

IS : 5382 - 1985
(Reaffirmed 2003)

Indian Standard
SPECIFICATION FOR
RUBBER SEALING RINGS FOR
GAS MAINS, WATER MAINS AND SEWERS

(First Revision)

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BUREAU OF INDIAN STANDARDS
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AMENDMENT NO. 1 JULY 1990
TO
IS 5382 : 1985 SPECIFICATION FOR RUBBER
SEALING RINGS FOR GAS MAINS, WATER
MAINS AND SEWERS
(First Revision)

(Page 6, clause 3.7.1) — Substitute the following for the existing clause:

“3.7.1 Hardness — Hardness when determined in accordance with ‘Microtest’ method described in IS 3400 (Part 2) : 1980 shall comply with the requirements given in Table 1. If the dimensions of the ring are appropriate, then ‘Normal test’ method specified in IS 3400 (Part 2) : 1980 may be used, provided that the ‘Microtest’ method is used for reference purposes.

For the same ring, or along the greatest length of an extruded profile cut to make a ring, hardness value shall not vary by more than 41 RHD. Each value shall be within the specified value.”

[Page 8, Table 1, Sl No. (v)] — Substitute the following for the existing item:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
v)	Cold resistance, increase in hardness after 72 hours at 0°C, Max	+5	+5	+5	+5	+5	+5

[Page 8, Table 1, Sl No. (vi)] — Delete.

[Page 8, Table 1, Sl No. (vii)] — Renumber Sl No. (vii) as Sl No. (vi).

(Page 10, clause 3.7.6) — Substitute the following for the existing clause:

‘3.7.6 Cold Resistance — When cooled in a chamber described in Appendix B, the increase in hardness, measured after 72 hours at 0°C, from the initial hardness, shall comply with the requirements given in Table 1.’

(Page 10, clause 3.7.7) — Delete.

(Page 10, clause 3.7.7.1) — Renumber 3.7.7.1 as 3.7.7 and insert the title ‘Splice Strength’.

(Page 10, clause 3.8.1) — Insert the following after 3.8.1:

'3.8.2 *Stress Relaxation in Compressions* — When determined as described in Appendix B, the stress relaxation in compressions shall comply with the requirements of Table 4.

NOTE — If measurement after 90 days at 27°C is specified it shall be considered only as a type approval test.

TABLE 4 OPTIONAL REQUIREMENTS

Sl. No.	CHARACTERISTIC	REQUIREMENT						METHOD OF TEST, REF TO
		Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
i)	Stress relaxation in compression:							
	—after 7 days at 27°C, percent by mass, <i>Max</i>	18	18	18	18	—	—	Appendix B
	—after 90 days at 27°C, percent by mass, <i>Max</i>	25	25	25	25	—	—	

(PCD 13)

Indian Standard
**SPECIFICATION FOR
 RUBBER SEALING RINGS FOR
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(First Revision)

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Indian Standard
SPECIFICATION FOR
RUBBER SEALING RINGS FOR
GAS MAINS, WATER MAINS AND SEWERS
(*First Revision*)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 11 November 1985, after the draft finalized by the Rubber Products Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

0.2 The vulcanized rubber sealing rings covered by this standard are used, generally, in jointing all kinds of drainage pipe-work like sewers, sewage pumping mains, soil and waste ventilating rain-water pipes and water mains where the pipes are of concrete, vitrified clay, cast iron, steel, plastics, pitch fibre or asbestos cement.

0.3 In the first version of the standard published in 1969 sealing rings were classified into 2 types broadly — Type 1 depending on the nature of the rubber (natural or synthetic or both) and not resistant to oil or solvent; and Type 2 of synthetic rubber and resistant to oil or solvent. Under each type, 5 sub-types in Type 1 and 4 sub-types in Type 2 were included based on differences in physico-chemical requirements. In this revision, 6 types of rings have been recognized based on nominal hardness values. Additional requirements of ageing, cold resistance and splice strength have been included. In addition stress relaxation in compression after 7 and 90 days has also been included.

0.3.1 Measurement of hardness, tensile strength and elongation at break and volume change prescribed for Type 2 rings after oil immersion at 100°C for 72 hours, in the original standard, has been deleted. However, minimum requirements for tensile strength and elongation at break have been specified for all 6 types depending on the polymer used for the manufacture of rings.

All other changes considered necessary to make the specification performance oriented have also been included.

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0.4 Recommendations regarding storage conditions after receipt from the manufacturer are given in Appendix A.

0.5 In the preparation of this standard, considerable assistance has been derived from ISO 4633 - 1983 'Rubber seal — Joint ring for water supply, drainage and sewerage pipelines — Specification for material'.

