

## IPM - International Perforation Management

high-tech engineering - China – Germany – Thailand

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<http://www.microperforation.com>

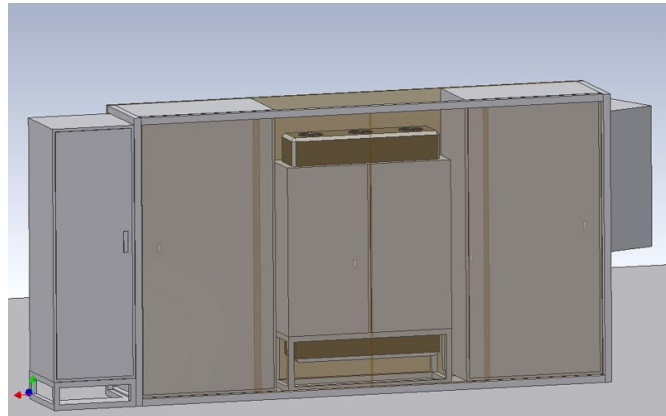
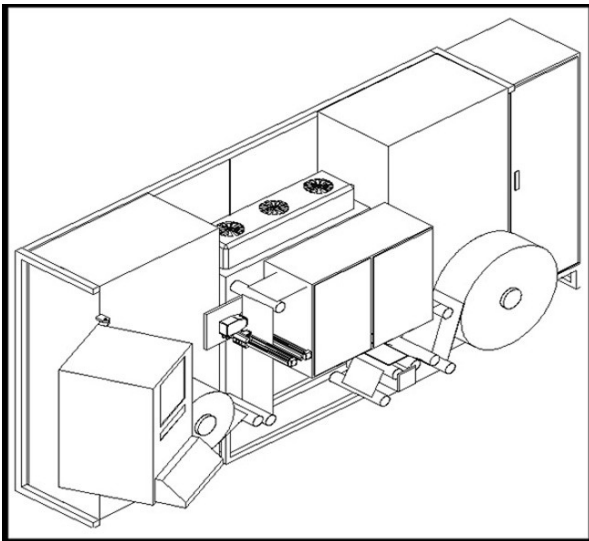
<http://www.microperforation.com.cn>

<http://www.deguodaguan.com/ipm/>

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### PS-250-4 quad bobbin perforation machine



#### Pos. 1 - Perforation system PS-250-4

- double web path system – perforation section A+B+C – cascaded in web direction
- each perforation section unit A, B and C with 8 electrode sets
- electrostatic double web path perforation of 4 bobbin width and 8 perforation zones in total
- slim-roll-by-roll production up to 24.300 meters
- 4 bobbins on each cut, up to 8 cuts with 32 bobbins on one slim roll without interruption
- **option:** quad bobbin by bobbin set production: the rewind stand can performed with a slitting and flying splice unit, two driven rewind shafts and zero meter start, slim rolls at unwind stand
- total web width up to 280 mm by 4 bobbins each of 64 mm width
- in total  $3 \times 8 = 24$  single perforation channels
- electrode housing: approx. 1400 mm wide, approx. 800 mm high, approx. 600 mm depth
- web inlet = below right, web outlet = top left
- on-line porosity control OPSS-1 scanner device just behind web outlet
- OPSS-1 scanner: approx. 320 mm wide, approx. 350 mm high, approx. 450 mm, all over dimension

- Rittal electronic cabinet: 600\*600\*2000 mm for 24 perforation channels
- Rittal high-voltage transformer box for 24 perforation channels: 1200\*800\*400 mm – assembled at rear side of the perforation unit
- machine/perforation control: 1200\*600\*600 mm, positioned as swing over panel at rewind section
- manual/automatic pulse width control 12 - 22  $\mu$ s for each perforation channel, electrode sets, coupled in eight groups of A, B, C together
- common frequency control for all perforation channels: 1000 - 6000 Hz
- hole size diameters can be influenced by variation of pulse length in ranges from 25 - 80  $\mu$ m
- hole densities/distances down web can be influenced by variation of spark repeat frequency
- perforation control of electronic cabinet from machine control unit
- **option:** automatic porosity feed-back and trend control with OPSS-1
- power consumption of perforation unit: 3\*400V/50Hz, approx. 12 KVA
- protection class and EU conformity: IP55, CE, EN55011/12
- operation range: 15 – 35 Grad C
- noise level: < 83 db(A)
- standard color: grey RAL 7032 – or others
- machine dimension: 5500 mm length, 1900 mm depth, 2100 mm high; depends of performance
- approx. machine weight: 3400 Kg; depends of technical performance

