

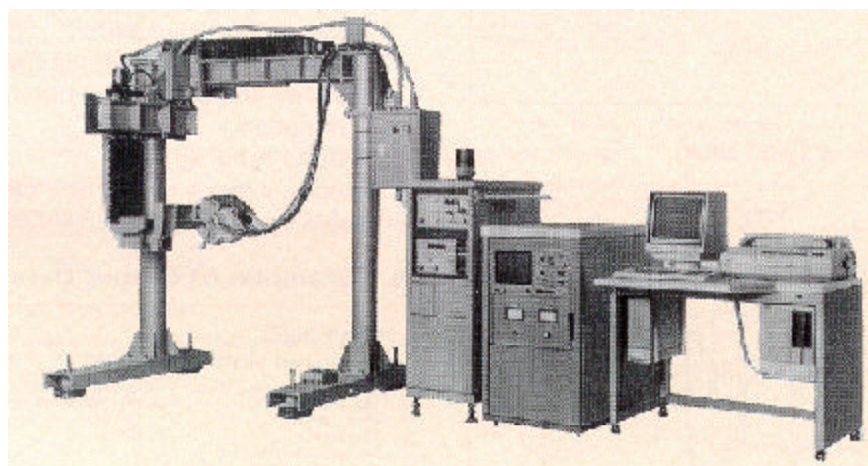
Product Information

RAPID X-RAY STRESS ANALYZER PSPC/MSF SYSTEM

1. Introduction

At the present stage where we are making the most of the properties of metal since its utility was discovered, the degree of working on various metals has reached the extreme. As a result, there is a frequent occurrence of problems these days concerning residual stress and the like. The problems of damage, corrosion, etc. due to such stresses have recently been more highlighted with the use of SUS materials for boilers, pipings and so on. To cope with this situation, researches are being made to in methods for relieving residual stress by analyzing different types of large and small samples having polygonal forms in a short time.

1) Overall View

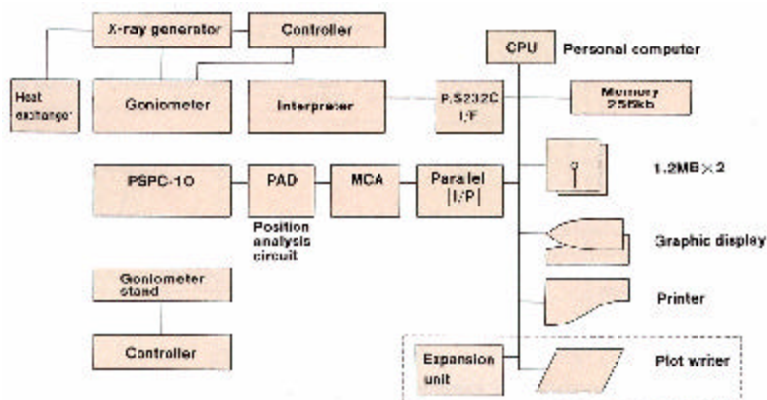


2. Configuration

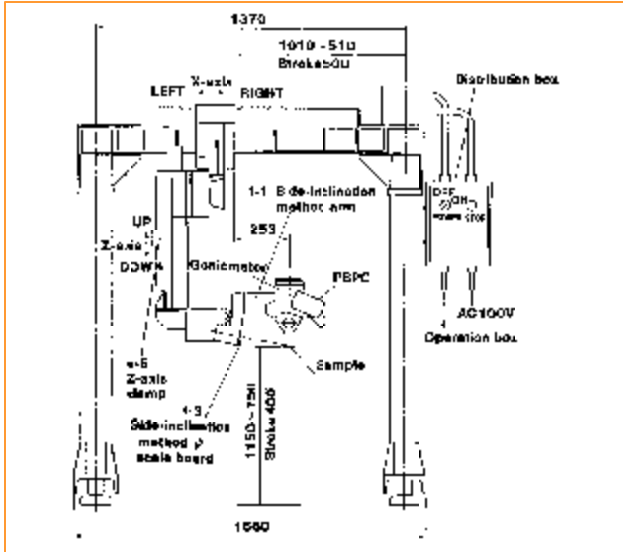
The stress measurement method by the use of X-rays offers a tool for such analytical researches. Among X-ray stress analyzers, the PSPC/MSF system is the first of this type equipped with a position sensitive detector. The system has reduced the measurement time to 1/10 to 1/100 or more compared with the conventional scanning type.

This reduction in measurement time is advantageous to the detection of very small peaks unrelated to the irradiation field and to the detection of weak peaks when the irradiation field is narrowed to 0.5 x 0.5 mm or less, so that a more precise and detailed stress distribution can be obtained regarding residual stress.

