भारतीय मानक ब्यूरो
(उपभोक्ता मामले, खाद्य एवं सार्वजनिक वितरण मंत्रालय, भारत सरकार)
BUREAU OF INDIAN STANDARDS
(Ministry of Consumer Affairs, Food & Public Distribution, Govt. of India)

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व्यापक परिचालन मसौदा

हमारा संदर्भ : सीईडी 15/ टी-25 **24 सितम्बर 2024**

तकनीकी समिति :बिल्डर हार्डवेयर अनुभागीय समिति, सीईडी 15

प्राप्तकर्ता :

1. **सिविल अभियांत्रिकी विभाग परिषद, सीईडीसी के सभी सदस्य**
2. **बिल्डर हार्डवेयर अनुभागीय समिति, सीईडी 15 के सभी सदस्य**
3. **रुचि रखने वाले अन्य निकाय।**

महोदय/महोदया,

निम्नलिखित मानक का मसौदा संलग्न है:

प्रलेख संख्या	शीर्षक
सीईडी 15(26622)WC	**द्रवचालित फ्लोर स्प्रिंग - विशिष्टि** (आई एस 6315 का *तीसरा पुनरीक्षण*) (आई सी एस संख्या : 91.190)

कृपया इस मसौदे का अवलोकन करें और अपनी सम्मतियाँ यह बताते हुए भेजे कि यह मसौदा प्रकाशित हो तो इन पर अमल करने में आपको व्यवसाय अथवा कारोबार में क्या कठिनाइयां आ सकती हैं।

सम्मतियाँ भेजने की अंतिम तिथि: 24 अक्टूबर 2024

सम्मति यदि कोई हो तो कृपया अधोहस्ताक्षरी को ई-मेल द्वारा ced15@bis.gov.in पर या उपरलिखित पते पर, संलग्न फोर्मेट में भेजें। सम्मतियाँ बीआईएस ई-गवर्नेंस पोर्टल, www.manakonline.in के माध्यम से ऑनलाइन भी भेजी जा सकती हैं।

यदि कोई सम्मति प्राप्त नहीं होती है अथवा सम्मति में केवल भाषा संबंधी त्रुटि हुई तो उपरोक्त प्रालेख को यथावत अंतिम रूप दे दिया जाएगा। यदि सम्मति तकनीकी प्रकृति की हुई तो विषय समिति के अध्यक्ष के परामर्श से अथवा उनकी इच्छा पर आगे की कार्यवाही के लिए विषय समिति को भेजे जाने के बाद प्रालेख को अंतिम रूप दे दिया जाएगा।

यह प्रालेख भारतीय मानक ब्यूरो की वेबसाइट www.bis.gov.in पर भी उपलब्ध हैं।

धन्यवाद।

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वैज्ञानिक ई एवं प्रमुख
सिविल अभियांत्रिकी विभाग

संलग्न: उपरलिखित

Draft for comments only

CED 15 (26622)
September 2024

भारतीय मानक ब्यूरो
(उपभोक्ता मामले, खाद्य एवं सार्वजनिक वितरण मंत्रालय, भारत सरकार)
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WIDE CIRCULATION DRAFT

Our Reference: CED 15/T-25 **24 September 2024**

TECHNICAL COMMITTEE: BUILDER'S HARDWARE SECTIONAL COMMITTEE, CED 15

ADDRESSED TO:

1. All Members of Civil Engineering Division Council, CEDC
2. All Members of Builder's Hardware Sectional Committee, CED 15
3. All others interested.

Dear Sir/Madam,

Please find enclosed the following draft:

Doc No.	Title
CED 15(26622)WC	**Hydraulically Regulated Floor Springs – Specification** *(Third Revision* of IS 6315 *)* ICS 91.190

Kindly examine the attached draft and forward your views stating any difficulties which you are likely to experience in your business or profession, if this is finally adopted as National Standard.

Last Date for comments: 24th October 2024

Comments if any, may please be made in the enclosed format and emailed at ced15@bis.gov.in or sent at the above address. Additionally, comments may be sent online through the BIS e-governance portal, www.manakonline.in.

In case no comments are received or comments received are of editorial nature, kindly permit us to presume your approval for the above document as finalized. However, in case comments, technical in nature are received, then it may be finalized either in consultation with the Chairman, Sectional Committee or referred to the Sectional Committee for further necessary action if so desired by the Chairman, Sectional Committee.

The document is also hosted on BIS website www.bis.gov.in.

Thanking you,

Yours faithfully,
Sd/-
Dwaipayan Bhadra
Scientist 'E' & Head
Civil Engineering Department

Encl: As above

FORMAT FOR SENDING COMMENTS ON THE DOCUMENT

[Please use A4 size sheet of paper only and type within fields indicated. Comments on each clause/sub-clause/ table/figure, etc, be stated on a fresh row. Information/comments should include reasons for comments, technical references and suggestions for modified wordings of the clause. Comments through e-mail to **ced15@bis.gov.in** shall be appreciated.]

