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Secretariat: Standards Management Department
SIRIM Berhad (Company No. 367474-V)
1, Persiaran Dato' Menteri
P.O. Box 7035, Section 2
40911 Shah Alam
Selangor Darul Ehsan
Malaysia

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MOTORCYCLE CHAINS AND SPROCKETS – PART 1: MOTORCYCLES CHAIN – SPECIFICATION (FIRST REVISION)

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Committee representation

The Road Vehicles Industry Standards Committee (ISC L) under whose authority this Malaysian Standard was developed, comprises representatives from the following organisations:

Automobile Association of Malaysia
Department of Environment Malaysia
Department of Standards Malaysia
Jabatan Pengangkutan Jalan
Malaysian Automotive Association
Ministry of International Trade and Industry
Motosikal dan Enjin Nasional Sdn Bhd
Perodua Manufacturing Sdn Bhd
Perusahaan Otomobil Nasional Berhad
Polis DiRaja Malaysia
Proton Vendor Association
Universiti Putra Malaysia
Universiti Teknologi Malaysia

The Technical Committee on Motorcycles which developed this Malaysian Standard consists of representatives from the following organisations:

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HL Yamaha Motor Research Centre Sdn Bhd
Jabatan Pengangkutan Jalan
Kawasaki Sunrock Sdn Bhd
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Pusat Pemeriksaan Kenderaan Berkomputer Sdn Bhd
SIRIM Berhad (Secretariat)
Universiti Teknologi Malaysia
Universiti Putra Malaysia

FOREWORD

This Malaysian Standard was developed by the Working Group on Chain and Sprocket under the authority of the Road Vehicles Industry Standards Committee.

This MS XXXX consists of the following parts, under the general title *Specification for Motorcycle Chains and Sprockets*:

Part 1: Motorcycle Chains

Part 2: Motorcycle Sprockets

This Malaysian Standard is the first revision of MS 996: Part 1 (P) 1985, *Specification for Motorcycle Chains and Sprockets -Part 1: Motorcycle Chains*.

Major modifications of this revision are as follows:

- a) additional to the scope as its also covers seal chain and silent chain;
- b) additional to the chain numbers , recommended use and type of chain in Table 1, Table 2 , Table 3 , Table 5, Table 6 and Table 7;
- c) change to a new figure 1 and figure 4; and
- d) rename a new Table 4 and additional notes to Table 4 as to covers seal chain and silent chain.

This revised Malaysian Standard cancels and replaces MS 996: Part 1: 1985 (P).

Compliance with a Malaysian Standard does not of itself confer immunity from legal obligations.

MOTORCYCLE CHAINS AND SPROCKETS

PART 1: MOTORCYCLE CHAINS - SPECIFICATION

1. Scope

1.1 This Malaysian Standard specifies dimensions, material and performance requirements for chains for use on motorcycles.

1.2 This standard covers bush chains, roller chains, seal chain and silent chain.

1.3 Chains covered by this standard are suitable for use as drive chains, cam chains, oil pump chain or balancer chains as specified.

2. Nomenclature, designation and construction

2.1 Nomenclature

For the purpose of this standard, the nomenclature given below and in Figures 2 and 3 shall apply.

2.1.1 Roller chain

A chain constructed with rollers around the bushes.

2.1.2 Bush chain

A chain constructed without rollers.

2.1.3 Seal Chain

A chain constructed with seal and roller around the bushes

2.1.4 Silent Chain

A chain constructed with pin and plate only

2.2 Designation

Chains specified in this standard shall be designated by chain numbers as given in Table 1. The recommended application for each chain type is also given in Table 1.

2.3 Chain construction

2.3.1 A chain shall be assembled by fitting inner links and outer links alternately.

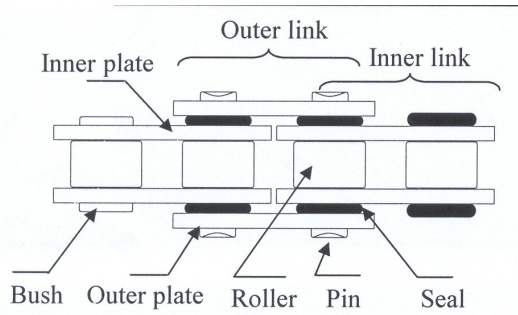
2.3.2 Chain components, referred to in this standard, are illustrated in Figure 1.