## Pos. 2 – Perforation section

- perforation housing: 1200\*800\*600 mm, three shielded windows in the front easy lift up door, noise reduced, internal EMI shielded
- base steel plate with 12 leading bars for 24 electrode sets
- 26 pieces AL chemical black coated, dust protected, smooth surface, light running web leading rollers in 80 mm diameter
- three sections of perforation electrodes sets, each equipped with 10 pieces of 1.0 mm Tungsten pins
- electrode gap: 1.5 - 1.6 mm maximal
- open/close electrode gap mechanism, one side pneumatic sliding cylinders, fixed opposite side with high voltage connection cables
- high voltage cable connectors fields embedded at rear machine base plate, high voltage transformer box added behind
- zone positioning manual/semi automatic with electrode bracket setting, pre-alignment, rough and fine adjustment across the web and with angle positioning
- electrode pin reset with slid-in plates, pneumatic open/close gaps, efficient pin resets in 5 minutes of three perforation sections
- time interval of electrode pin resets: 8-24 operating hours - depending of perforation power loading
- life time of 1.0\*80 mm Tungsten electrode pins: approx 2.500 operating hours
- electrode air cooling by two side-channel-compressors, each of 400 m<sup>3</sup>/h, 70 mbar air pressure
- plastic air pipe system, equipped with all hose connectors for 24 electrode sets
- bottom air film in blowing between double web path and absorption on the top with two vacuum devices to avoid inner paper web touches

- one side channel compressor of 140 m<sup>3</sup>/h with 40 mbar for air film in-blowing
- dust air cleaning device at web outlet
- three inner, two outer dust extraction connectors: approx. 1.500 m<sup>3</sup>/h by minimum of -10 mbar
- **note:** the dust extraction system and outside pipes are not combined by the PS-250-4 delivery

### **Pos. 3 - rewinding machine**

#### **Machine unwind/rewind stands**

- tipping paper material with a weight of 32-36 g/m<sup>2</sup>
- web width up to 300 mm
- web speed up to 600 m/min
- web tension controlled: 30 – 200 N
- inner core diameter: 120 mm on both sides, optional 66 or 70 mm
- slim roll lengths up to 25.000 meters
- slim roll weight maximal 300 Kg by 25.000 m
- slim roll diameter maximal 900 mm by 25.000 m
- acceleration time approx. 3 Second up to 400 m/min
- web guide unit and movement (E&L or Five) maximal 10 mm, web leading constancy of +/- 0.1 mm, positioned at unwind section
- 80 mm light running AL idle rollers, chemical black, dust protected, smooth surface

#### **Shaft-less unwind stand**

- Designed to handle 300 kg slim rolls with AC drive
- the stand is constructed with a solid steel base plate to give the best rigidity
- the machine is complete with a shaft-less unwind stand to handle 900 mm diameters down to a minimum of 70 mm
- the stand is complete with 120 mm (or other options) pneumatically operated concentrically expanding quick able chucks suitable for insertion into the cores
- linear slides for precision guiding which would be signaled via the lead screw and driven by fast response servo motor and drive for full guider movement of a maximum of 10 mm
- unwind tension control via PLC algorithms, AC drive and operators set reference
- operators controls, guider controls, unwind stand control are all positioned on the central control panel at rewind section
- the stand can be fitted with a splice table (optional) when specified

#### **Shaft-less rewind**

- Designed to handle 300 kg slim rolls with AC drive
- the stand is constructed with a solid steel base plate to give the best rigidity
- the machine is complete with a shaft-less unwind stand to handle 70 mm diameters up to a maximum of 900 mm
- the stand is complete with 120 mm (or other options) pneumatically operated concentrically expanding quick able chucks suitable for insertion into the cores

