

Couplings and clearance envelope for automobile power take-offs

1. Scope

This standard specifies the couplings and clearance of Power Take-Offs (hereinafter referred to as "PTO") fitted to the sides of automobile transmissions.

Remark: Applicable standards for this standard are shown as follows.

JIS B 1301	Sunk keys and their corresponding keyways
JIS B 1302	Woodruff keys and their corresponding keyways
JIS B 1602	Involute serrations
JIS D 2001	Involute spline for automobiles

2. Shapes and dimensions of shaft and coupling

2.1 Shapes and dimensions of shaft

The shapes and dimensions of the shaft shall be in accordance with **Table 1**.

Table 1 Shapes and dimensions of shaft

Type	Shape	Dimension
Type A ⁽¹⁾	Key, keyway	Shall be in accordance with Attached table 1 .
Type B ⁽²⁾	Screw thread, key, keyway	
Type C ⁽³⁾	Screw thread, spline	

Notes ⁽¹⁾ Straight type
⁽²⁾ Taper type
⁽³⁾ Spline type

2.2 Shapes and dimensions of coupling

The shapes and dimensions of the coupling shall be in accordance with **Table 2**.

Table 2 Shapes and dimensions of coupling

Type	Shape	Dimension
Type A ⁽⁴⁾	Keyway	Shall be in accordance with Attached table 2 .
Type B ⁽⁵⁾	Keyway	
Type C ⁽⁶⁾	Spline	

Notes ⁽⁴⁾ Straight type
⁽⁵⁾ Taper type
⁽⁶⁾ Spline type

3. Clearance envelopes for the removal of PTO and at the rear of PTO

3.1 Clearance envelope for the removal of PTO

The clearance envelope for the removal of PTO shall be in accordance with **Table 3**.

Table 3 Shapes and dimensions of coupling

Shape	Dimension
Type A ⁽⁷⁾	Shall be in accordance with Attached fig. 1 .
Type B ⁽⁸⁾	

Notes ⁽⁷⁾ When the mating gear of PTO protrudes from the transmission opening side face.
⁽⁸⁾ When the mating gear of PTO is inside the transmission opening side face.

3.2 Clearance envelope at the rear of PTO

The clearance envelope at the rear of PTO shall be in accordance with **Table 4**.

Table 4 Clearance at the rear of PTO

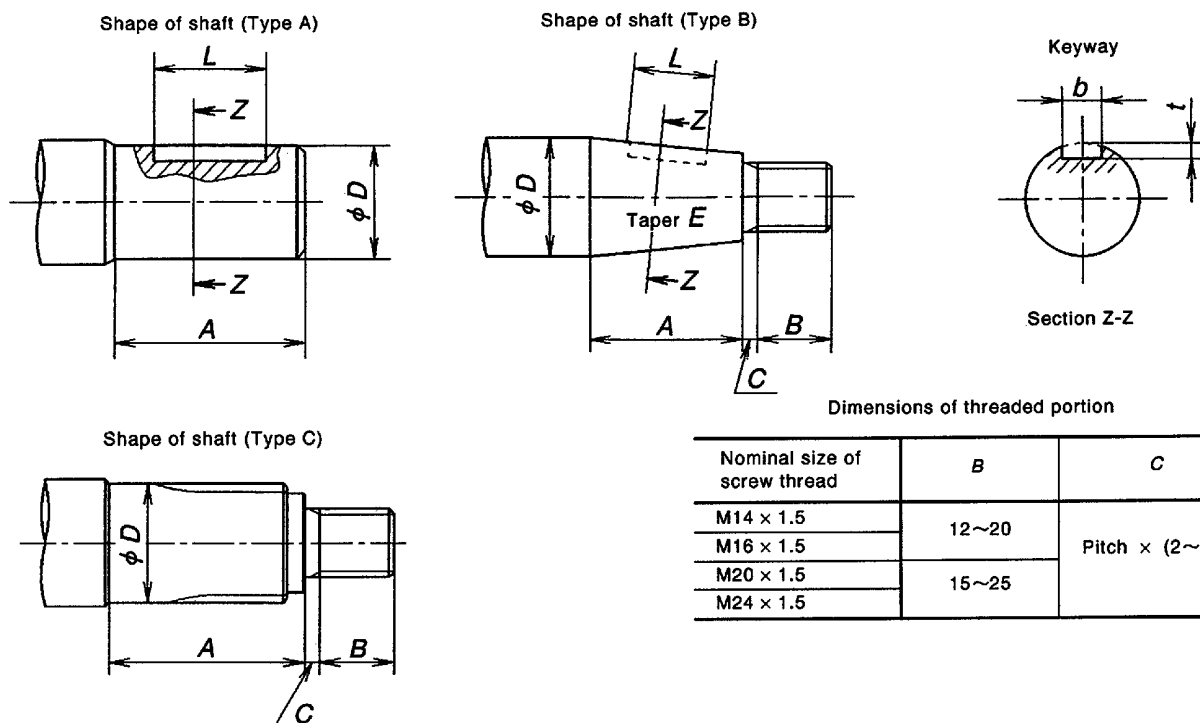
Shape	Dimension
Type A ⁽⁹⁾	Shall be in accordance with Attached fig. 2 .
Type B ⁽¹⁰⁾	Shall be in accordance with Attached fig. 3 .