0.6 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard prescribes the requirements for materials used for vulcanized solid rubber sealing rings for water supply and drainage systems, drain pipes, sewers and rainwater pipes, all at ambient temperature including gas connections. It covers joint rings for all pipeline materials including iron, steel, stonewares, asbestos-cement, concrete, pitch fibre, plastics and glass reinforced plastics.

1.2 This standard does not cover dimensional and joint design requirements.

2. TYPES

2.1 This standard covers six types of pipe joint rings, namely, 1 to 6. These correspond to the respective nominal hardness of 40, 50, 60, 70, 80 and 88 IRHD.

2.2 Sealing rings having two different types of rubber are permitted. Typical section of the ring is shown in Fig. 1 for guidance only.

3. REQUIREMENTS

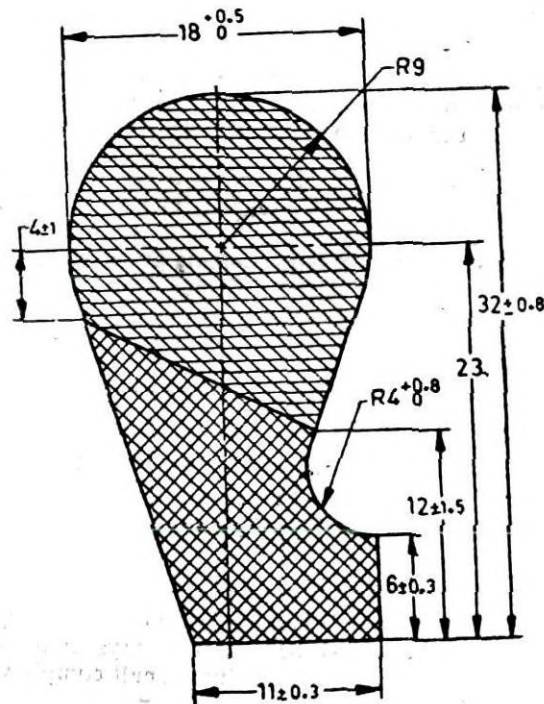
3.1 Material — The rubber shall be free from extractable substances which impart taste, odour or toxicity to water.

3.2 If the pipe is to convey drinking water, substances, capable of affecting the organoleptic properties of the water, or toxic materials, such as compounds of mercury, antimony, manganese, lead or copper shall not be included in the composition of rings.

*Rules for rounding off numerical values (revised).

NOTE — Positive list of rubber ingredients and test method for proving non-toxicity of rubber are under preparation. Till such time, it shall be the responsibility of the manufacturer to declare the safety of the rubber and rubber ingredients from toxicological as well as odour and taste considerations.

3.3 Finish — The rings shall be homogeneous, free from porosity, grit, excessive blooms, blisters or other visible surface imperfections. The fin or flash shall be reduced as much as possible and in any case the thickness of it shall not exceed 0.4 mm and the width 0.8 mm.



All dimensions in millimetres.

FIG. 1 SECTION OF RUBBER GASKET FOR TYTON JOINTS

3.4 Stretch Test — Stretch gaskets till the circumference is increased by 50 percent, then visually inspect for the following.

3.4.1 Gaskets shall be made of a properly vulcanized virgin rubber compound containing no scrap or reclaim.

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3.4.2 The surface of the gasket shall be smooth, free from pitting cracks, blisters, air marks, and any other imperfection that may affect its behaviour in service. The body of the gasket shall be free from porosity and air pockets.

3.5 Unless otherwise specified, the materials shall be black.

3.6 Dimensions and Tolerances — All the dimensions and tolerances shall be as agreed to between the purchaser and the manufacturer.

3.7 Physical Requirements

3.7.1 Hardness — Hardness when determined in accordance with 'Microtest' method described in IS : 3400 (Part 2) - 1980* shall comply with the requirements given in Table 1. For the same ring, hardness values shall be in a maximum range of 4 IRHD.

3.7.2 Tensile Strength and Elongation at Break — When determined by the method described in IS : 3400 (Part 1) - 1977†, using Type 2 dumb-bell shaped test pieces, the tensile strength and elongation at break shall comply with the requirements given in Table 2. The minimum values vary according to the polymer used.

3.7.3 Compression Set — When determined by the method described in IS : 3400 (Part 10)-1977‡ using the small test piece, the compression set shall comply with the requirements given in Table 1.

3.7.4 Accelerated Ageing in Air — When test pieces as described for the hardness test and the stress-strain test in 3.7.1 and 3.7.2 are tested after ageing in air at 70°C for 7 days, by the oven method described in IS : 3400 (Part 4)-1978§, the changes in hardness, tensile strength and elongation at break after ageing shall comply with the requirements given in Table 1.

