72%
ZONE 2
RED= 45%
GREEN= 47%
BLUE= 77%
INTENS= 56%
LAMP: 72%
READY
```

Adjust the lamp <u>signal of zone centre 1</u>
to e.g. 70% of the blue colour
or another value of parameter EE_Lamp_blue up to 90 %
position the <u>LIGHT SENSOR and their MARK to zone centre 1</u>
------------ auto-setting of the lamp intensity

```
psig
SIGNAL
RED= 35%
GREEN= 36%
BLUE= 56%
INTENS= 42%
LAMP: 66%
RED= 37%
GREEN= 39%
BLUE= 60%
INTENS= 46%
LAMP: 68%
RED= 40%
GREEN= 41%
BLUE= 65%
INTENS= 48%
LAMP: 70%
RED= 42%
GREEN= 44%
BLUE= 69%
INTENS= 52%
LAMP: 70%
SIGNAL OK LAMP: 180
READY
```

Scanning the porosity integrals of all zones and gaps between the perforation zones

```
pmess
PMESS
ZONE1= 45734
GAP  =     18355
ZONE2= 51680
ZONE2= 52028
GAP  =     18279
ZONE1= 45994
ZONE1= 45702
GAP  =     18334
ZONE2= 51402
ZONE2= 51976
GAP  =     18276
ZONE1= 45926
READY
```

Measure Paper Offset, porosity integral of all spaces between perforation zones

```
poffset
POFFSET
GAP  =255003
GAP  =254260
MWGAP=254631
GAP  =254824
GAP  =254188
MWGAP=254506
READY
```

10.3 Read and Set Parameter Routines

Read Zone positions and spaces between

```
zones?
ZONE 1=   15.4/   17.8MM
GAP  =                    28.7/
33.1MM
ZONE 2=   44.0/   46.5MM
GAP  =                  57.6/
62.0MM
ZONE 3=   73.3/   75.8MM
GAP  =                  86.6/
91.0MM
```

Read ALL internal parameters

```
para?
PARAMETER OPSS1 Version 0.11:
EE_Kennung:              28
EE_LaserTime:            70
EE_LaserLevel:           50
EE_ZoneLevel:       256
EE_MaxHoleDis:      500
EE_Lamp-Blue:         70
EE_LampPWM:          255
EE_MeasureOffset:    10
EE_SensorOffset:         260
EE_ParaRed:              1
EE_ParaGreen:            1
EE_ParaBlue:                    2
EE_ParaIntens:           1
EE_MWPaper:                   10
MWPoro_Paper :     254933
READY
```

Read Calibration table of <u>internal calculation factors</u> between porosity integral and the real porosity of all zones

```
kalib?
KALIBRATION-TAB:
ZONE  1=   41
ZONE  2=   41
ZONE  3=   41
ZONE  4=   41
READY
```

10.4 Set parameters

Each parameter will be displayed.
An acception will be done with "Enter" or a new value must be written.
After writing: the new value will be displayed.
To cancel the operation, send "ESC".
Here a complete listing of all parameters:

```
setpara
SET PARAMETER OPSS1 Version
0.11 :
EE_LaserTime          70
EE_LaserLevel         50
EE_ZoneLevel         256
EE_MaxHoleDis        500
EE_Lamp-Blue          70
EE_LampPWM           200
EE_MeasureOffset      10
EE_SensorOffset      260
EE_ParaRed             1
EE_ParaGreen           1
EE_ParaBlue            5
EE_ParaIntens          1= 2
EE_MWPaper            10
```

*10.5 Direct setting of each **<u>internal calculation factors</u>***

```
setkalib
SET KALIBRATION-TAB:
ZONE  1        =  41
ZONE  2       =  41
ZONE  3       =  41
ZONE  4( 40)        =  41
```

Or set the calibration table DIRECT with C.U. values