- rewind tension control from AC motor, digital flux vector drive signaled via PLC algorithms, operators set reference and encoder feedback
- pneumatically force controlled width lay-on roller is provided
- web fix guider before rewind shaft
- operators controls, guider controls, rewind stand control are all positioned on the central control panel at rewind section
- **option:** quad bobbin by bobbin set production: the rewind stand can performed with a slitting and flying splice unit, two driven rewind shafts and zero meter start, slim rolls at unwind stand

#### **Machine and process control, electronics, interfaces**

- Allen Bradley or Siemens S7 PLC, common 17" touch screen for machine, perforation, porovision control with OPSS-1 system
- fully process visualization, error history/message board, interlock and machine sensor indications
- AC drive configuration, parameter setting and reports
- OPSS-1 parameter setting, porovision trend setting, further information see Pos. 5
- test routines, help/support routines, Internet service support
- Electronics and pneumatic into two added cabinets on the unwind and rewind section
- power consumption of the rewinding unit: 3\*400V/50Hz, approx. 11 KVA
- system air supply and consumption: 6 bar max. 0.1 m3/h
- protection class and EU conformity: IP55, CE
- operation range: 15-35 Grad/C
- noise level: < 83 db(A)
- standard color: grey RAL 7032 – or other color

#### **Pos. 4 - Production results at Tipping paper**

- electrostatic zone perforation
- paper weight: 32-36 g/m<sup>2</sup>
- standard bobbin widths: 48 mm, 64 mm or others
- tipping paper width up to four bobbins: 280 mm
- perforation zone width: 2.0-6.0 mm
- perforation zone position constancy: +/- 0.2 mm
- zone register : centre-centre zone : minimal 22.0 mm (Z/2) – 48 mm  
centre-zone edge : minimal 12.0 mm (Z/2) – 48 mm
- holes density: 50-280 holes/cm<sup>2</sup>
- hole sizes: 25-80 µm
- hole sequence: 3.0-7. Million per Second
- **porosity range: 100 C.U.-800 C.U.**
- **max. perforation power coefficient, 3 perforation units of double web path, zone width 4.0 mm**  
**120.000 (C.U.\*m/min) ----- eg. 240 C.U. = 500 m/min, 500 C.U. = 240 m/min**
- **porosity deviation cv: with OPSS-1 < 3.0 % by 300 C.U., depends on paper quality**

## Pos. 5 – OPSS-1 porosity scanning, porosity control, feed-back system

### General data

- Laser perforation rows/groups or ESP porosity of tipping, plug-wrap or cigarette paper
- multiple sensor systems: line laser and monochromatic light source
- sensor A = perforation rows/groups or ESP zone position control
- sensor B = porosity control – simultaneously – see below details
- transmitter case with Line Laser + monochromatic light source on one side
- measuring head gap between transmitter and sensor case: 3.0 mm
- dimension of each case: length 160 mm; width 100 mm; deep 60 mm = across the web
- sensor case: AL chemical black; dust free; protection class IP 65
- mechanic connected to the scanner system: with flange plates
- geometric center 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 for different porosities, auto range function and routine
- laser line A: integrated at transmitter case - 20.0\*0.15 mm; 635 nm, 10 mW, Class 2
- light source B: light cassette with front fiber connector; stabilized Halogen light source 12V/100W; 550-650 nm; internal lamp power supply; remote controlled by AT-Mega-128-16AI sensor controller; long-life lamp operation up to 1500 hours; high-flexible, industry proof optical glass fiber
- position sensor A: real-time 64 pixel CCD-Sensor, internal control logic device
- porosity sensor B: real-time multiple color/intensity sensor system, AT-Mega-128-16AI
- sensor output A+B: pre-signal conditioning by AT-Mega-128-16AI controller Firmware
- communication via ASCII-commands, fast RS-232 link up to 256 Kbaud or RS-422
- 19" rack equipment: 230V/AC/250VA/50Hz; sensor power supply 24V/2A - 5V/1A; light cassette, interfacing and RS-232 link connectors
- CE electrical conformity of the OPSS-1 system
- absolute position control via ASM magnet resistive position Sensor system in lengths from 300-2000 mm; base resolution of +/- 30 µm; direct connected to sensor controller
- cleaning device and positioned air blowing nozzle