Notes ⁽⁹⁾ ; When a single pump is used.
⁽¹⁰⁾ ; When a double pump is used.

Reference standard:

JASO C205-91 Side openings for automobile power take-offs.

Attached table 1 Shapes and dimensions of shaft



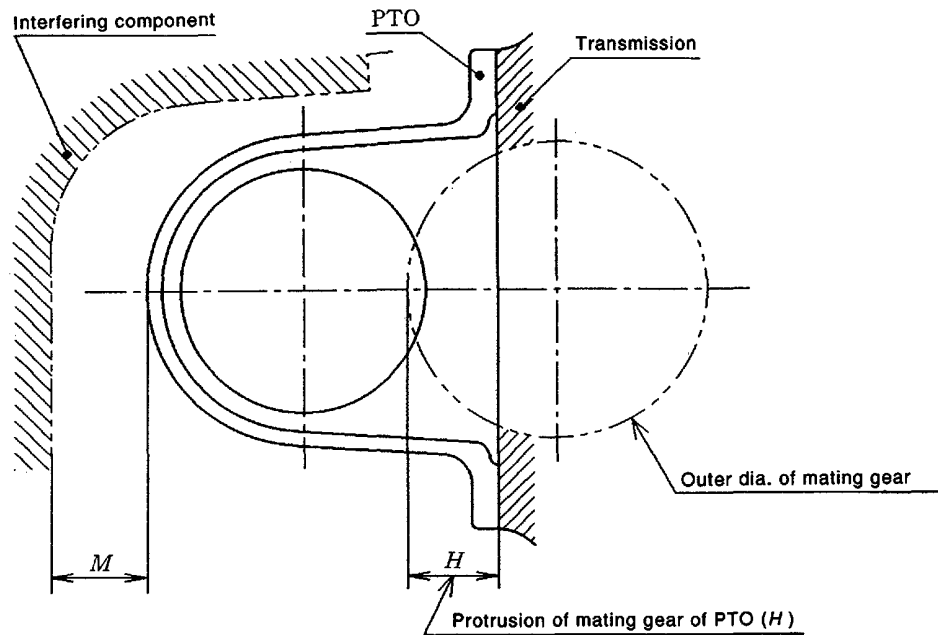
Dimensions of shaft and keyway

Unit : mm

Type	Dimensions of shaft		Taper	Dimensions of key and corresponding keyway						
				Parallel key				Woodruff key		
	ϕD	A	E	Nominal size	Keyway			Nominal size	Keyway	
					b	t	Length L		b	t
Type A	24	37	—	7 × 7	7	4.0	25 or 30	6 × 28	6	8.6
	30	55	—				30 or 40	7 × 32	7	10.4
Type B	20	24	1/8	—	—	—	—	5 × 22	5	7.0
	25	27	1/8	—	—	—	—	7 × 25	7	7.4
	30	27	1/8	7 × 7	7	4.0	25	7 × 32	7	10.4
	45	35	1/8	—	—	—	—	10 × 32	10	9.8
	24	31	1/10	7 × 7	7	4.0	25	6 × 28	6	8.6
Type C	30	45 or more	—	Involute spline 30 × 16 × 1.667						
	35	45 or more	—	Involute spline 35 × 19 × 1.667						
	40	45 or more	—	Involute spline 40 × 18 × 2.0						
	24	25 or more	—	Involute serration 24 × 23 × 1.0						