Condition: the average of the paper is measured before ("poffset")

```
setkalibcu
SET KALIBRATION IN CU:
ZONE  1 =  412
ZONE  2 =  422
```

10.6 Summary of system constants and variables – ***version 0.11***

Name	Value min	Value max	defaul	unit	Description and comments
EE_Kennung	Read only				only for check the EEPROM state
EE_LaserTime	70	255	**150**	count	Clock pulse of CCD-line - it controls the flashing light time of the 64 pixel sensor – **optimal 120 - 150**
EE_LaserLevel	0	255	**50**	digit	trigger level of 64 pixel sensor - start/stop of pos. beg./end of each lines/zones – **optimal 50 - 60**
EE_ZoneLevel	50	5000	**256**	digit	digital value of 64 pixel sensor - for line/zone detection **50 – 400 – level above the CCD sensor offset**
EE_MaxHoleDis	10	10000	**500**	**/100**	maximal distance range on which ALL line-groups or one zone has to be **– 500 - constant in mm**
EE_Lamp_blue	25	95	**70**	in %	**Blue colour level for PSIG** and lamp adjustment **normal range 50 – 90 % of the whole measuring range**
EE_LampPWM	0	255	**100**	count	startup-value PWM-Halogen lamp – 100 approx. 40 % of the max. lamp range **– optimal 120 – 200 – before PSIG command**
EE_MeasureOffset	10	5000	**10**	**/10**	zone/line-width: start:(start-zone-MeasureOffset)-stop:(stop-zone+MeasureOffset) **- constant**
EE_SensorOffset	200	300	**260**	**/10**	distance between the CCD-array and the colour-sensor - **constant by 26.0 mm**
EE_ParaRed	0	10000	**1**	factor	calculation factor **- red-signal – 1 or 2**
EE_ParaGreen	0	10000	**1**	factor	calculation factor **- green-signal – 1 or 2**
EE_ParaBlue	0	10000	**1**	factor	calculation factor **- blue-signal – 2 …… 5**
EE_ParaIntens	0	10000	**1**	factor	calculation factor **– intensity signal – 1 or 2**
EE_MWPaper	1	100	**100**	F. %	**Paper Offset – 10 up to 100 % - depends of the paper opacity**
MWPoro_Paper	Read only			count	average value of All GAPS - non-perfo.+ non-printed paper (needed for calculation)

10.7 Start-up commands for calibration and production

- **REF** - OPSS-1 scan sensor **ONE TIME** over the reference position and refer all
- SETREF – **ONE TIME** as manual define reference point – opposite of REF – <u>DO NOT SCAN the system one time more over REF or SETREF points</u>
-
- **SET PARAMETER**
-
- **PPOS** – detect both paper edges
- **ZONES** – detect all perforation zone positions and calculate the gaps
- scanner system position the OPSS-1 sensor with the LIGHT MARK to zone centre 1
- **PSIG** – auto. Halogen lamp control by blue colour monitoring, optimize the SENSOR measuring range 30 – 90 % in order of the REAL porosity
- **PMESS** – scan and measure optical porosity values of all zones and gaps, transmit all integrals in order of the internal formulas
- **POFFSET** – scan all non-perforated gaps, detect their values excluding text contours or gravure lines, define the average value of paper offset

- **SETKALIBCU** - enter real porosity values in C.U. of each zone
