Drawing Indication

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Considerations

- Traverse Length?

- Cut-off?

- Form Type?

- Filter type?

- Number of Cut-offs?

- Appropriate Parameters?

- Tip Type / Radius?

- Bandwidth?

- Where to measure?

- Lay / Direction Of Measurement?

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Early / Obsolete Methods

Indication	Maximum Permissible Value Rt (µm)				Meaning
	Row 1	Row 2	Row 3	Row 4	
No Sign	Free	Free	Free	Free	No specific Demands on the Surface
~	Free	Free	Free	Free	Demands Concerning Consistency and Look
▽	160	100	63	25	surfaces with a roughness which must not exceed the maximum permissible Rt Value
▽▽	40	25	16	10	
▽▽▽	16	6.3	4	2.5	
▽▽▽▽	-	1	1	0.4	

- Triangle symbols are used on many drawings
- This method is no longer valid and was cancelled in 1978
- It has been superseded by ISO 1301

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Triangle Symbols are obsolete.

Use of 'N' number to indicate surface finish indication is also obsolete.

Graphical Symbols For Surface Texture

6.8
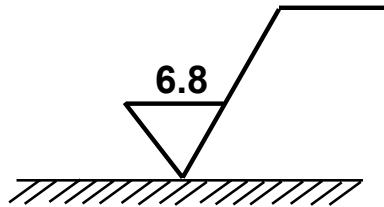
Conventional Surface Texture Symbol

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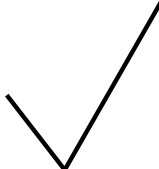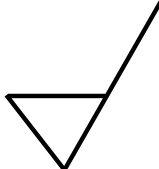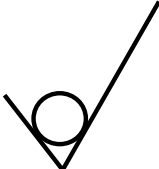TAYLOR HOBSON®

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The above slide shows the conventional method of indicating a surface finish requirement on a technical drawing, implying to someone measuring the surface that a maximum Ra value of 6.8μm is allowed. The symbol would also indicate the maximum allowable surface finish to the person producing the surface.

This method of indication is open to a lot of interpretation. It does not tell the machinist how to achieve the required finish nor whether removal of any material to achieve the specified finish is allowed. No information is given to the person measuring the surface as to which parameter is being measured, which cut-off is to be used, which filter type should be used nor whether the specified value is in fact the maximum allowable value.

To improve clarification of how surface texture is specified on technical drawings the international standard, ISO 1302:1999, has been produced. The above slide shows the three basic graphical symbols used with complementary information to indicate surface texture requirements. Each symbol has the basic following meaning:

1. Indicates that a requirement for surface texture exists but does not say if removal of material to achieve the specified finish is allowed or required.

2. Indicates that the removal of material by machining is required to obtain the required finish.

3. Indicates that removal of material is not permitted to obtain the required finish. This symbol would probably be used on a coated surface.

Graphical Symbols For Surface Texture

(c) Turned
(a) 0.0025-0.8/Rz 6.8
(b) 0.0025-0.8/Ra 2.2

(e) 3   **(d) ⊥**
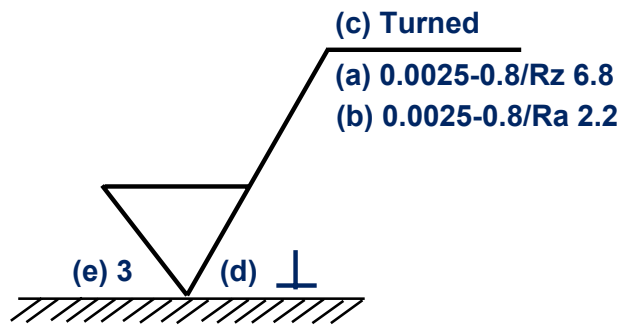
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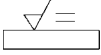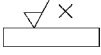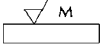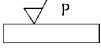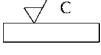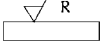
In order to ensure unambiguity when specifying surface finish requirements it is necessary to to add the the indication of the following:

(a)= Bandwidth/sample length/parameter numerical value

(b)= can be used for more parameter values

(c)= manufacturing method

(d)= surface lay & orientation

(e)= machining allowance

The above symbol indicates that the removal of material by turning is required to achieve an Ra value of 2.2µm and an Rz value of 6.8µm when measured using a 0.8mm cut off and lower cut of value of 0.0025mm with Gaussian filtering. The maximum amount of material removal allowed to achieve the required finish would be 3mm. The surface lay direction and orientation would be perpendicular to the view of the symbol. Unless otherwise specified measurements should be made using a 0.8mm Gaussian filter with an evaluation length of five sample lengths.