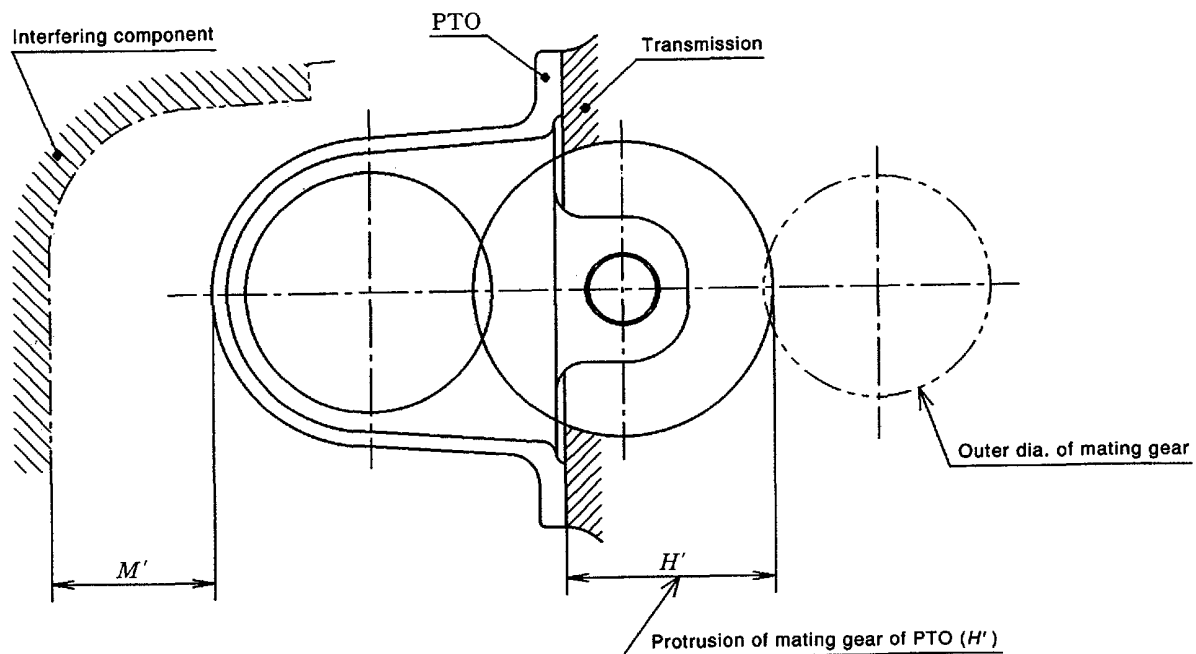
Attached fig. 1 Clearance envelope for the removal of PTO

Type A (When the mating gear of PTO protrudes from the transmission opening side face.)



Give a clearance for removal (M) larger than the protrusion of the mating gear of PTO (H). Peripheral components that are removable are regarded as the clearance.

Type B (When the mating gear of PTO is inside the transmission opening side face.)