- **PSCAN** – scan and measure all zones, calculate and transmit all integral values
- while scanning processes the ZONE commend can use to actualize all zone positions and their widths

10.8 Commands for production operation without a new calibration

- **PPOS** - searching both paper edges
- **ZONES** – detect all perforation zone positions and calculate the gaps
- scanner system position the OPSS-1 sensor and LIGHT MARK to zone centre 1
- **PSIG** - auto. Halogen lamp control by blue colour monitoring, optimize the SENSOR measuring range 30 – 90 % in order of the REAL porosity
- **PMESS** - scan and measure optical porosity values of all zones and gaps, transmit all integrals in order of the internal formulas
- **POFFSET** - scan all non-perforated gaps, detect their values excluding text contours or gravure lines, define the average value of paper
- **SETKALIBCU** - enter real porosity values in C.U. of each zone
- **PSCAN** – scan and measure all zones, calculate and transmit all integral values
- while scanning processes the ZONE commend can use to actualize all zone positions and their widths

10.9 Commands for Halogen lamp level setting and checking

- **SET PARAMETER**
- move with the scanner system the OPSS-1 sensor and LIGHT MARK to zone centre 1
- **PSIG** - auto. Halogen lamp control by blue colour monitoring, optimize the SENSOR measuring range 30 – 90 % in order of the REAL porosity
- **PTEST** – check and transmit the pulse-width control level of Halogen lamp

11 Calculation formulas and data examples

11.1 Internal formulas **to calculate all geometrical positions**

$$ZoneWidth(n) = StopZone(n) - StartZone(n)$$

$$ZoneCenter(n) = ZoneStop(n) - \frac{ZoneWidth(n)}{2}$$

$$Distance = ZoneCenter(n+1) - ZoneCenter(n)$$

$$GapCenter = \frac{ZoneCenter(n+1, even) - ZoneCenter(n, odd)}{2}$$

$$AverageWidth = \frac{\sum_{\text{quantityZones}}^{1} Width(n)}{\text{quantityZones}}$$

$$AverageDistancefreePaper = \frac{\sum_{\text{quantityZones-1}}^{1} ZoneCenter(n+1, even) - ZoneCenter(n, odd)}{\frac{quantityZones}{2}}$$

$$AverageDistanceprintedPaper = \frac{\sum_{\text{quantityZones-1}}^{1} ZoneCenter(n, odd) - ZoneCenter(n-1, even)}{\frac{quantityZones}{2} - 1}$$

$$AverageDistanceBorderZoneCenter = \frac{AverageDistanceprintedPaper}{2}$$

$$AverageDistanceZoneCenters = AverageDistancefreePaper$$

$$EndproductPaperwidth = AverageDistanceBorderZoneCenter * 2 + AverageDistanceZoneCenters$$

Internal formulas of the sensor system **to calculate all porosity values**

Poro_Color = (MWPoro_Red*EE_Para_Red) + (MWPoro_Green*EE_Para_Green) + (MWPoro_Blue*EE_Para_Blue)

Poro_Integral = (Poro_Color + MWPoro_Intensity) - MWPoro_Paper

Poro_CU = Poro_Integral / Kalib_Factor

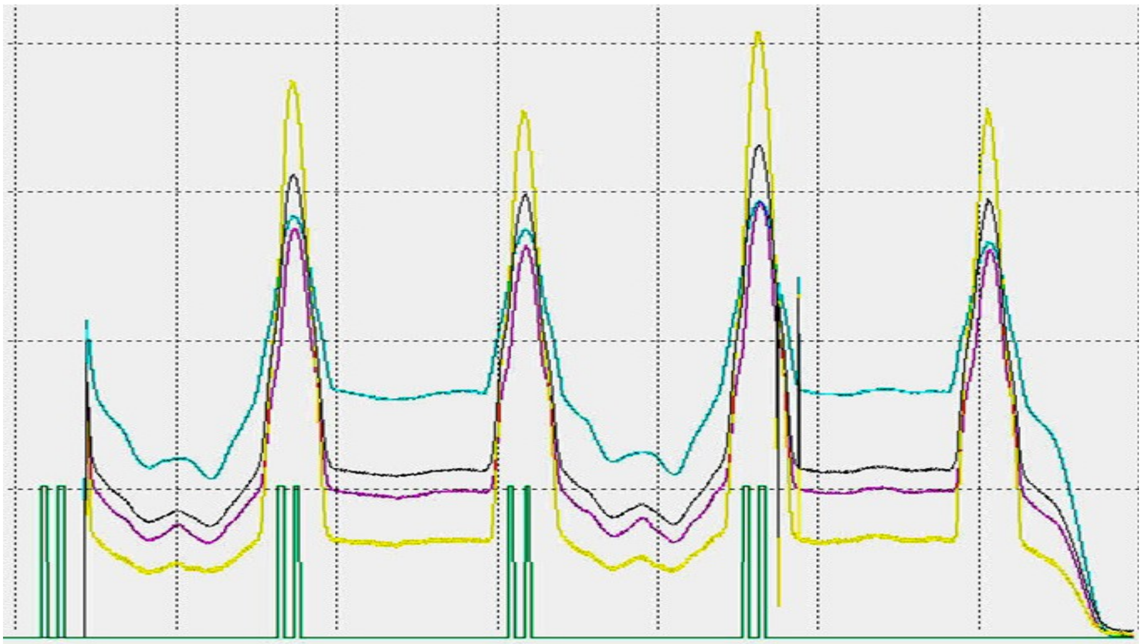
Poro_CU = Poro_Integral / (Poro_Integral-kalib / Poro_CU-kalib)

11.2 Envelope curve and position examples

Roh data: two laser perforation lines of two bobbins by 400 C.U.