3.7.5 Water Immersion — When determined according to the method given in IS : 3400 (Part 6)-1983|| after 7 days immersion in neutral water pH 7 at 70°C, the change in volume shall comply with the requirements given in Table 1.

*Methods of test for vulcanized rubber: Part 2 Hardness.

†Methods of test for vulcanized rubber: Part 1 Tensile stress-strain properties (first revision).

‡Methods of test for vulcanized rubber: Part 10 Compression set at constant strain (first revision).

§Methods of test for vulcanized rubber: Part 4 Accelerated ageing (first revision).

||Methods of test for vulcanized rubber: Part 6 Resistance to liquids.

TABLE 1 GENERAL REQUIREMENTS
(Clauses 3.7.1, 3.7.3 to 3.7.7)

SL No.	CHARACTERISTICS	REQUIREMENTS						METHOD OF TEST, REF TO
		Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
i)	Hardness in IRHD	40 \pm 5	50 \pm 5	60 \pm 5	70 \pm 5	80 \pm 4	88 \pm 3	3400 (Part 2) - 1980*
ii)	Compression set, percent, <i>M_{ax}</i>	- 4	- 4	- 4	- 4	- 4	- 4	
	for 24 \pm 0 \pm 2 h at 70 \pm 1°C	25	25	25	25	25	25	3400 (Part 10) - 1977†
	for 72 \pm 0 \pm 2 h at 27 \pm 2°C	12	12	12	12	15	15	
iii)	Ageing, maximum change for unaged-values after 7 days in air at 70°C							
a)	Hardness in IRHD	- 5 to + 8	- 5 to + 8	- 5 to + 8	- 5 to + 8	- 5 to + 8	- 5 to + 8	3400 (Part 2) - 1980*
b)	Tensile strength, percent	\pm 20	\pm 20	\pm 20	\pm 20	\pm 20	\pm 20	3400 (Part 1) - 1977‡
c)	Elongation at break, percent	- 30 to + 10	- 30 to + 10	- 30 to + 10	- 30 to + 10	- 30 to + 10	- 30 to + 10	3400 (Part 1) - 1977‡

*Methods of test for vulcanized rubber: Part 2 Hardness (first revision).

†Methods of test for vulcanized rubber: Part 10 Compression set at constant strain (first revision).

‡Methods of test for vulcanized rubber: Part 1 Tensile stress strain properties (first revision).

(Continued)

TABLE 1 GENERAL REQUIREMENTS—Contd

SL. No.	CHARACTERISTICS	REQUIREMENTS						METHOD OF TEST, REF TO
		Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	
(1)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
iv)	Water immersion change in volume after immersion in neutral water for 7 days at 70°C	- 0 to + 8	- 0 to + 8	- 0 to + 8	- 0 to + 8	- 0 to + 8	- 0 to + 8	3400 (Part 6) - 1967*
v)	Cold resistance, increase in hardness after 7 days at -10°C, Max	+10	+10	+10	+10	+10	+10	
vi)	Stress relaxation in compression:							
	— after 7 days at 27°C, percent by mass, Max	18	18	18	18	—	—	Appendix B
	— after 90 days at 27°C, percent by mass, Max	25	25	25	25	—	—	Appendix B
vii)	Splice strength, elongation imposed, percent, Max	100	100	100	100	50	30	

* Methods of test for vulcanized rubber: Part 6 Resistance to liquid.

TABLE 2 TENSILE STRENGTH AND ELONGATION FOR DIFFERENT TYPES

(Clause 3.7.2)

Sl. No.	POLYMER USED	REQUIREMENTS					
		Type 1 (3)	Type 2 (4)	Type 3 (5)	Type 4 (6)	Type 5 (7)	Type 6 (8)
(1)	(2)						
i)	Natural rubber (NR) and Isoprene rubber (IR)						
a)	Tensile strength, MPa, percent, <i>Min</i>	18	18	17	15	11	6
b)	Elongation at break, percent, <i>Min</i>	450	450	375	250	175	100
ii)	Butadiene-styrene rubber (SBR)						
a)	Tensile strength, MPa, <i>Min</i>	12	13	14	13	11	8
b)	Elongation at break, percent, <i>Min</i>	450	425	400	300	250	150
iii)	Ethylene propylene rubber (EPM and EPDM)						
a)	Tensile strength, MPa, <i>Min</i>	11	11	11	11	9	8
b)	Elongation at break, percent, <i>Min</i>	450	400	325	200	125	100

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3.7.6 Cold Resistance — When cooled in a chamber described in Appendix B, the increase in hardness, measured after 7 days at -10°C , from the initial hardness, shall comply with the requirements given in Table 1.