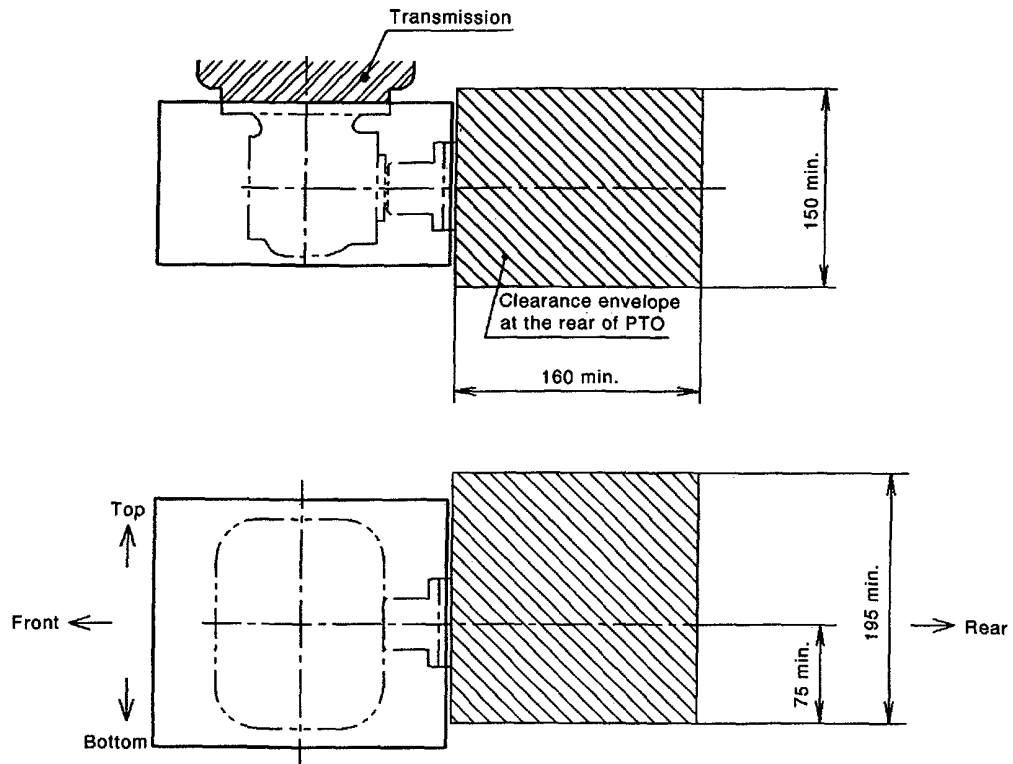


Give a clearance for removal (M') larger than the protrusion of the mating gear of PTO (H'). Peripheral components that are removable are regarded as the clearance.

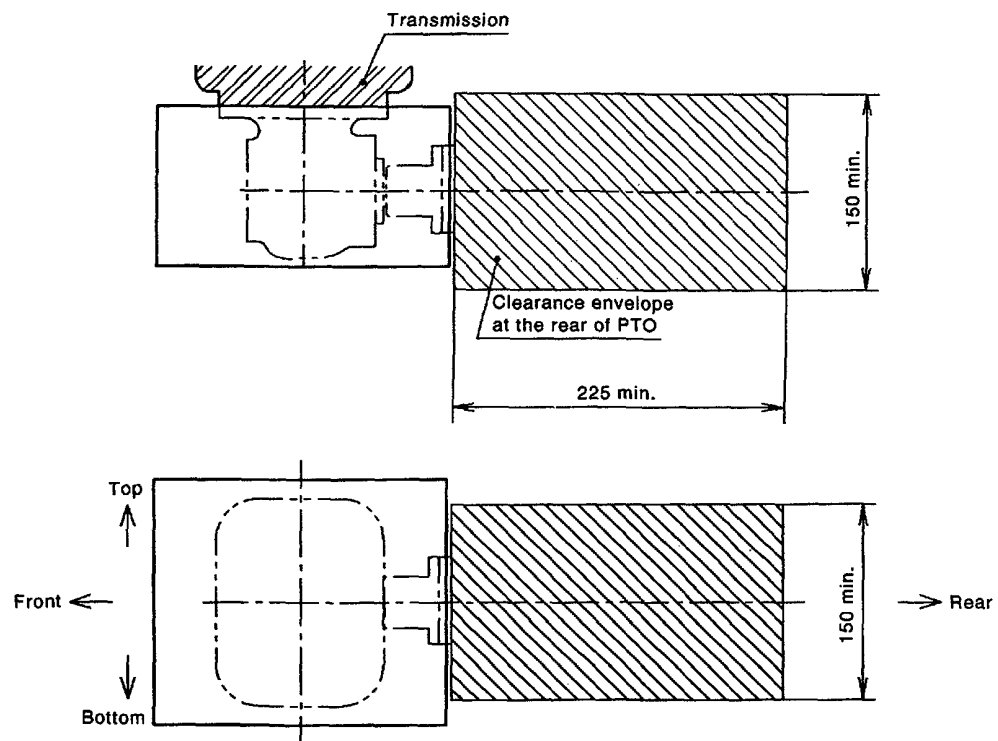
Attached fig. 2 Clearance envelope at the rear of PTO (Type A)

Type A1 (When the oil suction and discharge ports are on the top side.)