Envelope curve: red, green, blue and intensity level
Position: 2 perforation lines on each laser perforation row group

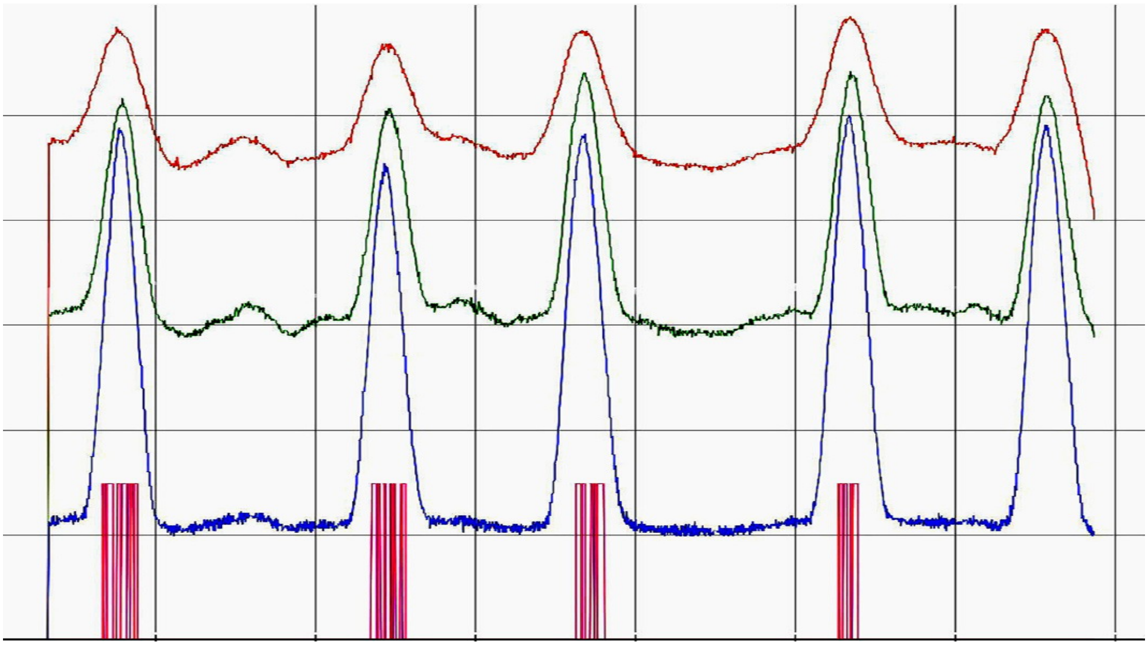
X-axe = across the web – the displacing of 26 mm between the position line laser and porosity detection across the web direction is compensated in this graphic

Monitoring with the FRONTEND OPSS-1.exe program which data acquisition and handling are equal as the Master PC process program



Roh data: electrostatic perforation of two bobbins by 200 C.U.
Envelope curve: red, green, blue and intensity level
Position: four perforation zones with their geometrical positions and zone widths

X-axe = across the web – the displacing of 26 mm between the position line laser and porosity detection across the web direction is compensated in this graphic



11.3 Production data examples

ESP perforated tipping paper, 3.0 mm zone width, nominal porosity 200 C.U.

Zone No. / Scanning Turns	zone1	zone 2	zone 3	zone 4	zone 5	zone 6	zone 7	zone 8
1	220,2	194,2	216,2	200,5	206,4	194,6	186	215,1
	218	182,3	215,5	198,1	204,9	191,8	185	213,6
2	215,5	180,3	210,4	195,7	200,9	190,4	181,1	209,4
	213,6	178,3	210,3	194,6	200	188,4	180,2	208,3
3	226,1	178,2	208,6	193,6	198,6	188,7	179,1	206,5
	211,8	176,3	207,5	192	197,7	185,2	177,7	205,3
4	210,4	176	205,6	191,1	220,6	185,3	175,9	203,1
	208,5	174,7	204,9	189,1	195	183	174,8	202,8
5	208	173,7	202,6	188,5	192,6	182,6	173,8	199,9
	205,9	172,1	202,2	187,2	191,9	180,8	172,8	198,3
AVERAGE	213,8	178,6	208,4	193,0	200,9	187,1	178,6	206,2
S.D.	5,94	5,95	4,60	4,08	7,97	4,21	4,29	5,22
C.V.%	2,78	3,33	2,21	2,11	3,97	2,25	2,40	2,53

ESP perforated tipping paper, 3.0 mm zone width, nominal porosity 200 C.U.