### Porosity data

- total porosity measuring range: 80-3000 C.U.
- **range A: 80 - 200 C.U. maximal +/- 4 C.U.**
- **range B: 201 - 600 C.U. Maximal +/- 6 C.U.**
- **range C: 601 - 3000 C.U. maximal +/- 20 C.U.**
- optical integration of measuring window of Sensor B: approx. 12 mm
- possible ESP perforation zone detection: 1.0-8.0 mm
- possible Laser perforation rows/groups: from 1-8 single lines for each porosity detection and control by maximal 8 mm group width
- minimum distances between Laser lines or perforation zones: 1.0 mm
- scanning speed: 20 - 200 mm/Second

### Sensor controller, position/porosity detection

- OPSS-1 Firmware 0.12 - up/down loading via high-speed RS-232 or RS-422 link
- RS-232 fast link up to 256 KBaud, optional via RS-422 bi-directional link
- Sensor firmware source code: Pascal program language
- measuring data exchanging between Master-PC and OPSS-1-Sensor system: commands send to the Sensor; receive data, setting/storage/reading parameters in order of the command list
- porosity calculation: four envelope curves; their integral values, different mathematical formulas, data calculation of porosity output in C.U., paper offset value, etc. see the Manual description
- additional procedure: porosity calibration; setting of Halogen lamp intensity; reference position, paper position edges etc. in order of commands and procedure list
- option: simultaneously acquisition and data output of each perforation zone/line position and their perforation quantity, as well for all optical porosity integrals via internal calculated envelope curves of multiple colors/ intensity, paper offset values – data exchanging to the Master PC- process software
- rough data Tool program: monitoring/display envelope curves, positioning line laser, etc.
- test possibilities: LAPTOP/PC; Hyper-Terminal without Master-PC process software

### General data mechanical scanning system

- paper working web width up to 300 mm from 1 up to 4 bobbin sets
- twin mechanical tooth belt driven scanner axis with one stepping motor
- precisions spindle axis with internal reference switch and dust protected sliding bars
- stepping motor and control unit with half step operation – USB connected to master PC/PLC
- absolute position control via ASM magnet resistive position Sensor for the entire stroke length plus 15mm; base resolution of +/- 30  $\mu$ m; direct connected to the sensor controller
- system performance, details, dimensions in order of base drawings
- fully assembled, integrated in a ultra stable AL-frame – see drawings
- OPSS-1 system positioned just after perforation section and web out coming
- base frame with two 80 mm AL light running idle rollers for stable and precise web leading
- geometrical alignment of the scanner device: +/- 0.1 mm in all dimensions of X,Y and Z axis
- sensor measuring gap cleaning unit, positioned close to the first inner reference point

### PC control system and cabinet

- 19" electronic performance integrated into the swinging operation panel at rewind section
- scanning controller, power supplies, master PC, 17" TFT touch screen, keyboard, machine interface
- industry PC 1.8 GHz duo-core, 100GB-HD/1024MB, CD-R/W-ROM, USB's, etc.
- two process programs: OPSS-1 Master process software, OPSS-1 Sensor Real-Time Firmware
- master PC with MS-Windows XP Professional or Beckhoff TwinCAD real time operation system
- **alternative**: Allen/Bradley or Siemens S7 master operation
- process visual for all perforation channels and graphic recordings
- base program language: C++, Visual Basic or object orientated PLC
- network with production control center/quality management – depends of the local application field

## Multiple real time process software for porosity control

- real time recording, statistic calculations of positions, quality changes of each ESP zones – Sensor A
- real time porosity recording, statistic calculations of each perforation zone in C.U., cv in %, warning levels and alarm limits during production – Sensor B
- real time records of paper offset at non-printed gaps by each scanning turn
- statistic summary of each production roll/bobbin: date-time stamp, job number, roll number, production length, channel or Laser line group numbers, porosity results in C.U., cv, warnings, alarms, positions
- ESP perforation zone or Laser line group qualities, quantities
- number of calculated porosity values from each ESP perforation zone: up to 4000 single values by 20.000 production meters
- e.g. by web speed of 200 m/min up to 160.000 values for one production roll with 40 perforation channels, 20 bobbin sets, by 50-200 mm/Sec. scanning speed
- real time process visualization of ESP zone position, widths, continuous quality control
- base measurement functions: real time ESP single zone operation, multiple zone operation, full process visualization during production
- easy calibration and feedback control to the ESP (OPSS-1/C controller system) perforation system
- **option:** network or manual inputs of static porosity values (Borgwaldt or Filtrona) according to each perforation zones to keep the OPSS-1 measurement levels precise and drift free to the static measurement level without further calibrations
- single bobbin and roll data storage, up to 500 rolls or 5000 bobbins, statistical results of each bobbin, bobbin cuts, each roll, group of rolls, etc.
- **option:** network/data transfer to the quality control center QC
- **option:** Hard/Software modules for automatic porosity control of IPM PS-250, PS-250-2, PS-250-4, PS-1200, PS-1600 perforation or Laser perforation machines
- program language: English, Mandarin or German
- complete roll certification in terms of ISO 9002