Unit : mm



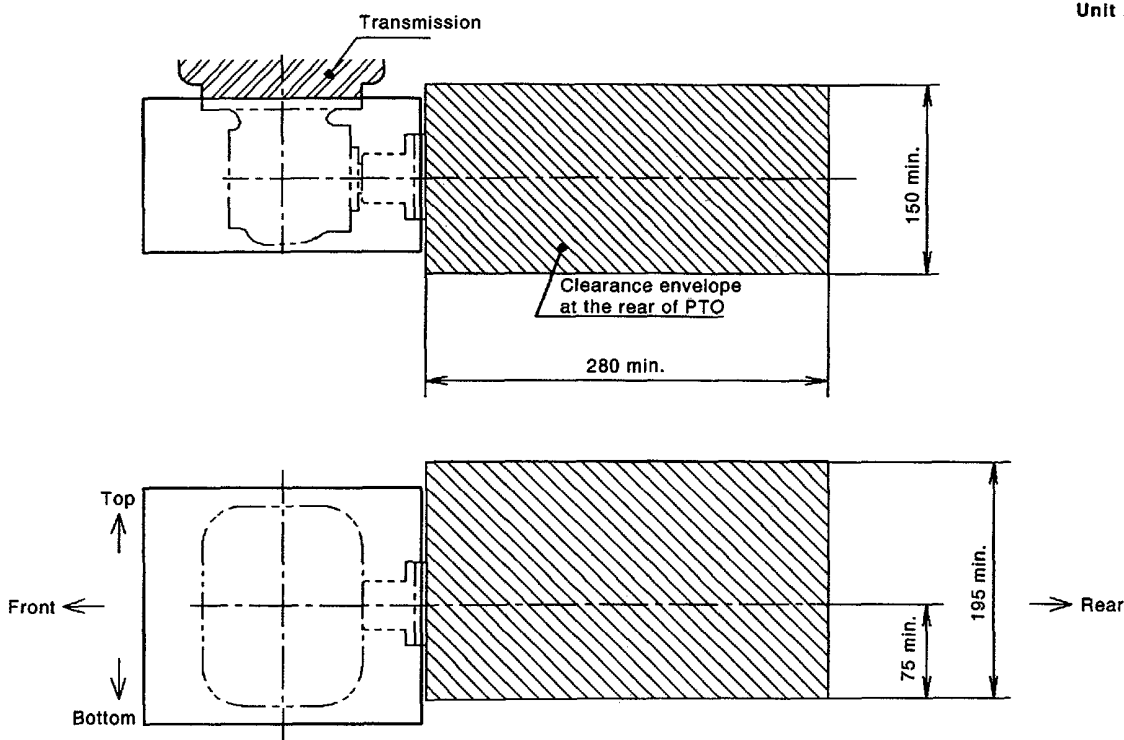
Type A2 (When the oil suction and discharge ports are on the rear side.)