2.3.3 Details of outer and inner link shall be as illustrated in Figure 2.

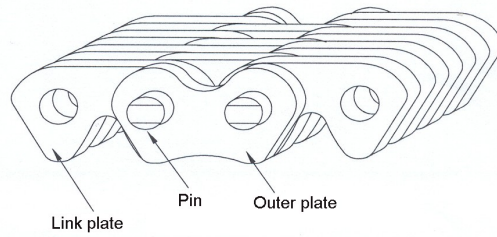
2.3.4 Details of the types of connecting links that shall be used are illustrated in Figure 3. Connecting links shall be either of the spring clip-type or rivetted-type.

Table 1. Chain number, recommended use and type

Chain number	Recommended use	Type
2 X 3	Cam chain, balancer chain, oil pump chain	Silent chain
3 X 4	Cam chain, balancer chain, oil pump chain	Silent chain
4 X 5	Cam chain, balancer chain, oil pump chain	Silent chain
25	Cam chain	Bush chain
25H	Cam chain, balancer chain, oil pump chain	Bush chain
25-2	Cam chain, balancer chain	Bush chain
219	Cam chain, balancer chain	Bush chain
219H	Drive chain	Bush chain
05T	Drive chain	Bush chain
270	Drive chain	Bush chain
415	Drive chain	Roller chain
415H	Drive chain	Roller chain
420	Drive chain	Roller chain
428SL	Drive chain	Roller chain
428	Drive chain	Roller chain
428H	Drive chain	Roller chain
520	Drive chain	Roller chain
525	Drive chain	Roller chain
530	Drive chain	Roller chain
520H	Drive chain	Roller chain
525H	Drive chain	Roller chain
530H	Drive chain	Roller chain
630	Drive chain	Roller chain
428KRO	Drive chain	Seal chain
428HKRO	Drive chain	Seal chain
520KRO	Drive chain	Seal chain



Roller chain, Bush chain & seal chain



Silent chain

Figure 1. Roller Chain , Bush Chain , Seal Chain and Silent Chain

Link nomenclature	Rough sketch	Chain parts		Remarks
		Number	Nomenclature	
Outer link		2 2	Pin Outer plate	An outer link consists of two pins assembled with two outer plates
Inner link		2 2 2	Inner plate Bush Roller	An inner link consists of two rollers around two bushes assembled with two inner plates

Figure 2. Outer and Inner Link of Chain Parts

Link nomenclature	Rough sketch	Chain parts		Remarks
		Number	Nomenclature	
Spring clip type connecting link		2 2 2 2	Outer plate Connecting pin Connecting plate Spring clip	A spring clip connecting link consists of two connecting pins press fitted in an outer plate and riveted. At the other ends they are either a press-fit or a slip-fit in a connecting plate and secured by a spring clip.
Riveted type connecting link		2 2 2	Outer plate Connecting pin Connecting plate	A riveted connecting links consists of two connecting pins press fitted in an outer plate riveted. At the other ends they are either heavy or light press fitted in a connecting plate and secured by riveting

Figure 3. Connecting Link of Chain Parts

3. Performance requirements

3.1 Breaking load

The minimum breaking loads of chains, when tested in accordance with the method specified in 5.1 shall be as given in Table 2.

3.2 Length

3.2.1 The length of the chain, when measured in accordance with the method specified in 5.2, shall be the nominal length with a permitted deviation of $\begin{matrix} +0.15\% \\ -0 \end{matrix}$. However, for Seal Chain, the permitted deviation is $\begin{matrix} +0.25\% \\ -0 \end{matrix}$

3.2.2 The nominal length as defined in this standard shall be the product of the nominal pitch (p) and the number of links.

3.3 Fatigue strength

The chain, when tested as specified in 5.3 and in accordance with the method specified in Appendix A, shall have fatigue strength at or above the limit specified in Table 3.

NOTE. The fatigue strength, in Table 3, is the max. load referred to in 5.3.

3.4 Wear resistance

The wear resistance of chains shall be determined by the method specified in 5.4 (details in Appendix B). The acceptance levels shall be fixed as the elongation cannot be exceeded as specified value for a testing duration as specified in Table 7, in reaching the specified testing duration, there shall be no defects such as stiff or cracked chain joints, bushes or rollers.