## Pos. 6 – tipping paper production output

- web width up to 4\*50 mm bobbins, 24 perforation channels – 3 times cascaded
- perforation power with triple section and double web path on each - zone width of 4.0 mm  
perforation power coefficient 120.000 C.U.\*m/min, 240 C.U. = 410 m/min, 500 C.U. = 200 m/min
- porosity deviation cv – with OPSS-1 < 3.0 % by 300 C.U. - depends on paper quality
- porosity deviation cv – without OPSS-1 < 4.0 % by 300 C.U. - depends on paper quality

## Tipping paper – 50 mm Bobbins – Slim-Roll-by-Slim-Roll-Production

**slim roll length: 15.300 meters** – 4 bobbins wide = 200 mm web width – each bobbin width of 50 mm  
6 kg of each bobbin - one slim roll = 20 bobbins

### **example A: 290 C.U. – web speed 410 m/min**

- slim roll exchanging time unwind/rewind: approx. 12 min
- running time of one slim-roll by 290 C.U. = 37 min = 20 bobbins
- production efficiency: approx. 90 % - breaks, cleaning, shift changing, etc.
- shift output:  $((480 \text{ min} \cdot 0.9) / (37 \text{ min} + 12 \text{ min})) \cdot 20 \text{ bobbins} \approx 176 \text{ bobbins}$
- daily output by 3 shifts:  $3 \cdot 176 \text{ bobbins} = 528 \text{ bobbins}$
- output by 312 working days/a:  $312 \cdot 528 \text{ bobbins} = 164.736 \text{ bobbins/year} = 8236 \text{ slim rolls}$
- **annual amount: 164.736 bobbins \* 6 Kg/bobbin = 988 tons/a**
- wasted paper by 200 meter start-up on each slim roll
- **1.291.600 meter = 8.7 tons/a = 0.8 %**

**each slim roll is to slit after perforation – result 20 bobbins of each roll**

### **example B: 600 C.U. – web speed 200 m/min**

- slim roll exchanging time unwind/rewind: approx. 12 min
- running time of one slim-roll by 600 C.U. = 76 min = 20 bobbins
- production efficiency: approx. 90 % - breaks, cleaning, shift changing, etc.
- shift output :  $((480 \text{ min} \cdot 0.9) / (76 \text{ min} + 12 \text{ min})) \cdot 20 \text{ bobbins} \approx 98 \text{ bobbins}$
- daily output by 3 shifts:  $3 \cdot 98 \text{ bobbins} = 294 \text{ bobbins}$
- output by 312 working days/a:  $312 \cdot 294 \text{ bobbins} = 91.728 \text{ bobbins/year} = 4586 \text{ slim rolls}$
- **annual amount : 91.728 bobbins \* 6 Kg/bobbin = 550 tons/a**
- **wasted paper by 200 meter start-up each roll: 720.600 meter = 4.9 t/a = 0.8 %**