Doc. No.: CED 15(26622)WC

BIS Letter Ref: CED 15/T-25

Title: Hydraulically Regulated Floor Springs – Specification (*Third Revision* of IS 6315)

Last date of comments: 24th October 2024

Name of the Commentator/ Organization: _____

Sl No.	Clause/ Para/ Table/ Figure No. commented	Type of Comment (General/ Technical/ Editorial)	Comments/ Modified Wordings	Justification of Proposed Change

NOTE- Kindly insert more rows as necessary for each clause/table, etc

BUREAU OF INDIAN STANDARDS

DRAFT FOR COMMENTS ONLY

Draft Indian Standard

HYDRAULICALLY REGULATED FLOOR SPRINGS – SPECIFICATION

(*Third Revision* of IS 6315)

(ICS 91.190)

Builder's Hardware Sectional Committee, CED 15 **Last Date of Comments** 24th October 2024

FOREWORD

(Formal clauses shall be added later)

Automatic door closing devices are becoming a necessity for homes, offices and commercial establishments like malls, hotels, hospitals, especially in air-conditioned rooms / areas, for prevention of temperature losses, to reduce outside noise, privacy and restricting movement of people. Floor spring is installed within the floor and flushes with the surface. Doors are mounted on floor springs along with accessories to support the load of the door decide the direction of opening and closing.

It is also essential that the device should be compact in shape and size and at the same time easy to mount. The heavy entrance doors used in public buildings need special attention, at the same time devices fixed thereto should cater for long service periods to which these are subjected.

This standard was first published in 1971 and subsequently revised in 1986 and 1992. This standard covers the covers fire rated and non -fire rated hydraulically regulated floor or frame mounted concealed floor springs which are being widely used and lays down the requirements for their manufacture and performance. The major changes in the revision include:

a) Scope of scope to include floor springs up to 160 kg.
b) Grading based on durability, corrosion resistance and other parameters.
c) Marking clause has been modified.
d) The classification code is included to harmonize the product marking and selection for easy understanding of the user.

While formulating this standard considerable assistance has been derived from EN 1154: 1997 'Building Hardware — Controlled Door Closing Devices — Requirements and test methods' with some modifications to suit Indian conditions.

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: 2022 ‘Rules for rounding off numerical values (second revision)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Draft Indian Standard

HYDRAULICALLY REGULATED FLOOR SPRINGS – SPECIFICATION

(*Third Revision*)

1 SCOPE

This standard covers fire rated and non -fire rated hydraulically regulated floor or frame mounted concealed floor springs for all types of doors weighing up to 160 kg.

2 REFERENCES

The standards listed in Annex A contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex A.

3 TERMINOLOGY

3.1 Floor Spring – It is a mechanical device that regulates the closing of a door by means of hydraulic or pneumatic force. The basic function of a floor spring is to provide a smooth, controlled closing action for the door after the door has been opened manually and released. There are several variations of floor springs for a variety of different applications.

3.2 Floor Spring (Hydraulically Regulated) – A device used to automatically close the door to slow down its speed before it reaches the closed position. Floor spring is installed within the floor and flushes with the surface. Doors are mounted on floor springs along with accessories to support the load of the door decide the direction of opening and closing. A typical floor spring sketch is shown in Fig. 1.

3.3 Single Action Floor Spring – A floor spring used to close automatically in one direction only.

3.4 Double Action Floor Spring – A floor spring used to close automatically in both the directions.

3.5 Right-Handed Floor Spring – A door which when viewed from the top, rotates in the anticlockwise direction about its hinges while opening is Right hand door and the floor spring suitable for such door is right-handed floor spring.

3.6 Left-Handed Floor Spring – A door which when viewed from the top, rotates in a clockwise direction about its hinges while opening is Left hand door and the floor spring suitable for such door is left-handed floor spring.

3.7 Angle of Closing – The maximum angle from fully closed position from which the floor spring can complete the closing action.

3.8 Single Action Accessories – All floor springs by its design can be used for closing of doors in either direction. However, by use of specific accessories which are handed

the opening and closing sequence can be regulated in a single direction. Single action accessories are used to define the direction of opening of door in a single direction.

3.9 Double Action Accessories – All floor springs by its design can be used for closing of doors in either direction. Double action accessories allow for opening and closing of doors in both directions.

3.10 Closing Speed – Most floor springs are equipped with adjustable closing speed valves which enable adjustment of the speed at which the door closes after being opened and released.

3.11 Latching Speed – Floor springs with adjustable latching speed valves enable adjustment of the last few degrees of closing. This is an especially helpful feature to prevent the door from slamming into the frame. Most quality closers are equipped with dual-valve adjustment, that is both closing speed and latching speed adjustment valves to ensure a smooth (and quiet) closing operation.

3.12 Delayed Action (Optional) – A floor spring equipped with a delayed action feature allows the door to remain open for a certain period before closing at the adjusted speed. This is accomplished by the addition of a “delayed action” adjustment valve on the closer, in addition to the speed and power regulating valves.

3.13 Back Check (Optional) – It is an adjustable feature available on many floor springs that provides “resistance” to prevent the door from being thrown open (by people or the wind) and causing personal injury or damage to the door, door handles or walls.

3.14 Power Size (Strength) – The power size of the floor spring in terms of maximum width of the door and the weight it can carry. Some floor springs come with fixed spring strength or power, suitable for a particular door width and door weight. Some floor springs are adjustable wherein, the power size can be increased or decreased by increasing or decreasing the strength of the spring. See Table 1.

3.15 Hold open – It is a function in floor spring which allows for doors to be held in open position at 90° angle or may be more in case of field selectable hold open mechanism. Requires manual release and not suitable for fire doors.

3.16 Closing Force – the power which the floor spring exerts on the door to move it into the closed position. Usually measured in power sizes and ranges from 1 to 7 which then refer to door sizes and weights.

3.17 Power Adjustment by Spring – The closers power can be adjusted after it is fitted by adjusting the spring tension of the unit to suit door size (width) & site conditions.

3.18 Door Coordinator – A device used on a pair of doors to ensure that the inactive leaf is permitted to close before the active leaf. Necessary when an overlapping astragal is present and exit devices, automatic or self-latching bolts are used with closers on both door leaves.