Table 2. Breaking load

Chain Number	Breaking load (min.)
	kN
2 X 3	5.2
3 X 4	7.8
4 X 5	10.4
25	3.5
25H	4.8
25-2	7.1
219	6.6
219H	8.8
05T	6.9
270	9.8
415	15.7
415H	15.7
420	15.7
428SL	15.7
428	16.7
428H	20.6
520	26.5
525	26.5
530	26.5
520H	31.4
525H	31.4
530H	31.4
630	35.3
428KRO	20.6
428HKRO	22.6
520KRO	26.5

Table 3. Fatigue limit

Chain Number	Fatigue limit (N)
2 X 3	980
3 X 4	1080
4 X 5	1180
25	780
25H	980
25-2	1280
219	1080
219H	1570
05T	1080
270	2260
415	3730
415H	3730
420	3730
428SL	3730
428	3730
428H	4410
520	5880
525	5880
530	5880
520H	7840
525H	7840
530H	7840
630	9810
428KRO	4900
428HKRO	5880
520KRO	6860

NOTE. Fatigue limit values specified are for chains without connecting links.

3.5 Hardness

The hardness of the pin, bush and roller shall be as specified in Table 4.

Table 4. Hardness of the pin, bush and roller

Component	Hardness		Case depth mm
	Surface	Core	
Pin	mHv 200 g	mHv 200 g	0.25 ~ 0.45
	700 ~ 900	400 ~ 500	
Bush	mHv 200 g	mHv 200 g	0.10 ~ 0.25
	700 ~ 900	320 ~ 480	
Roller	mHv 200 g	–	0.15 ~ 0.40
	450 ~ 700		

NOTES:

1. For Pin Hardness and Case depth mention above not applicable for seal chain and silent chain
2. For Pin and bush the case depth means the effective case depth
3. For **Carburizing** roller the case depth means the total case depth
4. For Hardening roller the case depth is not applicable

3.6 Other requirements

The finished chain shall be free from stiff joints and rollers.

4. Dimensions

4.1 Dimensions of chain components shall comply with the values specified in Figure 4 and Table 5.

5. Test methods

5.1 Breaking load

A gradually increasing tensile load shall be applied to the ends of a length of chain containing at least five free pitches. The chain shall be prevented from bending or twisting during the test. The ultimate tensile load shall be measured.

NOTE. Ultimate tensile load is taken to be equal to breaking load because of the small difference between the two.

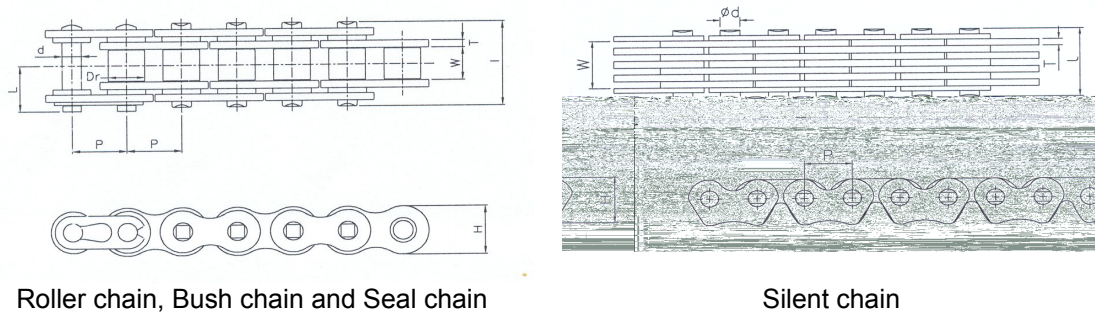


Figure 4. Chain dimension

5.2 Length

A standard length of finished chains not less than 610 mm shall be measured under load as specified in Table 6. When measured horizontally, the chain shall be supported horizontally throughout.

Table 5. Chain dimensions (in mm)