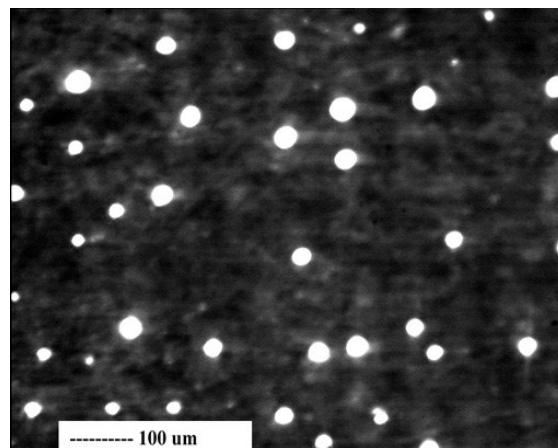
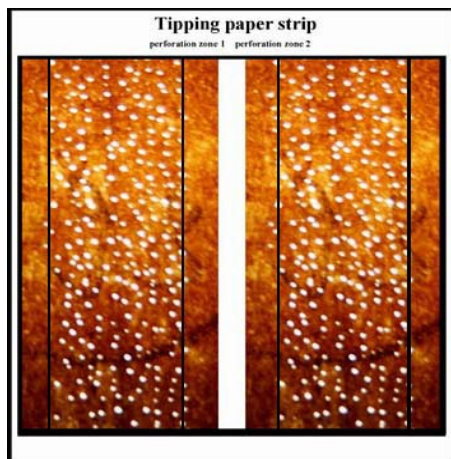
**each slim roll is to slit after perforation – result 20 bobbins of each roll**

### **General Remarks**

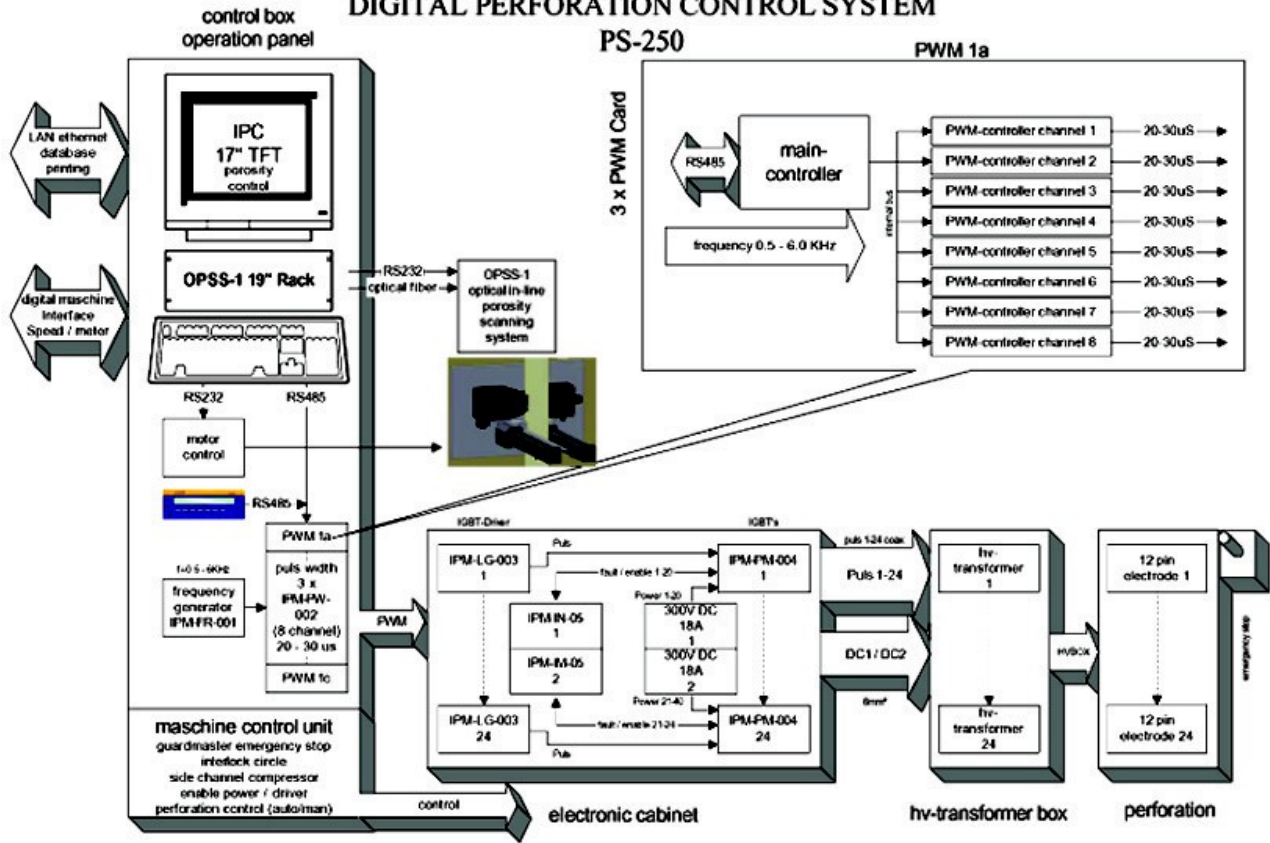
We reserve the right to incorporate changes and modifications of the equipment by which the performance and operation are not influenced.