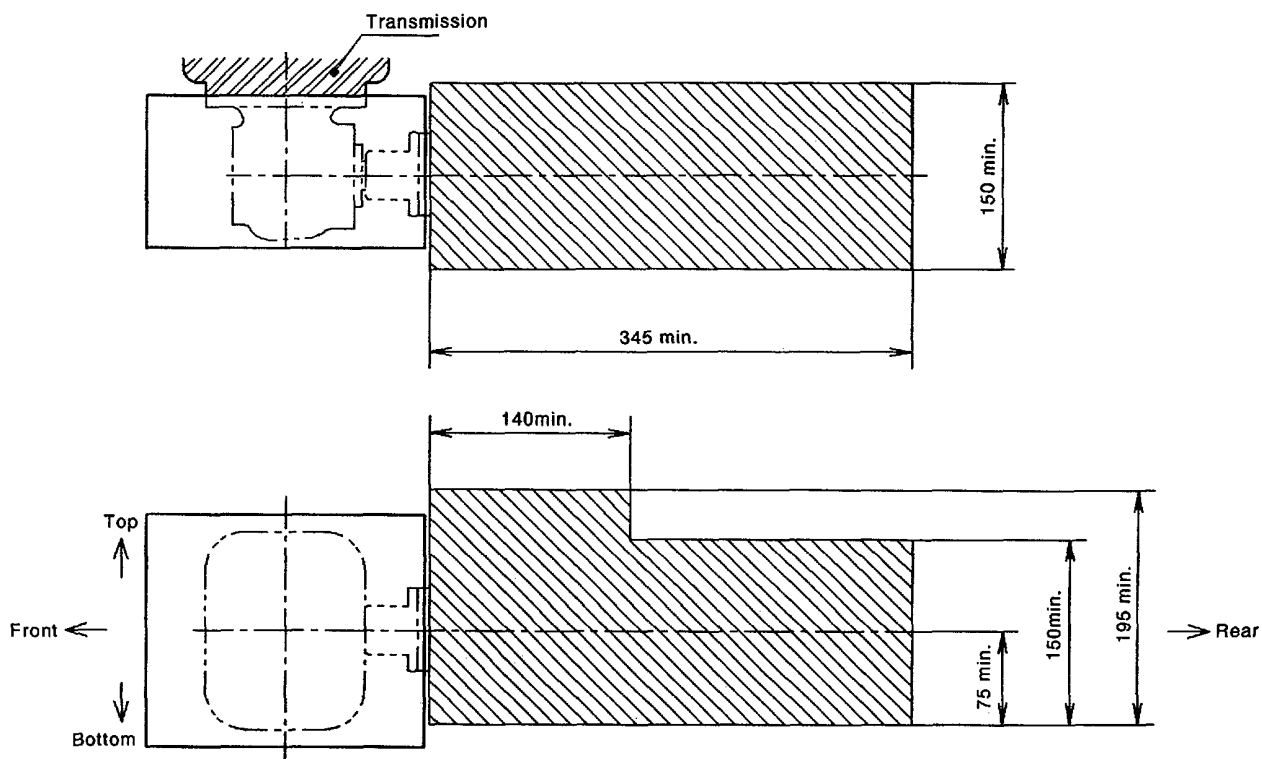
Attached fig. 3 Clearance envelope at the rear of PTO (Type B)

Type B1 (When the oil suction and discharge ports are on the top side.)

Unit : mm



Type B2 (When the oil suction and discharge ports are on the rear side.)



**Explanatory note
on
JASO C 206-93 Couplings and clearance envelope for automobile
power take-offs**

These explanatory notes aim to explain items specified in the standard as well as items related to them and are not a part of the standard.

1. Foreword

As vehicles with special kind of equipment have rapidly developed and come into wide use, the utilization of engine power for purposes other than vehicle drive in automobiles has increased for the past several years. Each chassis manufacturer heretofore has independently determined the couplings and clearance for Power Take-Offs. This situation is, however, not favorable to the development and progress of the vehicles with special kind of equipment. In addition, the kind of PTOs has increased with an increase in the kind of chassis.

On the other hand, the establishment of the Japanese automobile standard that was compatible with ISO Standards had been expected, since the global standards, ISO 7653 (Coupling) and ISO 7706 (Clearance) were established in 1985. Accordingly, JASO Power Take-Off Subcommittee was appointed as an establishment item in fiscal year 1992 by Chassis Committee of the Society of Automotive Engineers of Japan, Inc. The draft of this standard was prepared by referring to the in-house standards of each manufacturer and by obtaining information through questionnaire surveys, and was laid before Standard Committee and approved by it in March, 1993 through the deliberation of Chassis Committee in February, 1993.

2. Scope (1. of Standard)

Though there are a variety of methods for taking power off, this standard has specified, only those which are taken from the side of a transmission in accordance with JASO C 205-91.

3. Shapes and dimensions of shaft and coupling (2. of Standard)

3.1 Shapes and dimensions of shaft (2.1 of Standard)

For the shapes of shafts, three types, i.e. straight type, taper type and spline type, have been specified according to the actual situation on the basis of the investigation into the actual application records in Japan.

Since so many tapered types are available, there have been discussions for screening sizes to be standardized, and twelve types have been condensed to five types this time because of insufficient technical foundation.

The question of increasing or reducing the number of types has been left as an issue in the future.