3.19 Bottom Pivot – Accessory used for mounting of door on to the floor spring. These accessories vary for various types of doors like steel, aluminium, wood and glass. The fasteners should also be suitable for the type of door and its mounting.

3.20 Top Centre Pivot – A device used for supporting the door from top, usually mounted on to the frame profile or lintel. Available both as adjustable and fixed.

3.21 Spindle – Is the rotating cam connected to the floor spring which takes the entire load of door. All bottom accessories sit on the spindle.

3.22 Shoe – It is a device fixed to the bottom of the door leaf to hoist it to the floor spring.

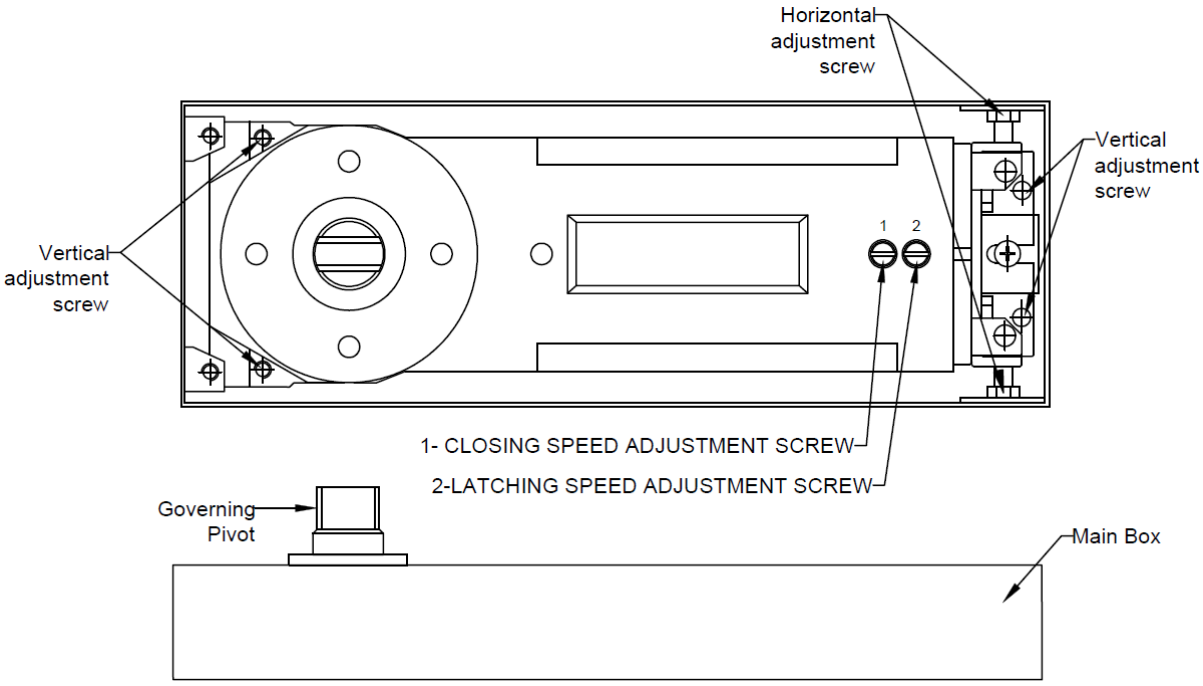


FIG. 1 TYPICAL DETAILS OF FLOOR SPRING (COVER REMOVED)

3.23 Closing Moment – The torque generated by the door closing device which acts upon the door leaf during the closing operation.

3.24 Opening Moment – The torque generated by the user which acts upon the door leaf during the opening operation.

3.25 Closing Force – The power which the closer exerts on the door to move it into the closed position. Usually measured in power sizes from 1 to 7 (*see* Table 1) which then refer to door sizes and weights.

3.26 Efficiency – A ratio of the opening force applied to the door by the user, and the force available for closing the door, expressed as a percentage.

3.27 Test Cycle – A cycle includes all operations of the test door, from the closed position, to opening to the required position and to closing back to the closed position.

4 TYPES OF HYDRAULIC FLOOR SPRINGS

4.1 Types – Most of the floor springs are hydraulically regulated and comes with two functions.

4.1.1 *With Hold Open* – It is an inbuilt function that allows the door to remain at either a pre-set or chosen angle until manually released. Standard hold open point is 90° most predominantly and goes up to 120°. Floor springs can have fixed hold open angle or field selectable degree of hold open starting from 70° to 120° or more. Floor spring may also have On/Off feature of hold open function.

4.1.2 *Without Hold Open* – Floor springs under this category may not have any inbuilt hold open function and comes with self-closing mechanism from any opening angle.

> Note – Manufacturer shall provide the information on maximum opening angle possible with the floor spring in the product literature and the product packing for easy understanding.

5 CONSTRUCTION OF FLOOR SPRING AND ACCESSORIES

5.1 Floor Spring may have a single cylinder and double cylinder to achieve the required spring size as outlined in the Table 1. All floor springs shall satisfy the requirement of spring strength, which could be fixed or variable. For example, a fixed spring size 3 is suitable for door widths up to 950 mm and weights up to 60 kg. If it is variable or adjustable like spring size 2 - 4 it means the floor spring can be used on door widths from 850 mm to 1 100 mm and weight from 40 kg to 80 kg.

5.2 The cylinders are cased in die cast body with springs and filled with hydraulic oil for controlled closing of doors. Floor springs with field selectable hold open, closing speed, back check or delayed closing shall have separate valves in the body of the closer with marking of function.