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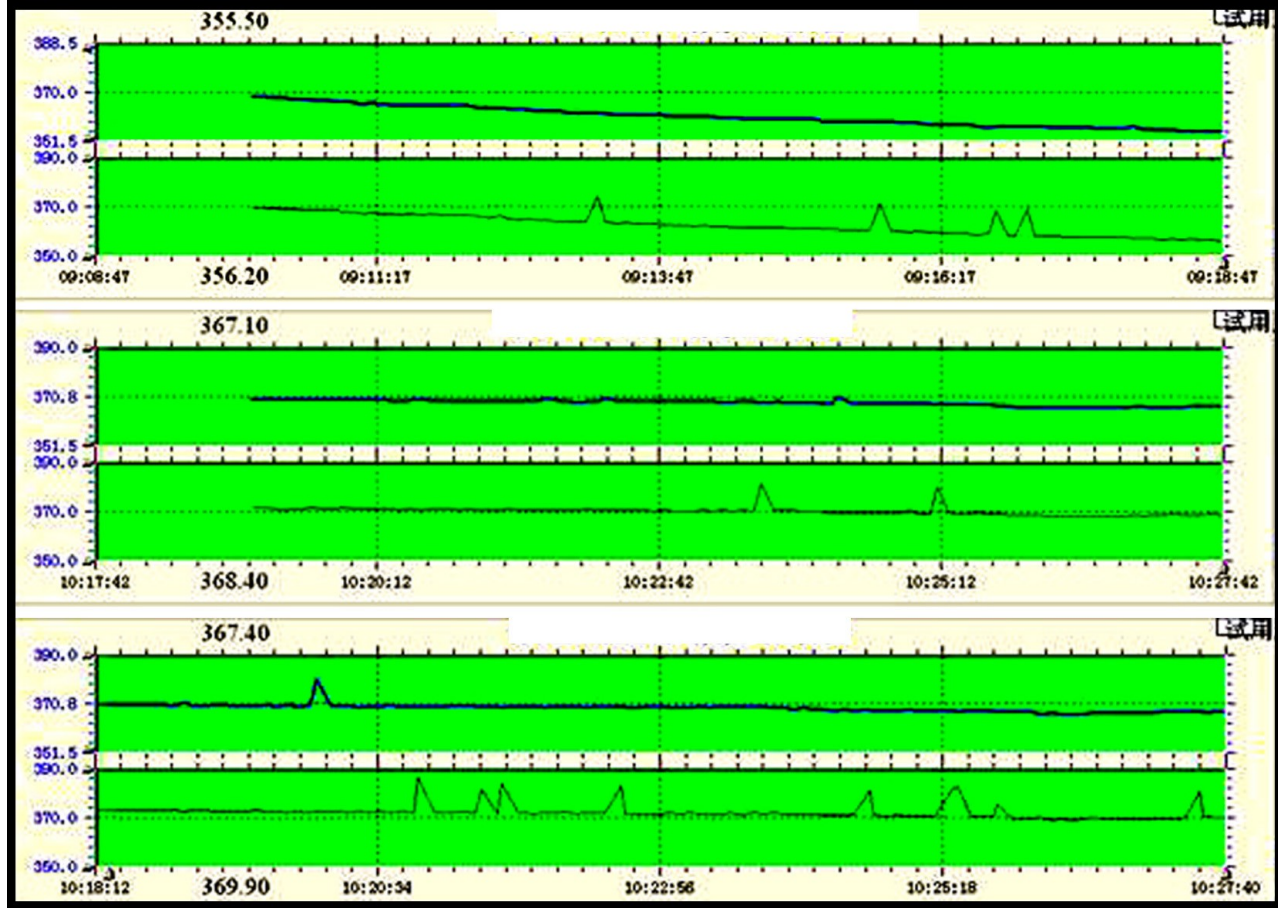
### **perforation examples**