3.7.7 Stress Relaxation in Compression—When determined as described in Appendix B, the stress relaxation in compression shall comply with the requirements of Table 1.

NOTE — The measurement after 90 days at 27°C is only required for material 'type approval'.

3.7.7.1 This test shall be carried out either on the ring itself or on a piece 200 mm in length and including the splice which shall have a length of 100 mm each side of the splice. Two reference marks shall be made equidistant from the splice and 50 mm apart. These shall be extended at a rate of 8.3 ± 0.8 mm/s to the elongation specified in Table 1. The splice shall be held at this extension for 1 minute and examined under tension. There shall be no visible alternation in the splice area.

3.7.8 Water Absorption — Sealing rings shall not absorb more than 10 percent (m/m) of water when tested according to the method prescribed in Appendix C.

3.8 Optional Requirement

3.8.1 Low Temperature Applications — The rubber sealing rings shall not show signs of brittleness at low temperature in addition to the requirements prescribed in 3.1 to 3.7.8. The temperature, time of exposure to such temperatures and the method of test shall be as agreed to between the purchaser and the supplier.

4. MARKING

4.1 Each sealing ring or packing or both shall be marked indelibly with:

- a) The manufacturer's name or trade-mark, if any;
- b) The month and year of manufacture; and
- c) The type followed by a word, such as 'Gas' or 'Water' or 'Sewers' depending on the application for which they are intended.

4.1.1 Each sealing ring or packing or both may also be marked with the Standard Mark.

NOTE — The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act 1986 and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

5. PACKING

5.1 The material shall be packed as agreed to between the purchaser and the supplier so as to protect them from undue exposure to light and heat and mechanical damages during transit and storage.

6. SAMPLING

6.1 Scale of Sampling and Criteria for Conformity — For the purpose of ascertaining conformity to this standard the scale of sampling and criteria for conformity shall be as prescribed in Appendix D.

7. TIME LAPSE BETWEEN RECEIPT OF MATERIAL AND TESTING

7.1 For all the test purposes, the minimum time between vulcanization and testing shall be 16 h.

7.1.1 For product tests, whenever possible, the time between vulcanization and testing should not exceed 4 months. In other cases, tests shall be made within 2 months from the date of receipt of the product by the customer.

8. TEST PIECE

8.1 Wherever possible, for all tests, test pieces shall be cut from the finished article. Where this is not possible, the manufacturer shall provide test slabs from the same batch of rubber and vulcanized to the same degree and in the same manner as that of the rubber from which the sealing rings have been manufactured.

8.1.1 Wherever it is not possible to cut standard test piece from the rings, for determination of tensile strength and elongation at break, test piece as shown in Fig. 2 shall be used with the rate of traverse of moving grip as 15 cm/min.

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in no case more than a force of 1N for balance-type machines and no more than 0.05 mm for stress-strain type machines, applied without overshoot and in a time not greater than 30s after commencing the additional compression.

B-2.3 Oven, provided with temperature control to maintain the specified temperature within the prescribed tolerances. Satisfactory circulation of the air shall be maintained by means of a fan.

B-2.4 Procedure

B-2.4.1 Carefully clean the operating surfaces of the compression device. The test piece surface shall be free from mould release agent or dusting powder. When a lubricant is applied, it shall consist of a thin coating of a lubricant having substantially no action on the rubber.

B-2.4.2 Preheat the compression device to the test temperature.

B-2.4.3 Preheat the test piece to the test temperature. A preheating period of 30 min is recommended.

B-2.4.4 Compress the preheated test piece by (25 ± 2) percent in the compression device (3.1) at the test temperature; use a compression of 15 ± 2 percent if a compression of 25 percent cannot be obtained. Apply the compression within 30s. When reached, the final compression shall be fixed and maintained during the entire test period.

B-2.4.5 $30 \pm \frac{2}{0}$ min after applying the compression, measure the counterforce with an accuracy of ± 1 percent, still at the test temperature.

B-2.5 Calculation

B-2.5.1 Calculate the compression stress relaxation.

$$\text{Compression stress relaxation} = \frac{F_0 - F_1}{F_0} \times 100$$

where

F_0 = initial counterforce measured 30 min after compression of the test piece; and

F_1 = counterforce measured after the specified duration of test.

The median value of the results for the test pieces shall be calculated. The individual values for the test pieces shall agree within 10 percent of the median value. If they do not, the test shall be repeated using three further test pieces and the median value of the combined test results shall be calculated and quoted.