Note: The 16% rule for parameter values is the default rule for all surface finish requirements specified on a drawing. (see 16% and MAX rule)

Drawing Indication of Surface Lay

TYPE	LAY	SYMBOL
Parallel		=
Perpendicular		⊥
Crossed		×
Multi-directional		M
Particulate		P
Circular		C
Radial		R

See ISO 1302

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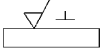The surface lay and the lay direction produced by the machining process can be indicated by using the symbols shown in the above table as specified in ISO 1302:1999. These symbols should be used with the graphical symbols for the indication of surface texture.

Graphical Symbols For Surface Texture
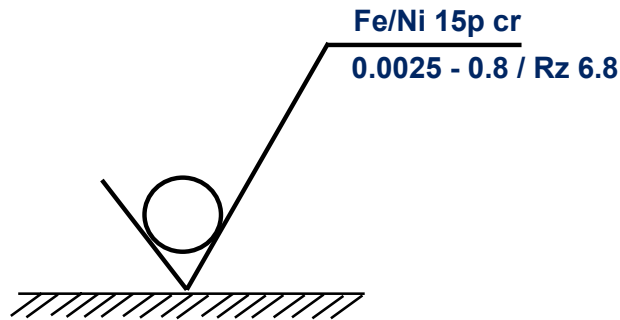
Fe/Ni 15p cr
0.0025 - 0.8 / Rz 6.8

The above symbol indicates that the removal of material is not permitted, the upper limit of the Rz parameter is 6.8µm using the 16% rule(default), with an evaluation length of five sampling lengths(default) and a 0.8mm cut-off(default).

For parameter designation the default value of 5 sample lengths is assumed unless indicated:

e.g: Rp3= Rp parameter over 3 sample lengths.

Graphical Symbols For Surface Texture

U Ra 0.9
L Ra 0.3
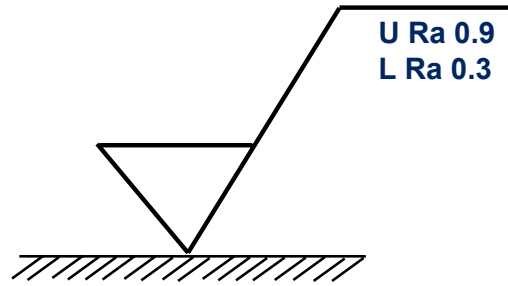
Bi-Lateral Tolerance

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When an upper and lower limit for a parameter is required (Bi-Lateral Tolerance) the prefix L for lower and U for upper may be used.

The 16% Rule (Default Rule)

- No more than 16% of the measured values for an upper limit should exceed the specified value

- No more than 16% of the measured values for a lower limit should be less than the specified value

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When an upper limit of a parameter is specified the measured value is acceptable if not more than 16% of all the measured values, based upon the evaluation length, exceed the specified value.
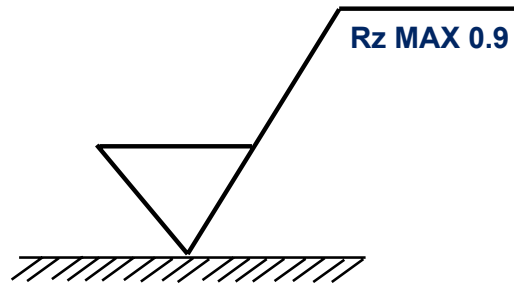
When a lower limit of a parameter is specified the measured value is acceptable if not more than 16% of all the measured values, based upon the evaluation length, are less than the specified value.

(Ref. ISO 4288)

The MAX Rule

Rz MAX 0.9

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To specify that a maximum permissible value applies, the "MAX" index has to be added to the parameter symbol as shown above. This means that none of the measured values for the specified parameter, taken over the complete surface shall exceed the specified value.

Summary

- Triangle symbols are used on many drawings, this method is no longer valid and was cancelled in 1978. It has been superseded by ISO 1301

    - Use of 'N' number to indicate surface finish indication is also obsolete.

- To improve clarification of how surface texture is specified on technical drawings, the international standard, ISO 1302:1999, has been produced.

    - Three basic graphical symbols are used with complementary information to indicate surface texture requirements.

- The surface lay and the lay direction produced by the machining process can be indicated by using symbols

- When an upper limit of a parameter is specified the measured value is acceptable if not more than 16% of all the measured values exceed the specified value.

    - To specify that a maximum permissible value applies, the "MAX" index has to be added to the parameter symbol

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