5.3 Suitable oil seals to be provided to assure oil does not leak either from the spring side or from valves.

5.4 The floor spring body shall include the foundation box to protect the floor spring from rusting and shall have provision to align the floor spring body once the box is cemented. Dimensions of the box and allowance for adjustments may vary as per construction.

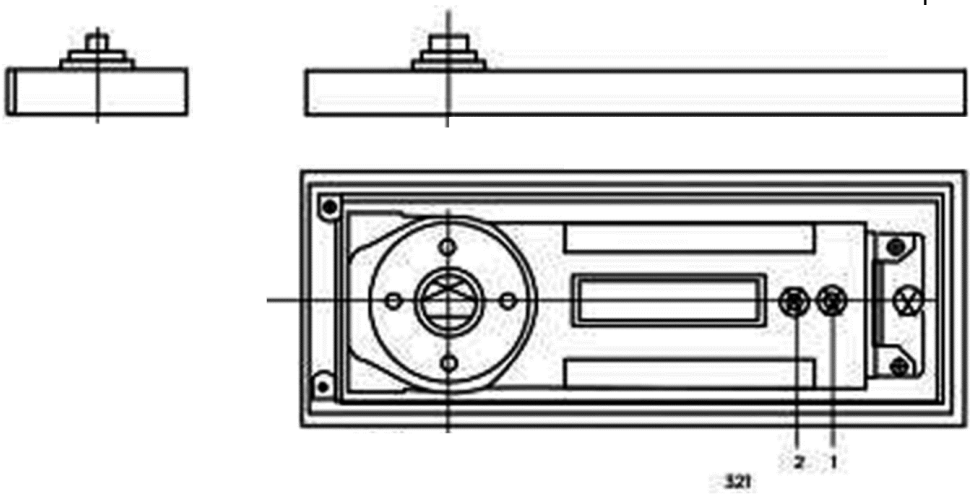


FIG. 2 TYPICAL SKETCH OF FLOOR SPRING BOX WITH THE BODY OF THE CLOSER AND SPINDLE

5.5 Fixed spindle or removable spindles to be provided for mounting of the door along with accessories (*see* Fig. 3). The height of the spindle shall be standard 3 mm and in case of removable spindle the extension heights may vary from 5 mm to 50 mm. The spindle material shall be hardened steel or stainless steel.

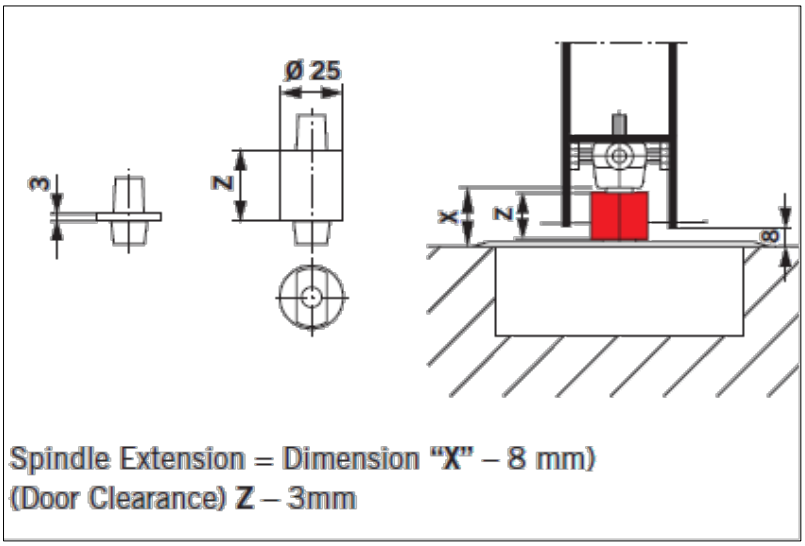


FIG. 3 TYPICAL SKETCH OF 3 SPINDLE FOR FLOOR SPRING

5.6 Floor springs by design can be used for both side swing (double swing) or opening in one direction (single swing). The opening and closing sequence of floor spring may vary based on the accessories used for mounting the door on the spindle. Single action accessories will allow for opening of doors in one direction. Double action accessories will be used if the door has to swing open in both directions.

5.7 Floor Springs shall be provided with protective cover in either stainless steel or brass. The finish of these covers could be satin or polished and may vary based on manufacturer. Floor springs with single action accessories are mounted offset, which requires a cover plate with split plate. See Fig. 4.