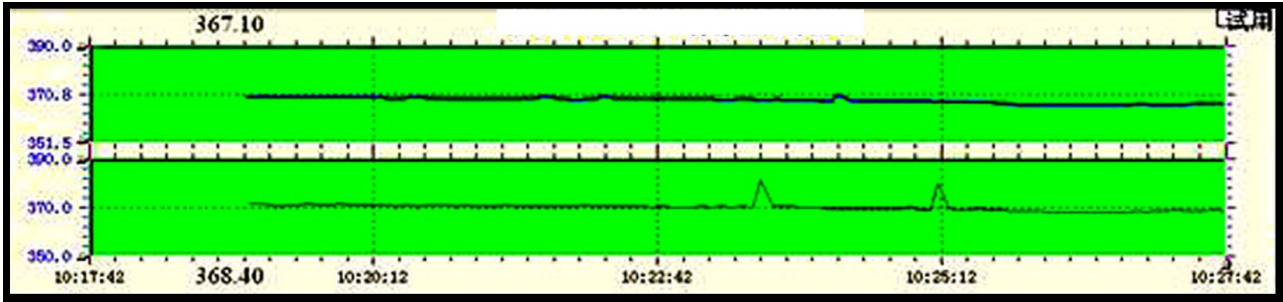
# IPM DIGITAL PERFORATION CONTROL SYSTEM



without porovision control



with porovision control



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

```

READY
READY
ZERO OK
READY
SEARCH FPOS
FPOS= 26.9mm
FPOSR=276.8mm
READY SEARCH ZONE
ZONE 1= 53.6/ 54.8mm
GAP = 64.8/ 68.1mm
ZONE 2= 77.9/ 79.0mm
GAP = 93.9/ 97.2mm
ZONE 3= 111.8/ 113.1mm
GAP = 123.0/ 126.3mm
ZONE 4= 136.2/ 137.4mm
GAP = 152.1/ 155.4mm
ZONE 5= 170.0/ 171.4mm
GAP = 181.2/ 184.5mm
ZONE 6= 194.4/ 195.8mm
GAP = 210.4/ 213.7mm
ZONE 7= 228.3/ 229.6mm
GAP = 239.5/ 242.6mm
ZONE 8= 252.6/ 254.0mm
GAP =
ENDZONE
READY
READY
ZONE 1
RED= 46%
GREEN= 47%
BLUE= 72%
INTENS= 55%
LAMP: 70%
ZONE 2
RED= 43%
GREEN= 43%
BLUE= 67%
                
```

ZONE8= 348.5 CU

Command2:

Command3:

```

SEARCH ZONE
ZONE 1= 53.6/ 54.8mm
GAP = 64.8/ 68.1mm
ZONE 2= 77.9/ 79.0mm
GAP = 93.9/ 97.2mm
ZONE 3= 111.8/ 113.1mm
GAP = 123.0/ 126.3mm
ZONE 4= 136.2/ 137.4mm
GAP = 152.1/ 155.4mm
ZONE 5= 170.0/ 171.4mm
GAP = 181.2/ 184.5mm
ZONE 6= 194.4/ 195.8mm
GAP = 210.4/ 213.7mm
ZONE 7= 228.3/ 229.6mm
GAP =
                
```

|    | 1     | 2     | 3     | 4    | 5     | 6     | 7     | 8     |
|----|-------|-------|-------|------|-------|-------|-------|-------|
| CU | 349.9 | 347.9 | 348.1 | 380. | 347.8 | 344.8 | 347.2 | 348.5 |
| CU |       |       |       |      |       |       |       |       |
| W  | 1.2   | 1.1   | 1.3   | 1.2  | 1.4   | 1.4   | 1.3   | 1.4   |
| SP | 27.9  | 23.1  | 32.8  | 23.1 | 32.6  | 23    | 32.5  | 23    |

产品长度 (m):

车速 (m/min):

电机位置: 347847

CU参数:  FPOS:

W参数:  FPOSR: