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**Geometrical Product Specification
(GPS)—Surface texture :
Profile method—Metrological
characteristics of phase correct
filters**

ICS 17.040.20

Descriptors : roughness (surface), geometric surfaces, surface treatment

Reference number : JIS B 0632 : 2001 (E)



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Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee according to the proposal of establishing a Japanese Industrial Standard from the Japanese Standards Association (JSA), with a draft of Industrial Standard based on the provision of Article 12 Clause 1 of the Industrial Standardization Law.

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Geometrical Product Specification (GPS)— Surface texture : Profile method— Metrological characteristics of phase correct filters

Introduction This Japanese Industrial Standard has been prepared based on **ISO 11562 Geometrical Product Specifications (GPS)—Surface texture : Profile method—Metrological characteristics of phase correct filters** published in 1996 without modifying the technical contents.

This Standard is a Geometrical Product Specification (GPS) standard and is to be regarded as a General GPS standard (see **TR B 0007**). It influences chain links 2 and 3 of the chains of standards for roughness profile and waviness profile and chain link 2 of the chain of standards for primary profile and is envisaged also to cover roughness and other form characteristics.

For more detailed information of the relation of this standard to other standards and the GPS matrix model, see annex B.

For digital instruments, the appropriate filter for surface profile information is a phase correct filter. The chosen weighting function, for the phase correct filter, is Gaussian with a 50 % transmission at the cut-off wavelength. This provides a transmission characteristic with a relatively sharp cut-off.

It is of importance that the transmission for the cut-off wavelength is 50 % since the short wave and long wave portions of the surface profile are separated and can be recombined without altering the surface profile.

“Information” underlined with dots in this Standard is the matter not stated in the original International Standard.

Remarks : **TR B 0007** is identical with **ISO/TR 14638 : 1995 Geometrical Product Specifications (GPS)—Master plan**.

1 Scope This Standard specifies the metrological characteristics of phase correct filters for the measurement of surface profiles. In particular it specifies how to separate the long and short wave content of a surface profile.

Remarks : The International Standard corresponding to this Standard is as follows.

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standard and **JIS** are IDT (identical), MOD (modified), and NEQ (not equivalent) according to **ISO/IEC Guide 21**.

ISO 11562 : 1996 *Geometrical Product Specifications (GPS)—Surface texture : Profile method—Metrological characteristics of phase correct filters* (IDT)

2 Definitions For the purposes of this Standard, the following definitions apply.

2.1 profile filter Filter which separates profiles into longwave and shortwave components.

2.1.1 phase correct profile filter Profile filter which does not cause phase shifts which lead to asymmetrical profile distortions.

2.2 phase correct filter mean line (mean line) Long wave profile component which is determined for any point of the profile by a weighted mean value derived from adjacent points (hereafter referred to as "mean line").

2.3 transmission characteristic of a filter Characteristic which indicates the amount by which the amplitude of a sinusoidal profile is attenuated as a function of its wavelength.

2.4 weighting function Function for calculating the mean line which indicates for each point the weight attached by the profile in the neighbourhood of that point.

Note : The transmission characteristic of the mean line is the Fourier transformation of the weighting function.

2.5 cut-off wavelength of the phase correct filter Wavelength of a sinusoidal profile of which 50 % of the amplitude is transmitted by the profile filter.

Note : Profile filters are identified by their cut-off wavelength value.

2.6 transmission band for profiles Band of sinusoidal profile wavelengths which are transmitted at more than 50 % when two phase correct filters of different cut-off wavelengths are applied to the profile.

Note : The profile filter with the shorter cut-off wavelength retains the long wave profile component and the profile filter with the longer cut-off wavelength retains the short wave profile component.

2.7 cut-off ratio Ratio of the long wavelength characteristic cut-off to the short wavelength characteristic cut-off of a given transmission band.

3 Characteristics of phase correct profile filters

3.1 Weighting function for the phase correct profile filter The weighting function of the phase correct filter (see figure 1) corresponds to the equation of the Gaussian density function. With the cut-off wavelength λ_{co} (where co = cut-off), the equation is as follows:

$$s(x) = \frac{1}{\alpha \lambda_{co}} e^{-\pi \left(\frac{x}{\alpha \lambda_{co}} \right)^2} \dots\dots\dots (1)$$

where

x is the position in relation to the centre of the weighting function;

λ_{co} is the cut-off wavelength of the profile filter;

$$\alpha = \sqrt{\frac{\ln 2}{\pi}} = 0.469 \ 7 \dots\dots\dots (2)$$

Information : The phase correct profile filter stated above has the byname of "Gaussian filter".