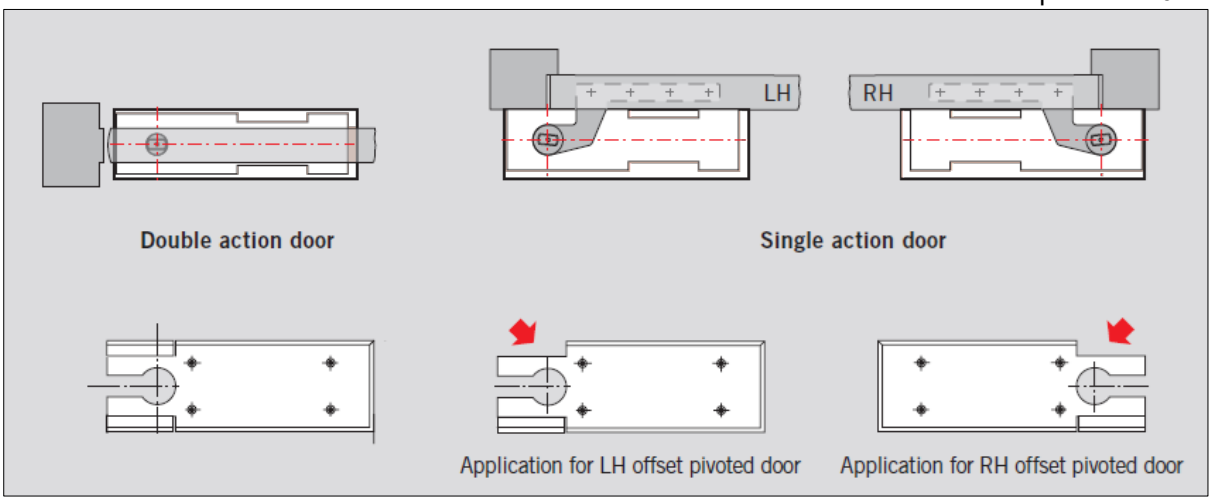


FIG. 4 TYPICAL SKETCH OF COVER PLATES FOR FLOOR SPRING

5.8 ACCESSORIES FOR DOUBLE ACTION FLOOR SPRINGS

Double action accessories are used when the door swings open in both directions. The floor spring is placed centre aligned to the frame at the time of installation as per manufacturer instructions. Following additional accessories are required to mount solid doors. In case of glass doors, the glass fittings work as a bottom shoe or bottom pivot or top pivot.

The manufacturer shall provide suitable double action accessories, as part of package or as additional requirement to mount various type of doors like wood, steel and aluminium. The accessories shall include Bottom strap and top pivot with receiver plate for doors. See Fig. 5 and Fig. 6.

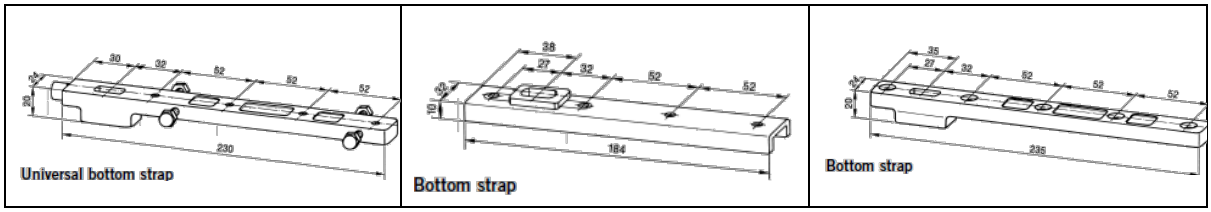


FIG. 5 DOUBLE ACTION ACCESSORIES BOTTOM STRAPS FOR VARIOUS TYPES OF DOORS

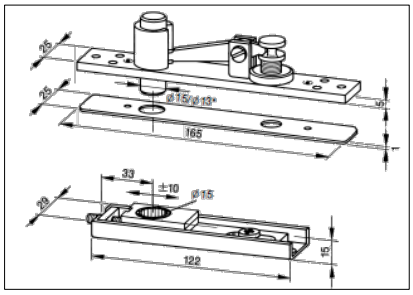


FIG. 6 DOUBLE ACTION ACCESSORIES TOP CENTRE FOR VARIOUS TYPES OF DOORS

5.9 ACCESSORIES FOR SINGLE ACTION FLOOR SPRINGS

Single action accessories are used in application where the swing of the door is restricted to one direction also known as single swing door. The floor spring is placed offset and aligned with rebated frame at the time of installation as per manufacturer instructions. Following additional accessories will be required to mount solid doors. In case of glass doors, the glass fittings works as a bottom shoe or bottom pivot or top pivot.

The manufacturer shall provide suitable single action accessories, as part of package or as additional accessories to mount various type of doors like wood, steel and aluminium. The accessories shall include Bottom strap and set of top straps for frame and shutter for doors. See Fig. 7. In addition, protection covers may be required to cover the straps projecting out of the door and these covers may be handed for top and bottom straps.

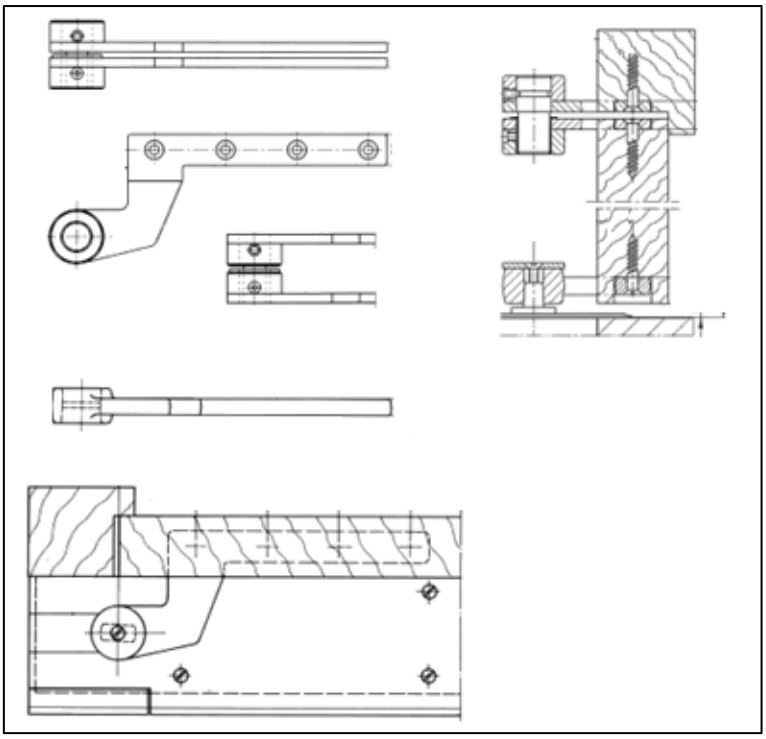


FIG. 7 SINGLE ACTION ACCESSORIES TOP & BOTTOM STRAP FOR VARIOUS TYPES OF DOORS

6 FUNCTIONAL CONTROLS OF FLOOR SPRINGS

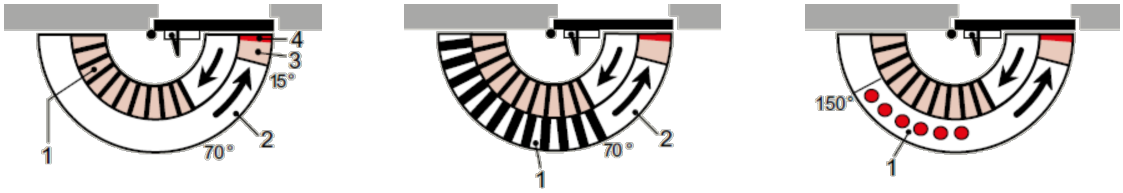
6.1 Closing Force – It is the actual spring strength of the floor spring. Floor spring selection is based on the door width and weight and the spring strength will define what kind of floor springs is suitable for the opening. Manufacturers offer floor springs with fixed power size e.g. (2 / 3 / 4) or with adjustable power size e.g. 2 to 4 or 3 to 6. All adjustable closing force floor spring shall have adjusting valve for increasing or decreasing the closing force. (See Fig 8)

6.2 Closing Speed – Floor spring closing speed may vary based on type of floor spring and its respective power size. Installation of floor spring on the push side will also have a direct bearing on the performance of the closing speed. The closing speed shall be operated by single adjustable valve from 180° to 0°. Alternatively, floor spring s can have multiple adjustable valves from 180° to 15° and 15° to 0°. (See Fig 8)

6.3 Latching Speed – This is the end closing speed which will create an additional push for overcoming the latching force and closing the door.

6.4 Back Check – A function of creating resistance to additional pressure applied on the door while opening, so that the door does not go and hit the adjacent wall furniture. Mostly, recommended for areas where there is high chances of abuse and doors opening against walls. Some floor springs come with a regulating back check which is inbuilt, or it is adjusted by valve. (See Fig 8)

6.5 Delayed Closing – Floor springs with delayed closing shall have an additional valve to control the hold open delay before closing the door. This is an optional feature and may be used on floor springs meant to delay the closing of door to allow material or man movement. (See Fig 8)



i) Self-regulating back check
ii) Infinitely variable closing speed in the range 180° – 15°
iii) Infinitely variable closing speed in the range 15° – 0°
iv) Adjustable latch range (by arm)

i) Adjustable delayed action
ii) Fully controlled closing with adjustable speed

i) Hold-Open range

Note: Hold-open arms are shall not be used for fire and smoke check doors.

NOTE – The above values and range are indicative only.

FIG. 8 TYPICAL ILLUSTRATION OF FLOOR SPRINGS SPEED CONTROL AND VARIOUS FUNCTIONS

7 NOMINAL SIZES

The floor springs shall be classified on power sizes based on suitability for door weight and width of the door leaf as per Table 1. Where a floor springs provides a range of power sizes, both the minimum and maximum shall be defined, for example size 2-4.

8 MATERIAL, FINISH & WORKSMANSHIP

8.1 The components of floor springs shall be manufactured from suitable materials and plated or coated accordingly to meet the performance and corrosion resistance requirements.

8.2 The floor spring, along with its accessories shall be free from sharp edges, burrs, flashes, dents, nicks etc. The sub assembly and necessary accessories shall show no signs of oil leakage, rust, scales, grease, scratches, dents.

TABLE 1 POWER SIZE
(*Clause* 3.14, 7, 9.3, 10.3, C-3.1, D-3.1, D-3.5 and D-4.1)

Sl No.	Power Size	Recommended Door Leaf Width (mm), Max.	Test Door Weight (kg)	Floor Spring Efficiency Between 0° and 4° (%), Min.
(1)	(2)	(3)	(4)	(5)
i)	1	750	20	50
ii)	2	850	40	50
iii)	3	950	60	55
iv)	4	1 100	80	60
v)	5	1 250	100	65
vi)	6	1 400	120	65
vii)	7	1 600	160	65

NOTE -Test door masses shown are only related to floor spring power size for the purpose of the test procedure.

9 CLASSIFICATION CODE

For the purpose of this standard, floor springs shall be classified according to following 6-digit coding system.

9.1 Digit 1 - Category of Use

For use on all internal and external doors the grades for classification are as follows:

i) Grade 3: For closing doors from at least 105º;
ii) Grade 4: For closing doors from 180º open.

NOTES
1 Grade 4 classification assumes standard installation according to the manufacturer's instructions.
2 For applications subject to extreme abuse, or for a particular limitation of opening angle, floor springs incorporating a back check function or provision of a separate door-stopper should be considered.

9.2 Digit 2 – Durability

Based on the durability aspects, four grades are specified as follows:

i) Grade 5: 50 000 test cycles
ii) Grade 6: 1 00 000 test cycles
iii) Grade 7: 2 00 000 test cycles
iv) Grade 8: 5 00 000 test cycles

9.3 Digit 3 – Test Door Mass and Floor Spring Power Size

Seven test door mass grades and related floor spring power sizes are classified in Table 1. Where the floor spring provides a range of power sizes both the minimum and the maximum sizes shall be identified.

9.4 Digit 4 – Fire Resistance

Five grades are classified for the requirement of use of floor spring on fire door assemblies are as follows:

Grade 0: Not suitable for use on fire / smoke check doors;
Grade 1: Minimum fire resistance capacity 30 minutes;
Grade 2: Minimum fire resistance capacity 60 minutes;
Grade 3: Minimum fire resistance capacity 90 minutes; and
Grade 4: Minimum fire resistance capacity 120 minutes.

NOTE – Floor spring with spring size of 1 and 2 are not recommended for use on fire and smoke check doors because of their low closing moments.

9.6 Digit 5 – Safety

All floor springs are required to satisfy the essential requirements of safety in use. Therefore, only grade 1 is identified. In this grade 1, there shall be no sharp corners which will hurt during installation and usage and also shall meet the surface requirements given in **9.2**.

9.7 Digit 6 – Corrosion Resistance

Capability of corrosion resistance are categorized in five grades based on following duration when tested as per IS 9844.

i) Grade 1: Mild resistance, up to 24 h (recommended for dry interiors);
ii) Grade 2: Moderate resistance, up to 48 h (recommended for interiors subject to condensation);
iii) Grade 3: High resistance, up to 96 h (recommended for damp interior and exterior); and
iv) Grade 4: Very High resistance, up to 240 h (recommended for polluted exterior – industrial / coastal)

9.8 Examples of Classification

Floor spring with fixed power size, can close the door from at least 105° open position, and has been tested for 50 000 cycles of operation, is suitable for door widths up to 950 mm and weight up to 60 kg, is not suitable for fire/ smoke doors, meets the safety requirements and has a moderate corrosion resistance.

Digit 1	Digit 2	Digit 3	Digit 4	Digit 5	Digit 6
3	5	3	0	1	2

Floor spring with variable power sizes, can close the door from at least 180° open position, and has been tested for 2 00 000 cycles of operation, is suitable for door widths starting from 750 mm up to 1100 mm and weight from 40 kg up to 80 kg, is suitable for up to 60 minutes fire / smoke resistance when installed with an equivalent fire rated door along with recommended accessories, meets the safety requirements and has high corrosion resistance.

Digit 1	Digit 2	Digit 3	Digit 4	Digit 5	Digit 6
4	7	2 4	2	1	3

10 PERFORMANCE REQUIREMENTS

10.1 General

10.1.1 The general test conditions and tolerances on testing parameters shall be as given in Annex B.

10.1.2 When tested as per this standard, the floor springs shall meet the performance requirements given from **9.1** to **9.7** and **10.2** to **10.6** as per the declared classification code of the floor spring.

10.2 Durability

10.2.1 The floor spring shall be able to close the test door complying with the requirements mentioned in **D-3** from opening angle of 90º. The floor spring sample shall be subjected to cycles as mentioned in **9.2**, with the maximum load specified by the power size of floor spring for a minimum of 50 000 cycles and maximum of 500 000 cycles as per the grading. For double action floor springs, the direction of closing to be alternated between clockwise and anticlockwise directions after every 5 000 cycles.

10.2.2 At the end of the test, the floor spring shall not show any sign of oil leakage or damage to the floor spring which will adversely affect its performance. After the test, verify for functioning of the floor spring for hold open & delayed closing action features (if available) in accordance with **D-2.2** and **D-2.3** respectively. The test set-up and method for floor spring testing are given at Annex C and Annex D respectively.

10.3 Power Size and Efficiency

The floor spring manufactured in any of seven power sizes, and shall confirm to the requirements of efficiency given in Table 1 in accordance with the direction of opening of the door either clockwise or anticlockwise. After 5 000 test cycles and after the completion of the test and tested as per method given in measured floor spring efficiency between 0° and 4° of the sample shall not be less than the values mentioned in Table 1 for the particular power size.

10.4 Fire Resistance

10.4.1 This requirement is based on the evaluation of product on test door assemblies as per IS 3614 or other individual test for use on fire rated door. The manufacturer shall indicate the method of fixing which will be used, together with the details of any additional material necessary to achieve the required performance under this test. The product shall conform to the classification given in **10.4**.

10.4.2 For fire rated floor springs, additional requirements are as follows:

10.4.2.1 The floor spring, when installed as per manufacturer installation instructions shall be capable of closing the test door from any angle to which it may be opened. Floor springs with adjustable closing force shall be capable of adjustment at least to power size 3.

> NOTE - For floor springs with adjustable closing force, the installation instructions shall include precise instructions to the installer to ensure that the floor spring power is adjusted on the site to size 3 or more, to overcome resistance of any seals or latches fitted.

10.4.2.2 Hold open units are not allowed on test floor spring unless it is electrically operated.

10.4.2.3 Control regulators shall be either be concealed or operable by only tools.

10.4.2.4 The floor spring shall be designed in a manner it is not possible to inhibit the closing action in anyway without the help of the tools.

10.4.2.5 Any delayed action function shall be capable of adjustment to less than 25 s, between the door closing angles of 120º and the end of the delay zone.

10.4.2.6 Where the floor spring is intended to be used with other significantly different assemblies, which may be supplied separately, that combination shall also be tested according to **10**.

10.5 Corrosion Resistance

10.5.1 Floor spring sample shall be tested as per IS 9844 for the duration given in **9.7** as per the grade specified by the manufacturer. At the end of the test, remove the floor spring from the salt spray cabinet. After half an hour, carefully remove residues of the spray solution from their surfaces. A suitable method is to rinse or dip the specimens gently in clean running water at a temperature not exceeding 40°C and then to dry them immediately in a stream of compressed air at a pressure not exceeding 200 kPa, at a distance of approximately 300 mm.

