

**WHAT IS CLAIMED IS:**

1. A representative value calculating apparatus comprising:

a first calculation unit which calculates a median value and a median absolute deviation (MAD), or a mean value and a standard deviation of process condition values for each sampling point, by using the process condition values which have been measured through a sensor for the each sampling point for each sample;

a second calculation unit which calculates standardized values by using the process condition values, the median value, and the median absolute deviation (MAD), or calculates standardized values by using the process condition values, the mean value, and the standard deviation; and

a third calculation unit which calculates a representative value of the process condition values for the each sample based on the calculated standardized values.

2. The representative value calculating apparatus of claim 1, further comprising:

an extraction unit which extracts only the process condition values corresponding to sampling points which have been set by a user among the measured process condition values.

3. The representative value calculating apparatus of claim 1, wherein the first calculation

unit calculates the median absolute deviation (MAD) by using Equation 1:

Equation 1

$$MAD = a * \text{Median}(|X_i - \text{Median}(X_i)|)$$

here,  $a$  is a correction factor making the MAD identical with a standard deviation for a normal distribution,  $X_i$  is a process condition value,  $X_j$  is a median value, and  $\text{Median}(X)$  is a function calculating a median value among  $X$  variables.

5        4.        The representative value calculating apparatus of claim 1, wherein the second calculation unit calculates the standardized value by using Equation 2:

Equation 2

Standardized value =  $(X_i - X_j) / \text{Median Absolute Deviation (MAD)}$

here,  $X_i$  is a process condition value, and  $X_j$  is a median value.

10        5.        The representative value calculating apparatus of claim 1, wherein the second calculation unit calculates the standardized value by using Equation 3:

Equation 3

Standardized value =  $(X_i - \text{Mean value}) / \text{Standard Deviation}$

15        here,  $X_i$  is a process condition value.

6.        The representative value calculating apparatus of claim 1, wherein the third calculation unit calculates a representative value of the process condition values based on any one of a mean value, a median value, a mode, a minimum value, a maximum value, and a standard deviation of the calculated  
20        standardized values.

7.        The representative value calculating apparatus of claim 1, further comprising:

a controller which displays at least one of the standardized values for the each sampling point, the calculated representative value for the each sample, and an accumulated sum of the calculated representative value for the each sample in a display unit.

5           8.       The representative value calculating apparatus of claim 1, wherein the process condition comprises at least one of a temperature, a pressure, a time, and a location of a product.

9.       A representative value calculating method comprising:

10           calculating a median value and a median absolute deviation (MAD), or a mean value and a standard deviation of process condition values for each sampling point, by using the process condition values which have been measured through a sensor for the each sampling point for each sample;

15           calculating standardized values by using the process condition values, the median value, and the median absolute deviation (MAD), or calculating standardized values by using the process condition values, the mean value, and the standard deviation; and

          calculating a representative value of the process condition values for the each sample based on the calculated standardized values.

20           10.       The representative value calculating method of claim 9, further comprising:

          extracting only the process condition values corresponding to sampling points which have been set by a user among the measured process condition values.

25           11.       The representative value calculating method of claim 9, wherein calculating the median value and the median absolute deviation (MAD), or the mean value and the standard deviation comprises calculating the median absolute deviation (MAD) by using Equation 1:

Equation 1

$$\text{MAD} = a * \text{Median}(|X_i - \text{Median}(X_j)|)$$

here,  $a$  is a correction factor making the MAD identical with a standard deviation for a normal distribution,  $X_i$  is a process condition value,  $X_j$  is a median value, and  $\text{Median}(X)$  is a function calculating a median value among  $X$  variables.

12. The representative value calculating method of claim 9, wherein calculating the standardized values comprises calculating the standardized value by using Equation 2:

Equation 2

$$\text{Standardized value} = (X_i - X_j) / \text{Median Absolute Deviation (MAD)}$$

here,  $X_i$  is a process condition value, and  $X_j$  is a median value.

13. The representative value calculating method of claim 9, wherein calculating the standardized value comprises calculating the standardized value by using Equation 3:

Equation 3

$$\text{Standardized value} = (X_i - \text{Mean value}) / \text{Standard Deviation}$$

here,  $X_i$  is a process condition value.

14. The representative value calculating method of claim 9, wherein calculating the representative value comprises calculating the representative value of the process condition values based on any one of a mean value, a median value, a mode, a minimum value, a maximum value, and a standard deviation of the calculated standardized values.

15. The representative value calculating method of claim 9, further comprising:
- displaying at least one of the standardized values for the each sampling point, the calculated representative value for the each sample, and an accumulated sum of the calculated representative value for the each sample in a display unit.