3.2 Spline type

Though the spline type included couplings for directly coupled oil pumps, they were mainly in-house standards of chassis manufacturers. They have therefore not been included in the standard this time. However, it has been decided that this matter is re-examined at the time of review if any inconvenience is found in the future.

Though the splines of the couplings of ISO 7653 are straight-sided splines, no company uses them in Japan. Consequently, the standardization of the straight-sided splines has been shelved this time.

3.3 Length of spline type shaft

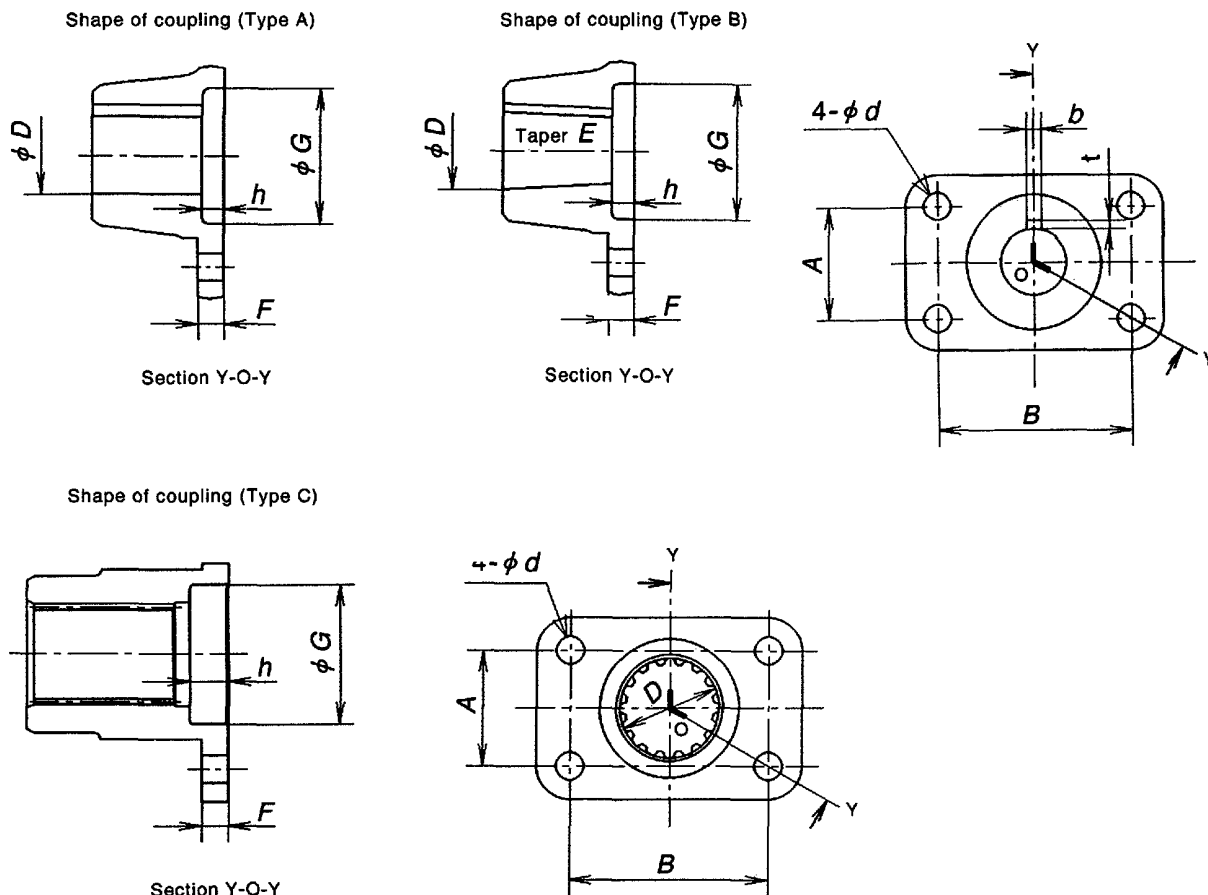
For the length of spline type shafts, the expression of “- or more” has been used because there is a difference in the size of machining relief due to a difference in the method of production (forming by rolling, hobbing, etc.).

3.4 Key and keyway

For the key and the corresponding keyway, the parallel key and woodruff key have been standardized.