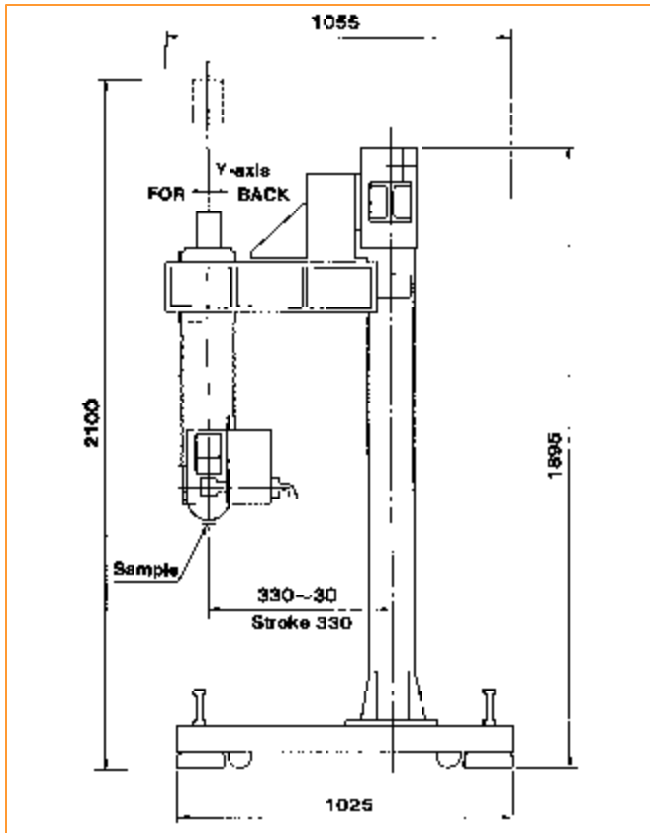
2) Block diagram



3) Measuring Head (front view)



4) Measuring Head (side view)



3. Features

1) Compared with the conventional scanning type, the measurement time has been reduced to 1/10 to 1/100 or more. This is because information on the whole measuring angle range is simultaneously received by a position sensitive proportional counter

(PSPC) and is separated into 256 - 4096 channels for subsequent discrimination by a position analysis circuit. Accordingly, those peaks which have so far been regarded as un-measurable because of their broad FWHM or weak intensities can be properly handled by measurement for 600 seconds or longer.

2) Very small areas can be measured. When the irradiation field is limited to an exceedingly small area of $0.5 \times 0.5 \text{ mm}^2$ or less, the X-ray diffraction intensity will decrease to 1/10 to 1/100. The PSPC displays its high performance in peak detection in such a case. It permits stress measurement of a micro region so that a distribution state of residual stress is analyzable more precisely and minutely than ever.

3) Data processing is included in the standard configuration. Software is provided for:

Background elimination

Peak search (FWHM, the method of center of gravity, the parabola method)

Smoothing

Stress value kg/mm^2

Besides, either a printer or a plotter is selectively available for output of the result.

4. Examples of Output Data

Example 1.

Input Data Processing Method

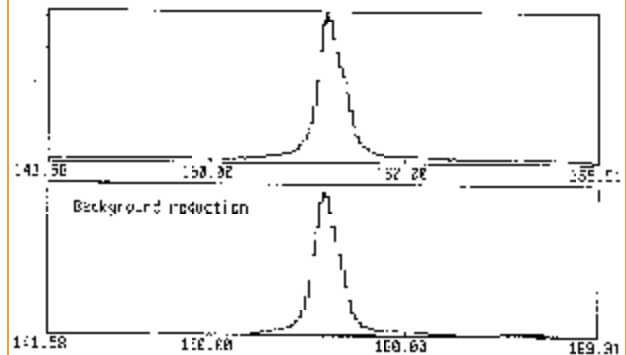
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Start angle      : 141.575
Stop angle      : 152.311
Full scale      : 22334
Background reduction : 1
Background point : 5
L.F.B correction : 1
Peak search method : 1
Parabola point   : 4
Print out (E:No, I:Yes) : 0
Smoothing point : 2
Plotter (E:No, I:Yes) : 0
    
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Data Processing 0 --- No execution, 1 --- execution
Peak search method 1 --- FWHM middle point method
                  2 --- Center of gravity method
                  3 --- Parabola method
Back point < Data numbers / 2 ((x1EB points))
Smoothing point(N) *B --- No execution, *2:Input smoothing point)
Plotter 0 --- No execution, 1 --- execution
    
```

Print/Plot = 0 Sample Name : 34W



Example 2.

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***** RESULTS OF PEAK SEARCH *****
MEASURE MODE=MSF
SMOOTHING DATA : 7
PEAK SEARCH METHOD=FWHM MIDDLE POINT
PSID = 30.00 deg
PSI = 30.00 deg
FIXED TIME= 70.0 sec
2 THETA PEAK ANGLE = 156.06 deg
MAX. INTENSITY = 2949.0
FWHM = 1.31 deg
INTEGRAL BREADTH = 1.96 deg
INTEGRATED INTENSITY = 34720.0

***** RESULTS OF PEAK SEARCH *****
MEASURE MODE=MSF
SMOOTHING DATA : 7
PEAK SEARCH METHOD=FWHM MIDDLE POINT
PSID = 40.00 deg
PSI = 40.00 deg
FIXED TIME= 70.0 sec
2 THETA PEAK ANGLE = 156.29 deg
MAX. INTENSITY = 2468.0
FWHM = 1.61 deg
INTEGRAL BREADTH = 2.10 deg
INTEGRATED INTENSITY = 3147.0

***** RESULTS OF PEAK SEARCH *****
MEASURE MODE=MSF
SMOOTHING DATA : 7
PEAK SEARCH METHOD=FWHM MIDDLE POINT
PSID = 45.00 deg
PSI = 45.00 deg
FIXED TIME= 70.0 sec
2 THETA PEAK ANGLE = 156.32 deg
MAX. INTENSITY = 2364.0
FWHM = 1.50 deg
INTEGRAL BREADTH = 2.11 deg
INTEGRATED INTENSITY = 29042.0

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STRESS = -16.33 kgf/mm²
 1 SIGMA RELIABILITY = +- 0.72 kgf/mm²
 SLOPE = 0.5431 deg
 2 THETA ANGLE (AT PSI=0) = 156.058 deg