Zone No. / Sanning Turns	zone1	zone 2	zone 3	zone 4	zone 5	zone 6	zone 7	zone 8
1	223,3	217	216,4	203,5	208,2	196,7	211,8	223,9
	221	206,3	215,8	202	207,2	194	210,5	222,8
2	219,3	204,4	212,3	199,7	204,7	192,6	208,5	219,6
	217,8	202,3	211,6	198,4	204	190,7	206,5	218,8
3	219,3	204,4	212,3	199,7	204,7	192,6	208,5	219,6
	217,8	202,3	211,6	198,4	204	190,7	206,5	218,8
4	214,2	199,5	206,7	195,4	199,3	186,5	200,7	212,7
	213,2	197,6	206,5	193,7	197,8	184,9	200,9	212,1
5	214,7	221	207,7	195,5	199,6	188,3	204,5	213,9
	213,9	198,5	207,4	194,4	199,5	186,9	202,9	213,4
AVERAGE	217,5	205,3	210,8	198,1	202,9	190,4	206,1	217,6
S.D.	3,20	7,37	3,44	3,11	3,42	3,53	3,64	4,04
C.V.%	1,47	3,59	1,63	1,57	1,69	1,85	1,77	1,86

ESP perforated tipping paper, 3.0 mm zone width, nominal porosity 200 C.U.

Zone No. / Scanning Turns	zone1	zone 2	zone 3	zone 4	zone 5	zone 6	zone 7	zone 8
1	242,7	208,2	217,8	215,7	191,7	196,4	206,2	215
	221,5	206,2	217,3	196,7	189,8	199,2	203,1	212,6
2	221,1	205,7	217,9	195,8	190,8	202,5	205,2	213,4
	221,1	204,7	217,6	195,2	188,8	188,4	201,3	208,7
3	219,4	203,3	216,6	194,6	189,2	191,6	202,8	210,5
	219,1	202,8	216,9	193,4	204,8	185,6	198,7	207,6
4	217,9	202,1	215,6	193	188,5	191,4	200	209,2
	217,1	201,8	214,8	200,4	186,1	184,1	204,3	206
5	217,2	227,3	216,3	192,4	188,4	189,4	201	230,3
	216,6	200,6	214,7	191,5	186,2	184,6	196,7	203,9
AVERAGE	221,4	206,3	216,6	196,9	190,4	191,3	201,9	211,7
S.D.	7,31	7,34	1,12	6,72	5,07	5,96	2,82	6,98
C.V.%	3,30	3,56	0,52	3,41	2,66	3,12	1,40	3,30

12 Operating with the Master PC program

The OPSS-1 sensor system communicating with the **PC master process software** what controls the stepping/scanning motor unit. Depends of client program structure, program modules, configurations, program language, operating system, perforation feedbacks, quality control centre, etc. are not further details described.

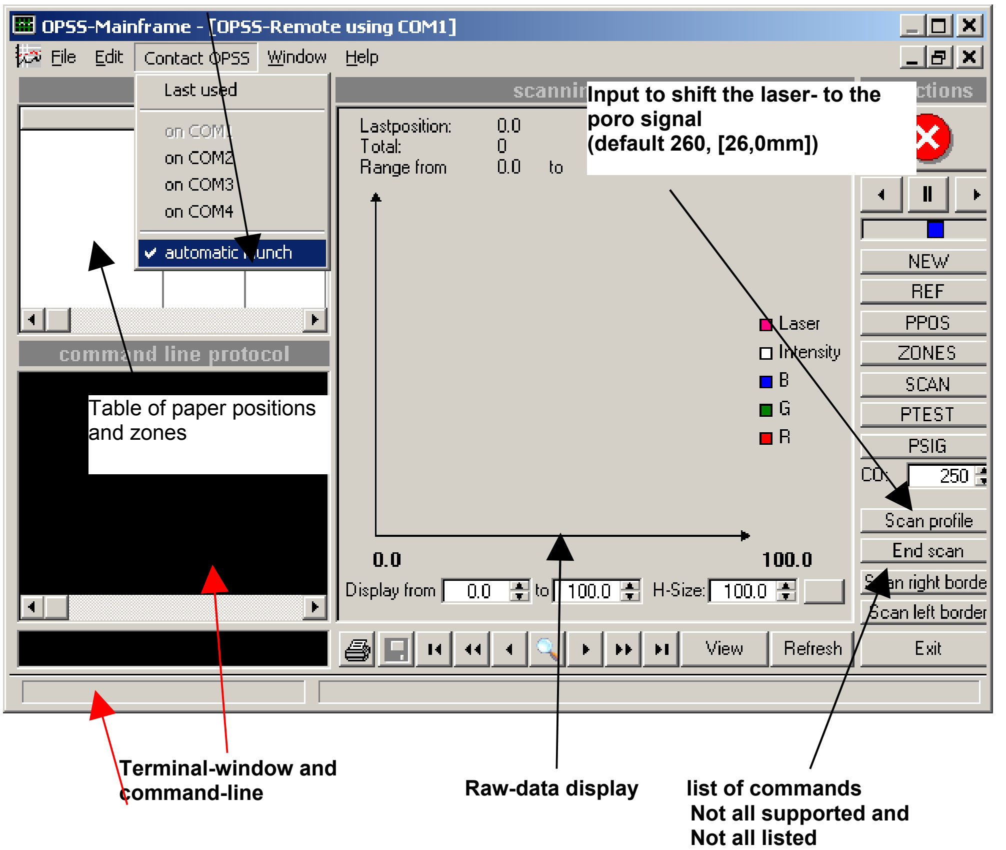
All necessary commands, data exchanges and several examples of the OPSS-1 sensor calibration, data exchanging, production measurement, operation modes as well for test scans are explained in the chapter 10.