To calculate median value, the test results may be arranged in order of magnitude and numbered 1 to n . The median is then taken as the $\frac{n+1}{2}$ th value if n is odd. If n is even it is the arithmetic mean of $\frac{n}{2}$ th and $(\frac{n+1}{2})$ th value by convention.

APPENDIX C

(Clause 3.7.8)

WATER ABSORPTION TEST

C-1. PROCEDURE

C-1.1 From the finished ring, cut a piece of about 3 g. Weigh it accurately. Put in 150 ml of distilled water. Boil under reflux with air condenser for 168 hours. Remove the piece and weigh again after surface water layer is dried up.

C-2. CALCULATION

C-2.1 Calculate the water absorption as follows:

$$\text{Water absorption, percent by mass} = \frac{M_2 - M_1}{M_1} \times 100$$

where

M_1 = original mass in g of the test piece before immersion in water,
and

M_2 = mass in g of the test piece after immersion in water.

APPENDIX D

(Clause 6.1)

SAMPLING AND CRITERIA FOR CONFORMITY

D-1. SCALE OF SAMPLING

D-1.1 Lot — In a consignment all the sealing rings of the same type, dimension, design and manufactured from the same type of rubber under

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essentially similar conditions of production shall be grouped together to constitute a lot.

D-1.2 Samples shall be selected and tested from each lot separately for ascertaining its conformity or otherwise to the requirements of this specification.

D-1.3 The number of sealing rings to be selected at random from a lot for different tests shall depend upon the size of the lot and shall be in accordance with col 1 and 2 of Table 3.

TABLE 3 SCALE OF SAMPLING AND PERMISSIBLE NUMBER OF DEFECTIVES

NO. OF SEALING RINGS IN THE LOT	FOR DIMENSIONS AND FINISHING DEFECTS (see 3.3 AND 3.4)		NO. OF TESTS FOR EACH CHARAC- TERISTIC, FOR HARDNESS, TENSILE STRENGTH, ELONGA- TION COMPRESSION SET, WATER ABSORPTION AND STRETCH TESTS	NO. OF TESTS FOR EACH CHARACTERISTIC, FOR AGEING AND WATER IMMERSION TESTS (TABLES 1 AND 2)
	Sample Size	Permissible No. of Defectives		
(1)	(2)	(3)	(4)	(5)
Up to 100	5	0	3	1
101 to 150	8	0		
151 to 300	13	0		
301 to 500	20	0	5	2
501 to 1 000	32	1		
1 001 and above	50	2	8	3

D-1.3.1 The rings to be selected from the lot shall be chosen at random. In order to ensure the randomness of selection, random number tables shall be followed. In case random number tables are not available, the rings may be selected from the lot in the following manner:

Starting from any ring in the lot, the rings shall be counted as 1, 2, ..., r and so on in one order, where r is the integral part of N/n (N and n being the lot size and sample size respectively). Every r th ring thus counted shall be withdrawn to constitute the sample.

D-1.3.2 If the rings are packed in bundles, at least 10 percent of the bundles shall be opened and the required number of rings shall be selected by taking approximately equal number of rings at random from each of the bundle.

D-2. NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

D-2.1 All the sealing rings selected according to **D-1.3** shall be examined for dimensions and finishing defects. Any ring failing in one or more of these characteristics shall be considered as defective. If the number of defectives found in the sample is less than or equal to the corresponding permissible number given in col 3 of Table 3, the lot shall be declared as conforming to these requirements, otherwise not.

D-2.1.1 In the case of those lots which have been found unsatisfactory according to **D-2.1** all the sealing rings may depending upon the agreement between the purchaser and the supplier, be inspected for these characteristics and the defective ones removed.

D-2.2 The lot having been found satisfactory for workmanship and dimensions according to **D-2.1** shall then be examined for hardness, tensile strength, elongation strength, swelling, water absorption and compression characteristics. The number of tests to be conducted for each of these characteristics is given in col 4 of Table 3. For this purpose, required number of rings shall be selected at random from those already selected under **D-1.3** and if necessary, from the lot. For each of the characteristics the various tests shall be conducted on independent test pieces. The lot shall be declared as satisfactory if the median value of the test results of compression characteristic satisfies the relevant requirements and for the remaining characteristics none of tests fails.

D-2.3 The lot which has been found satisfactory according to **D-2.2** shall then be subjected to relevant ageing and oil immersion tests. The number of independent tests to be conducted for each of the characteristics is given in col 5 of Table 3. For this purpose, required number of rings shall be selected from those which have been tested and found satisfactory under **D-2.2**. The lot shall be declared satisfactory with respect to ageing characteristic if none of the tests fails.

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