Chain	Pitch <i>P</i>	Roller diameter <i>Dr.</i> max.	Width between inner plates <i>W</i> min.	Pin Length <i>L</i> max.	Pin Diameter <i>d</i> max. (Reference)	<i>L</i> Part of connecting pin length <i>L</i> max.	Inner plate depth <i>H</i> max.	Plate thickness <i>T</i> (Reference)
2 X 3	6.35	-	3.05	6.2	2.45	-	6.9	1.0
3 X 4	6.35	-	5.10	8.3	2.45	-	6.9	1.0
4 X 5	6.35	-	7.15	10.4	2.45	-	6.9	1.0
25	6.35	3.30(*)	3.10	8.0	2.31	4.8	6.0	0.75
25H	6.35	3.30(*)	3.10	9.0	2.31	5.3	6.0	1.0
25-2	6.35	3.30(*)	3.10	14.4	2.31	4.8	6.0	0.75
219	7.774	4.59(*)	4.68	12.0	3.01	7.3	7.6	1.2
219H	7.774	4.59(*)	4.68	12.6	3.01	7.6	7.6	1.4
05T	8.00	4.73(*)	4.55	12.5	3.05	9.4	7.8	1.3
270	8.50	5.00(*)	4.75	13.3	3.28	7.8	8.6	1.8
415	12.70	7.77	4.68	13.3	3.97	8.5	12.5	1.5
415H	12.70	7.77	4.68	13.3	3.97	8.5	12.5	1.5
420	12.70	7.77	6.25	15.0	3.97	9.0	12.5	1.5
428SL	12.70	8.50	7.85	15.5	4.51	9.9	12.5	1.2
428	12.70	8.50	7.85	17.0	4.51	10.6	12.5	1.5
428H	12.70	8.50	7.85	18.9	4.51	11.6	12.5	2.0
520	15.875	10.16	6.25	17.6	5.09	10.9	15.5	2.0
525	15.875	10.16	7.85	18.9	5.09	11.6	15.5	2.0
530	15.875	10.16	9.40	21.0	5.09	13.0	15.5	2.0
520H	15.875	10.16	6.25	19.0	5.25	11.6	15.5	2.3
525H	15.875	10.16	7.85	20.6	5.25	12.3	15.5	2.3
530H	15.875	10.16	9.40	22.5	5.25	13.0	15.5	2.3
630	19.05	11.91	9.40	23.2	5.96	13.5	18.6	2.3
428KRO	12.70	8.50	7.85	21.5	4.51	11.5	12.5	1.8
428HKRO	12.70	8.50	7.85	22.3	4.51	12.3	12.5	2.0
520KRO	15.875	10.16	6.25	20.5	5.10	11.1	15.5	2.0

NOTE. * Dimension for bush diameter

5.3 Fatigue strength

A cyclic load, with a ratio of mean load (P_m) to load amplitude (P_a) of 1.2 shall be applied on a chain. The maximum load shall be that specified in Table 3. There shall be no failure at the end of 5,000,000 cycles.

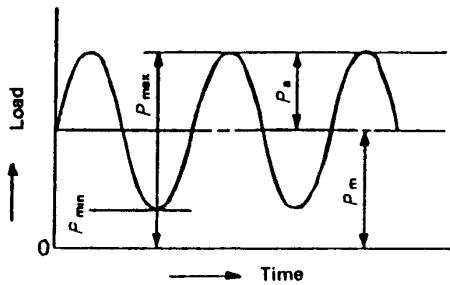
Details of test method are given in Appendix A.

5.4 Wear resistance

A chain shall be driven under conditions specified in Table 7 and the elongation after specific time shall be measured. Details of the method are specified in Appendix B.

Table 6. Load for length measurement

Chain Number	Load (min.)
	N
2 X 3	30
3 X 4	50
4 X 5	50
25	80
25H	80
25-2	160
219	80
219H	80
05T	80
270	80
415	140
415H	140
420	140
428SL	140
428	140
428H	140
520	220
525	220
530	220
520H	220
525H	220
530H	220
630	310
428KRO	140
428HKRO	140
520KRO	220



P_m is the mean load
 $P_{min.}$ is the minimum load
 P_a is the load amplitude
 $P_{max.} = \text{maximum load} = P_m + P_a$

6. Rust prevention

6.1 Chains shall be appropriately treated to prevent rusting.

7. Marking

7.1 All chains shall be marked with the manufacturer's name (or trade-mark) and chain number on the outer plate.

Table 7. Testing conditions for chain wear resistance

Chain number	Number of links	Number of teeth in sprocket		rpm of drive shaft	Chain Pull		Testing Duration (Hour)	Specified elongation (%)	
		Drive	Driven		N	Lubrication			
2 X 3 3 X 4 4 X 5	82 ~ 98	17	34	6000	390	Oil bath	200	0.2	
640									
930									
25	82 ~ 98	17	34	6000	200				
25H		14	28		220				
25-2 219 219H 05T		17	34		290				
270									5000
415 415H 420									148
428SL 428 428H	980								
520 525 530	120	33	17	730	1180				
520H 525H 530H					1960				
630					96	17	15	730	2650
428KRO 428HKRO	148	41	19	1500	780	No lubrication*	60	0.5	
520KRO	120	33	17	1500	1960				

* Chain submitted for 'No lubrication' tests are to be applied initially with lubricants or rust preventatives that are used on chains for sale.