For the nominal size, one size and five sizes have been specified for the parallel key and the woodruff key, respectively, from among

Attached table 2 Shapes and dimensions of coupling



Dimensions of coupling and keyway

Unit : mm

Type	Dimensions of shaft								Dimensions of key and corresponding keyway					
	ϕD	ϕG	h	F	A	B	ϕd	E	Parallel key			Woodruff key		
									Nominal size	b	t	Nominal size	b	t
Type A	24	37	3 or more	6~10	25	50	8	—	7 × 7	7	3.0	6 × 28	6	2.6
	30	42	3 or more	6~10	35	60	8	—	7 × 7	7	3.0	7 × 32	7	2.8
Type B	20	34	3 or more	6~10	25	50	8	1/8	—	—	—	5 × 22	5	2.2
	25	34	3 or more	6~10	35	60	8	1/8	—	—	—	7 × 25	7	2.8
	30	42	3 or more	6~10	35	60	8	1/8	7 × 7	7	3.0	7 × 32	7	2.8
	45	68	3 or more	6~10	80	80	10	1/8	—	—	—	10 × 32	10	3.4
	24	34	3 or more	6~10	25	50	8	1/10	7 × 7	7	3.0	6 × 28	6	2.6
Type C	30	42	3 or more	6~10	35	60	8	—	Involute spline			30 × 16 × 1.667		
	35	55	3 or more	6~10	51	55	10	—	Involute spline			35 × 19 × 1.667		
	40	65	3 or more	6~10	45.5	71.8	10	—	Involute spline			40 × 18 × 2.0		
	24	34	3 or more	6~10	25	50	8	—	Involute serration			24 × 23 × 1.0		

JIS B 1301 and JIS B 1302.

3.5 Nominal size of screw thread

Though five nominal sizes, i.e. M14, M16, M20, M22 and M24, were used, each of M22 and M24 was used by one chassis manufacturer. Hence, the number of nominal sizes has been reduced to four as shown in this standard after getting manufacturers' understanding of the significance of integration.

Though there was an opinion that the allowable range of screw thread length was too wide, the standards have been made according to the draft, leaving the adjustment of the opinion to the parties concerned.

3.6 Shapes and dimensions of coupling hole

For the shapes and dimensions of the coupling holes, three different types, i.e. straight type, taper type and spline type, have been specified in accordance with the shapes and dimensions in 3.1 (2.1 of Standard).

3.7 Bolt pattern

For the bolt pattern, five sizes have been specified basically by regarding chassis manufacturers' opinions as important.

In addition, two straight types, five taper types and four spline types have been specified so as not to increase the number of types combining bolt patterns and hole shapes.

3.8 Size of bolt hole

Two bolt hole sizes, i.e. 8 mm and 10mm have been specified.

Though there was an opinion that the accuracy of hole diameters should be unified, only nominal diameters have been indicated and the accuracy has not been indicated this time because a united opinion could not be got.

4. Clearance envelopes for the removal of PTO and at the rear of PTO (3. of Standard)

4.1 The hottest discussion was made on this subject among those deliberated this time. Chassis manufacturers commented that the clearances specified in ISO 7706 (Clearance) were too wide to specify as they were. As a result of the coordination on this matter between car body manufacturers and chassis manufacturers, it was decided to follow **JASO C 205-91** and compromised values could be found as shown in this standard, though concrete dimensions could not be specified.

4.2 Vehicles with special kind of equipment that have oil pumps directly connected to PTOs have been increasing in recent years. Under this circumstances, car body manufacturers had strong comments that they had been making great efforts to secure clearances for installing car bodies. It has therefore been decided to specify clearances for installing oil pumps.

In the event of any doubt, the original standards in Japanese should be referred.

□ : SI PHASE UNRELATED STANDARD
(The standard to which SI units are not given or which dose not use units.)

Established by the Standard Council of JSAE
Date of Establishment : 1993-03-26
Sub Committee in which the draft was made : SC of Power take-offs
Technical Committee under which the draft was discussed : TC of Chassis
Investigating Committee : Standard Committee under the Standard Council

Published by
The Society of Automotive Engineers of Japan, Inc.
10-2, Goban-cho, Chiyoda-ku, Tokyo 102, Japan

This printed matter has been prepared with financial support from the Japan Auto-Race Organization.