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Guidelines for the selection of roller chain drives

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by Japan Chain Association (JCA)/Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14.

Consequently **JIS B 1810:1999** is replaced with this Standard.

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Guidelines for the selection of roller chain drives

Introduction

This Japanese Industrial Standard has been prepared based on the second edition of **ISO 10823** published in 2004 without modifying the technical contents.

The portions underlined with dots are the matters not given in the corresponding International Standard.

1 Scope

This Standard gives guidelines for the selection of chain drives, composed of a roller chain, bush chain and sprockets conformant with **JIS B 1801**.

The selection procedures and the chain ratings it describes provide for roller chain drives operating under specified conditions, as defined in clauses **9** and **10**, with a life expectancy of approximately 15 000 h.

In addition, the example of chain drive selection and the power rating equations are shown in Annex A and Annex B, respectively.

Owing to the wide variations in loading characteristics, environmental conditions and achieved maintenance, it is desirable that the supplier of the chains and sprockets be consulted to ensure that the performance of the product meets the requirements specified both by the user and by this Standard.

NOTE : The International Standard corresponding to this Standard and the symbol of degree of correspondence are as follows:

ISO 10823:2004 *Guidelines for the selection of roller chain drives* (IDT)

The 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 21-1**.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitutes provisions of this Standard. The most recent edition of the standard (including amendments) indicated below shall be applied.

JIS B 1801 *Short-pitch transmission precision roller chains and bush chains*

NOTE : Corresponding International Standard: ISO 606 *Short-pitch transmission precision roller and bush chains, attachments and associated chain sprockets* (MOD)

3 Symbols

The symbols and units used in this Standard are given in table 1.

Table 1 Symbols, designations and units

Symbol	Designation	Unit
a	Maximum centre distance	mm
a_0	Approximate centre distance	mm
f_1	Application factor to allow for the operating conditions (see table 2)	—
f_2	Factor for number of teeth on small sprocket [see figure 4 and Equation (5)]	—
f_3	Factor for calculation of the number of links with different number of teeth (see table 5)	—
f_4	Factor for the calculation of the centre distance with different numbers of teeth (see table 6)	—
i	Speed ratio	—
n_1	Input sprocket speed	min ⁻¹
n_2	Output sprocket speed	min ⁻¹
n_s	Small sprocket speed	min ⁻¹
p	Chain pitch	mm
P	Input power	kW
P_c	Corrected power	kW
P_d	Power rating	kW
T	Input torque	N·m
v	Chain speed	m·s ⁻¹
X	Number of pitches in chain	—
X_0	Calculated number of pitches in chain	—
z_1	Number of input sprocket teeth	—
z_2	Number of output sprocket teeth	—
z_s	Number of small sprocket teeth	—

4 Basic equations

4.1 Input power

The power to be transmitted is the input P , in kilowatts, to the drive sprocket. If input torque T is the known requirements, then P can be derived from the following equation:

$$P = \frac{T \times n_1}{9\,550} \dots\dots\dots (1)$$

4.2 Corrected power

To allow for the characteristics of the drive symbol and the type of load to be transmitted, the input power, P , is multiplied by factors to obtain the corrected power, P_c .

$$P_c = P \times f_1 \times f_2 \dots\dots\dots (2)$$

5 Drive design specifications

The following design features should be specified before the chain and sprockets are selected:

- a) power to be transmitted;
- b) type of driver and driven machinery;
- c) speeds and sizes of the driver and driven shafts;
- d) centre distance and layout of the shafts;
- e) environmental conditions.

6 Sprocket selection

Determine the number of teeth on the sprockets using the following procedure:

- a) select the desired number of teeth, z_1 , for the input sprocket;
- b) determine the speed ratio, i , using the equation [see clause 5 c)]:

$$i = \frac{n_1}{n_2} \dots\dots\dots (3)$$

- c) determine the number of teeth on the output sprocket, z_2 , using the equation:

$$z_2 = i \times z_1 \dots\dots\dots (4)$$

- d) it is good practice to use sprockets with not less than 17 teeth and not more than 114 teeth;
- e) if the chain drive operates at high speed or if it is subjected to impulse loads, the small sprocket should have at least 25 teeth and the teeth should be hardened.

In addition, the small sprocket indicates one on which the number of teeth is z_1 or z_2 , whichever is smaller.

7 Chain calculations and selection

7.1 Normal operating conditions and drive capacities for chains

The typical capacity rating charts shown in figures 1, 2 and 3 apply to chain drives operating under the following conditions:

- a) a chain drive with two sprockets on parallel horizontal shafts;
- b) a small sprocket with 19 teeth;
- c) a simplex chain without cranked link;
- d) a chain length of 120 pitches;
- e) a speed ratio of from 1:3 to 3:1;
- f) an expected life of 15 000 h;
- g) an operating temperature between $-5\text{ }^{\circ}\text{C}$ and $+70\text{ }^{\circ}\text{C}$;

- h) sprockets correctly aligned and chain maintained in correct adjustment (see clause **10**);
- i) uniform operation without overload, shocks or frequent starts;
- j) clean and adequate lubrication throughout the chain's life (see clause **9**).

NOTE : Figures 1, 2 and 3 can be used to select the size of chain suitable for a chain drive as a function of the corrected power, P_c , and the small sprocket rotational speed, n_s .

The capacity rating charts given in figures 1, 2 and 3 are representative of those published by chain manufacturers. Individual manufacturers can rate their chains differently. It is therefore recommended that the appropriate manufacturer's rating chart be consulted.