Annex A

Fatigue strength test method

A1. Chains for test

Chains submitted for this test shall be those which have been manufactured and tested as required by this standard.

A2. Testing machine

The testing machine shall be capable of subjecting the chain to a cyclic load, as required in 5.3 of the standard. In addition, it shall have the following auxiliary devices:

- a) an indicator to show the load applied;
- b) a counter to indicate the number of cycles completed;
- c) a device to prevent the machine from being restarted, following a stoppage due to breakdown in electricity supply or any other reason; and
- d) an automatic stoppage device.

The machine shall operate at between 500 cycles and 3000 cycles per minute.

A3. Method of test

A3.1 A chain for test shall contain 5 to 7 free pitches excluding those for shackles.

A3.2 The chain shall be fixed to the shackles in such a manner that when loaded in tension, the load is evenly distributed on every link, with no twisting or bending. Counting shall start only after the chain is loaded as specified.

A3.4 There should be no break in the test. In the event that the chain does not fail at the end of 5×10^6 cycles, the test shall be stopped. The machine should stop automatically should the chain break during the course of the test.

Annex B

Wear resistance test method

B1. Chains for test

Chains submitted for this test shall be those which have been manufactured as required by the standard.

B2. Testing machine

The testing machine shall contain the following components.

- a) a power source to drive a variable speed motor;
- b) a driver shaft and sprocket which can be easily assembled and disassembled;
- c) a driven shaft and sprocket which can be easily assembled and disassembled;
- d) a device capable of loading the chain as required; and
- e) a device capable of adjusting the taut span of the chain.

The machine shall be so designed that the chain is subjected to taut and slack spans thus preventing the overheating of the chain.

B3. Testing method

B3.1 A chain for test shall be mounted on the testing machine after its length has been measured as specified in the standard.

B3.2 The chain shall be driven under conditions specified in Table 7. The test shall be continued until the specified elongation is reached. During the test, the chain shall be measured at least twice.

B3.3 Measurement of length shall cover at least 1.5 pitches.

B3.4 Measurements shall be taken when the chain is at room temperature.

B3.5 Chains for which the testing condition specifies that no lubrication is required, shall **not** be lubricated during intervals when length measurement is carried out.

B3.6 When lubrication is required, lubricants of grade SAE 10W 30 to 40 or equivalent shall be used.

B4. Treatment of test results

B4.1 A graph of chain elongation against time shall be plotted.

B4.2 The time required for the specified elongation shall be obtained from the curve plotted.

B4.3 In the event that the chain cannot be driven up to the specified elongation due to chain failure, stiff links or roller cracks, the test report shall indicate the duration for which the test had been carried out and the reason for non-completion of the test.

Acknowledgments

Technical Committee on Motorcycles members:

Y. Bhg. Dato' Syed Mohammad Aidid (Chairman)	Motorcycles and scooter Assembler and Distributor Association of Malaysia
Puan Nor Anisazila Bt Abdul Rahim (Secretary)	SIRIM Berhad
Encik Khalili Zulkifli	Armstrong Auto Parts Sdn Bhd
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Kapten Mohd Sabri	KL 21 Sdn Bhd
Encik Chee Kok Leong	Motorcycles and scooter Assembler and Distributor Association of Malaysia
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ASP Zainal Abdul Hamid	Polis DiRaja Malaysia
Encik Azlan Abu Samah	Pusat Pemeriksaan Kenderaan Berkomputer Sdn Bhd
Cik Nurulakmar Abu Husain	Universiti Teknologi Malaysia
Prof Madya Dr Wong Shaw Voon	Universiti Putra Malaysia

Working Group on Chain and Sprocket members:

Encik Lee Thian Chai (Chairman)	Kilang Rantai S.A Sdn Bhd
Puan Nor Anisazila Bt Abdul Rahim (Secretary)	SIRIM Berhad
Encik Teoh Ching Hua	Kilang Rantai S.A Sdn Bhd
Encik Lim Chin Yong	Kilang Rantai S.A Sdn Bhd
Encik Heng Jeng Sheng	Excel Rim Sdn Bhd
Encik Tang Chiang Bu	Kilang Rantai S.A Sdn Bhd
Encik Tan Eng Chun	Kilang Sprocket S.A Sdn Bhd