## **WHAT IS CLAIMED IS:**

### 1. A representative value calculating apparatus comprising:

a first calculation unit which calculates a median value and a median absolute deviation (MAD), or a mean value and a standard deviation of process condition values for each sampling point, by using the process condition values which have been measured through a sensor for the each sampling point for each sample;

a second calculation unit which calculates standardized values by using the process condition values, the median value, and the median absolute deviation (MAD), or calculates standardized values by using the process condition values, the mean value, and the standard deviation; and

a third calculation unit which calculates a representative value of the process condition values for the each sample based on the calculated standardized values;

wherein the first calculation unit calculates the median absolute deviation (MAD) by using Equation 1:

Equation 1

$$\text{MAD} = a * \text{Median}(|X_i - \text{Median}(X_j)|)$$

here,  $a$  is a correction factor making the MAD identical with a standard deviation for a normal distribution,  $X_i$  is a process condition value,  $X_j$  is a median value, and  $\text{Median}(X)$  is a function calculating a median value among  $X$  variables.

### 2. The representative value calculating apparatus of claim 1, further comprising:

an extraction unit which extracts only the process condition values corresponding to sampling points which have been set by a user among the measured process condition values.

3. The representative value calculating apparatus of claim 1, wherein the second calculation unit calculates the standardized value by using Equation 2:

Equation 2

$$\text{Standardized value} = (X_i - X_j) / \text{Median Absolute Deviation (MAD)}$$

here,  $X_i$  is a process condition value, and  $X_j$  is a median value.

4. The representative value calculating apparatus of claim 1, wherein the second calculation unit calculates the standardized value by using Equation 3:

Equation 3

$$\text{Standardized value} = (X_i - \text{Mean value}) / \text{Standard Deviation}$$

here,  $X_i$  is a process condition value.

5. The representative value calculating apparatus of claim 1, wherein the third calculation unit calculates a representative value of the process condition values based on any one of a mean value, a median value, a mode, a minimum value, a maximum value, and a standard deviation of the calculated standardized values.

6. The representative value calculating apparatus of claim 1, further comprising:

a controller which displays at least one of the standardized values for the each sampling point, the calculated representative value for the each sample, and an accumulated sum of the calculated representative value for the each sample in a display unit.

7. The representative value calculating apparatus of claim 1, wherein the process condition comprises at least one of a temperature, a pressure, a time, and a location of a product.

8. A representative value calculating method comprising:

calculating a median value and a median absolute deviation (MAD), or a mean value and a standard deviation of process condition values for each sampling point, by using the process condition values which have been measured through a sensor for the each sampling point for each sample;

calculating standardized values by using the process condition values, the median value, and the median absolute deviation (MAD), or calculating standardized values by using the process condition values, the mean value, and the standard deviation; and

calculating a representative value of the process condition values for the each sample based on the calculated standardized values;

wherein calculating the median value and the median absolute deviation (MAD), or the mean value and the standard deviation comprises calculating the median absolute deviation (MAD) by using Equation 1:

Equation 1

$$MAD = a * \text{Median}(|X_i - \text{Median}(X_j)|)$$

here, a is a correction factor making the MAD identical with a standard deviation for a normal distribution,  $X_i$  is a process condition value,  $X_j$  is a median value, and  $\text{Median}(X)$  is a function calculating a median value among X variables.

9. The representative value calculating method of claim 8, further comprising:

extracting only the process condition values corresponding to sampling points which have been set by a user among the measured process condition values.

10. The representative value calculating method of claim 8, wherein calculating the standardized values comprises calculating the standardized value by using Equation 2:

Equation 2

$$\text{Standardized value} = (X_i - X_j) / \text{Median Absolute Deviation (MAD)}$$

here,  $X_i$  is a process condition value, and  $X_j$  is a median value.

11. The representative value calculating method of claim 8, wherein calculating the standardized value comprises calculating the standardized value by using Equation 3:

Equation 3

$$\text{Standardized value} = (X_i - \text{Mean value}) / \text{Standard Deviation}$$

here,  $X_i$  is a process condition value.

12. The representative value calculating method of claim 8, wherein calculating the representative value comprises calculating the representative value of the process condition values based on any one of a mean value, a median value, a mode, a minimum value, a maximum value, and a standard deviation of the calculated standardized values.

13. The representative value calculating method of claim 8, further comprising:

displaying at least one of the standardized values for the each sampling point, the calculated representative value for the each sample, and an accumulated sum of the calculated representative value for the each sample in a display unit.