13 Operating-testing with the Hyper Terminal and OPSS-1.exe

Condition: using the Special software tool OPSS-1-FRONTEND
Special software-tool - CD:\\Tools\OPSS.exe.
These program runs under windows 2000 or XP.

For use, copy the directory (with all files!) from the CD on your hard-disk.
Execute the OPSS.exe and the following screen will be displayed --------

Connect to the OPSS1 via RS232



14 Specification of the OPSS-1 sensor system

14.1 Measuring process and OPSS-1 sensor system

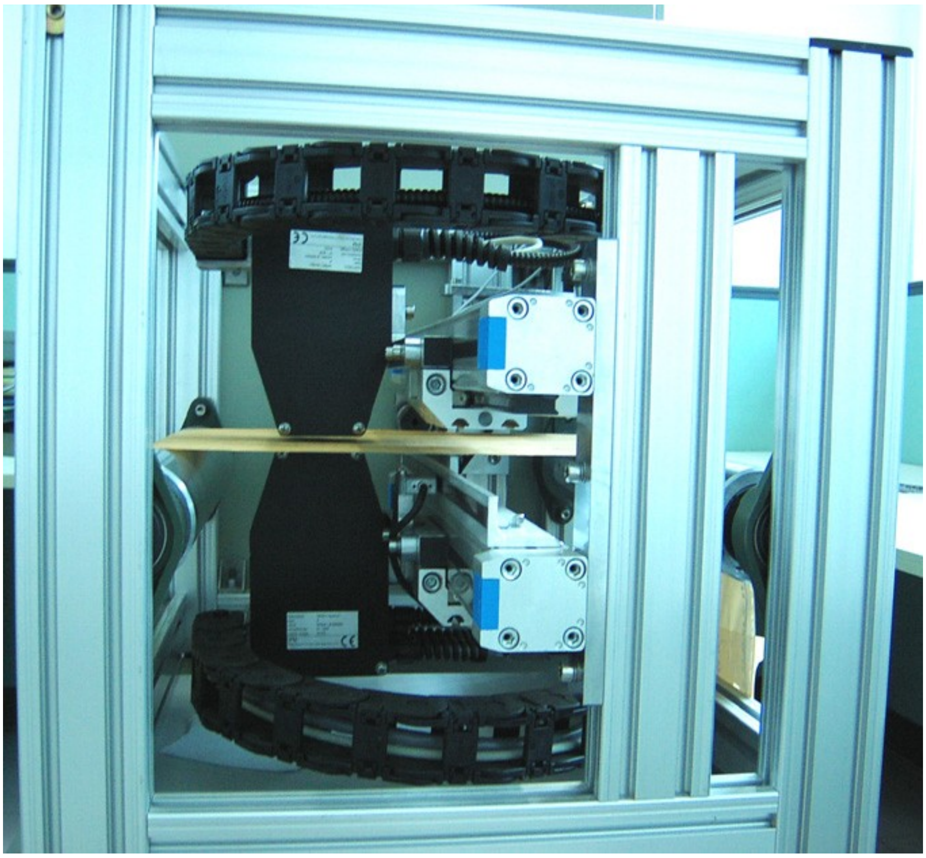
- measurements: Laser perforation rows, ESP porosity of tipping, plug wrap or cigarette paper
- paper weights from 24 – 40 g/m2
- paper web speed: up to 600 m/min
- scanning speed: depends of the mechanical performance up to 250 mm/Sec.
- multiple sensor systems : line laser and monochromatic light source
  A = perforation rows/groups or ESP zone position control
  B = porosity control - simultaneously – see below details
- transmitter case with Line Laser + monochromatic light source on one side – preferable from the top - and the sensor systems – preferable from the bottom - on the other paper web side
- head gap between transmitter/sensor case: 4.0 – 6.0 mm – depends of application
- dimension of each case: length 160 mm; width 100 mm; deep 70 mm = across the web – for more details see dwg's
- material: chemical black coloured AL-cases; dust free; protection in accordance of IP 65
- mechanically connected to the scanner system: flange plates – more details see dwg's
- geometric centre distance of both optical axis A and B: 26 mm = across the web
- **porosity detection B:** with simultaneously compensation of printing design, thickness, structure, lines, text contours, pinholes, surface roughness etc.
- automatic light intensity setting be different porosity ranges with output signal detection and auto range function – see halogen lamp device
- **laser line source A:** integrated in the transmitter case - LASOS Line Laser with a dimension of 20.0 * 0.3 mm; wave length of 635 nm; 15 mW-Class 2
- **light source B:** light cassette with front fibre connector; one stabilised Halogen light source 12V/100W; wave length of 550 – 650 nm; internal power supply and PWM-control of the Halogen lamp; remote controlled by AT-Mega-128-16AI controller; long-life halogen lamp operation up to 1500 hours; high-flexible optical fibre with 6.5 inner diameter and connected via front jack; supplied to the transmitter from the top of deep side of 60 mm
- maximum light fibre length: 6.0 meters
- **position sensor A:** real-time 64 pixel CCD-Sensor and internal control logic device
- **porosity sensor B:** real-time multiple three colour and intensity sensor system with internal AT-Mega-128-16AI controller unit
- **sensor output signals A + B:** pre-signal conditioning by AT-Mega-128-16AI controller and own Firmware; external communication via ASCI-commands
- **output links:** high speed RS-232 serial link from 19.200 up to 230.400 Baud, or RS-422 bi-directional serial link, optional: CAN-BUS, Profi-BUS
- 19" rack: main power supply, 230V/AC/250VA/60Hz; power supply for the sensors 24V/2A - 5V/1A; light cassette, interfacing for RS-232 and RS-422 link connectors; see other options
- cable length between sensor system to 19" rack: 6.0 meters – because light fibre
- electrical conformity of the OPSS-1 system: CE
- Connection transmitter/sensor: serial Sub-D cable, 9pole female male/female (Laser, Sensor, Control) on the rear side of the 19" rack; fixed on the transmitter and sensor side
- absolute position control via magnet resistive position Sensor system in length of 300 – 2000 mm; base resolution of +/- 30 µm; direct connected to the sensor controller; sensor strip fixed and glued on the bottom scanning unit
- provided cleaning device with a pre-positioned air blowing nozzle

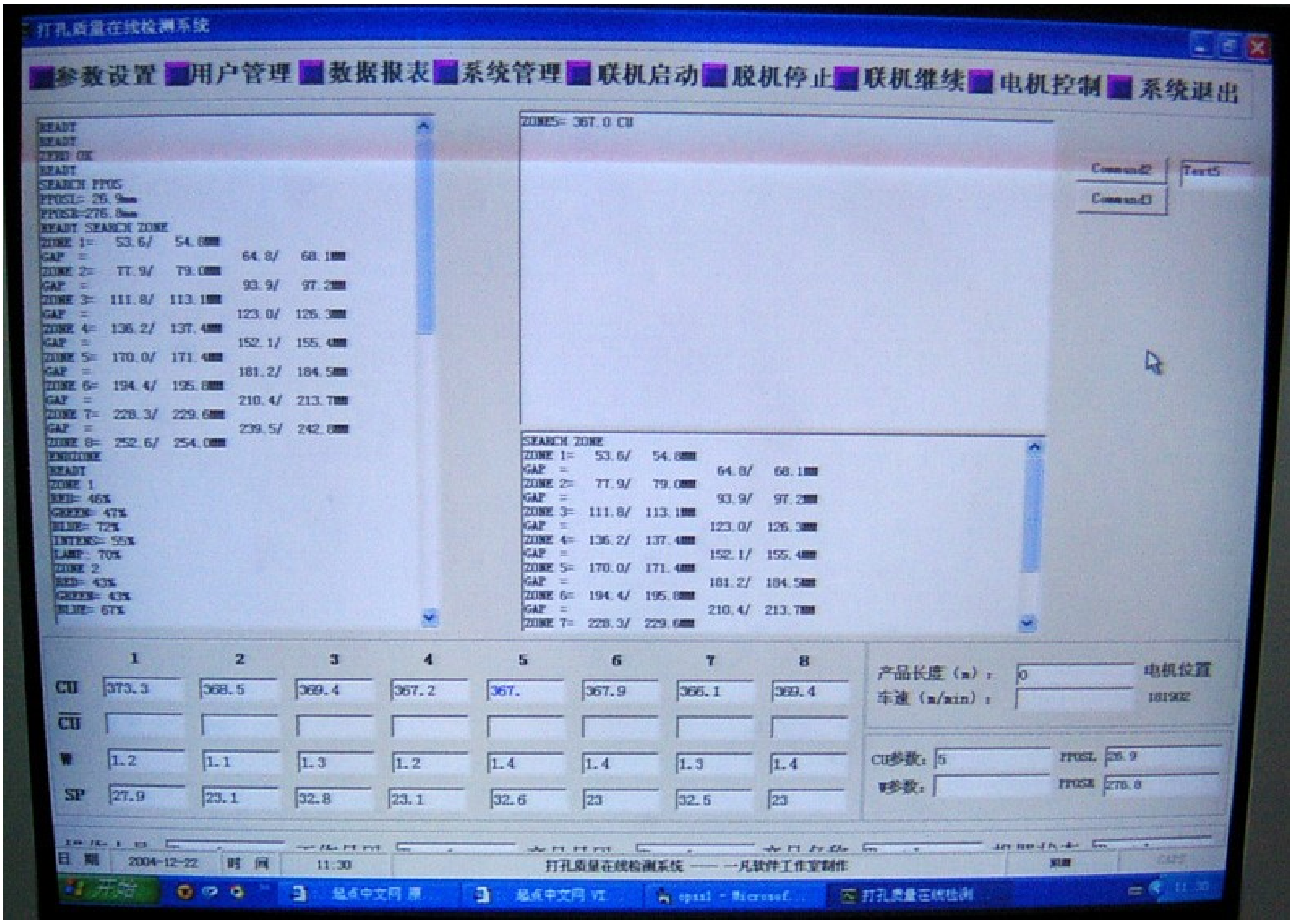
14.2 Technical data of porosity control

- total porosity measuring range: 80 – 3000 C.U.
- porosity accuracy : range - A: 80 - 200 C.U. max. +/- 3 C.U.
  range - B: 201 - 600 C.U. max. +/- 5 C.U.
  range - C: 601 - 3000 C.U. max. +/- 20 C.U.
- optical permeability integration of the measuring window for Sensor B: 16 mm diameter
- ESP perforation zone widths: 1.0 - 6.0 mm
- Laser perforation rows/groups: from 1 – 8 single lines for each porosity detection and control by max. 8 mm group width
- Minimum distances between Laser perforation lines: 1.0 mm
- Provided scanning speed: 20 - 200 mm per second

14.3 Software features of data exchanging and porosity calculation

- OPSS-1 Firmware – up/down loading via RS-232 link and tool program
- Firmware source code: Pascal
- Data exchanging between the Master-PC to OPSS-1-Sensor system: commands sending to the Sensor; receiving data, setting/storage parameters, reading parameters, etc. in order of command lists
- porosity calculation: four envelope curves; integral values, several mathematic formulas for data calculation of porosity output in C.U. units
- additional procedure: porosity calibration; setting of the Halogen lamp intensity; reference position, paper finding etc. in order of the command and procedure list
- rough data tool program: display of envelope curves and positioning data of the line laser detection
- real time operating: via LAPTOP; Hyper-Terminal without Master-PC and process program




打孔质量在线检测系统
参数设置 用户管理 数据报表 系统管理 联机启动 脱机停止 联机继续 电机控制 系统退出
产品长度（m）：
车速（m/min）：
电机位置
CU参数：
W参数：
打孔质量在线检测系统 —— 一凡软件工作室制作