10.5.2 Post rinsing, when measured as per **D-3.4**, the closing moment of the floor spring shall not be less than 80 percent of the closing moment measured prior to the corrosion resistance test.

10.6 Operation at Extremes Temperature

Before setting and verifying the floor spring at the temperature extremes, the floor spring shall be conditioned in the temperature-controlled chamber for minimum 3 h at the temperatures mentioned below. Mount the floor spring in accordance with manufacturer's installation instructions on test door set-up (see Annex C), and the requirements shall be checked within 15 minutes of conditioning. The mounted floor spring shall be verified for smooth closing action and average of three readings of closing time shall not decrease to less than 5 s or increase to more than 20 s. It also shall not show any signs of oil leakage.

a) Ambient Temperature: (25 ± 5) ºC;
b) Low temperature: (-10 ± 2) ºC; and
c) High temperature Test: (40 ± 2) ºC

11 LOT, SAMPLING AND CRITERIA OF CONFORMITY

11.1 Lot - All floor spring of the same power size, shape, design, and features and manufactured under relatively similar conditions of production from shall be considered as one lot.

11.2 Sampling

11.2.1 For third party, the number of floor springs may be selected from a lot as per sampling procedure given in IS 2500 Part 1.

11.2.2 The floor springs shall be selected at random from the lot, for reference see IS 4905. The minimum quantity of floor springs to be taken for the testing of samples shall be as follows:

i) One floor spring for general requirements (workmanship, finish and safety), functional check and operation at extreme temperatures;
ii) One floor spring for durability (including power size and efficiency);
iii) One floor spring for corrosion resistance; and
iv) One floor spring for fire resistance, on test door assemblies as per IS 3614.

NOTE – In case the floor spring has adjustable power sizes, in case of i) and ii), two floor springs to be drawn from the lot. One floor spring to be set to minimum power size and other to maximum power size and the tested as per this standard. For corrosion test, only one floor spring set to minimum power size to be tested.

11.3 The samples of floor spring selected for testing for conformity, shall meet the requirements as given in this standard.

12 MARKING

12.1 Each floor spring body shall be legibly and indelibly marked with the following information:

a) Manufacturer's logo or brand name or trademark;
b) Marking of control valves; and
c) Classification code.

12.2 The following information shall be legibly marked on packing:

a) Manufacturer's name or trademark or other means of manufacturer identification;
b) Model number;
c) Handing of floor spring (if applicable) – L, R or U of floor spring;
d) Quantity and content in the package;
e) Month and Year of manufacture; and
f) Classification code of the product

12.3 BIS Certification Marking

The product conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the Bureau of Indian Standards Act, 2016 and the Rules and Regulations framed thereunder and the product may be marked with the Standard Mark.

13 PACKING

13.1 The floor spring shall be packed in individual packs. Additionally, it may be reinforced with boards or straw to prevent damage to the packed content. Packing shall be of such type and quality that it protects the content from moisture and physical damage during storage and transportation.

13.2 Each floor spring shall be supplied with a list of accessories along with instructions for its installation, regulation, use and maintenance.

13.3 Where the floor spring is recommended for fitting in other than standard application, these instructions shall clearly define the floor spring power size for each application of fitting position stated.

13.4 Installation Template

13.4.1 The manufacturer should provide clear, detailed instructions for its installation, regulation and maintenance which shall include any limitation of opening angle.

13.4.2 Installation templates shall be provided with all types of floor springs and shall contain minimum following instructions for users.

a) Floor spring power size (or max. door weight & max. door leaf width)
b) Floor spring mounting position and installation template
c) Fixing screws
d) Recommended drill bit for making holes on doors.
e) Instruction on spring adjustment (for adjustable power size floor spring)
f) Instruction on closing speed adjustment

g) Any additional information suitable for making proper adjustments and maintenance of floor springs.

Annex A
(*Clause* 2)

LIST OF REFERRED INDIAN STADNDARDS

IS. No.	*Title*
IS 9844: 1981	Methods of testing corrosion resistance of electroplated and anodized aluminium coatings by neutral salt spray test
IS 2500: 2000 Part 1	Sampling Schemes indexed by Acceptance Quality Level (AQL) for Lot by lot Inspection
IS 3614: 2021	Fire Doors and Door sets - Specification (*first revision*)
IS 4905: 2015	Random sampling and randomization procedures (*first revision*)

Annex B
(*Clause* 10.1.1)

GENERAL TOLERANCES IN THE TESTING PARAMETERS

B-1 TOLERANCES

Throughout this standard, the following tolerances shall apply, unless otherwise stated;

a) Mass in kilograms or grams (kg or gm) - ± 2 %
b) Length in milli-meters (mm) - ± 2 %
c) Force in kilo Newton or Newton (kN or N) - ± 2 %
d) Torque in Newton-meter (Nm) - ± 2 %
e) Time in seconds (s) - ± 5s
f) Temperature in Celsius (ºC) - ± 2 ºC
g) Angular position expressed in degrees - ± 2 %

B-2 The ambient temperature of the test environment shall be controlled throughout the tests to between (25 ± 5) ºC.

Annex C
(*Clause* 10.2.2 and 10.6)

TEST SET UP FOR FLOOR SPRING TESTING

C-1 Single Action Floor Spring

The test apparatus shall consist of a test door mounted in a frame, capable of manual opening to angles above the floor spring maximum opening angle or maximum up to 180º with automatic actuating means to enable the required opening angle.

C-2 Double Action Floor Springs

The test apparatus shall consist of test door mounted in a frame, capable of manual opening to at least 120º in each direction with automatic actuating means to enable the required opening angle in alternate directions.

C-3 Test Door

C-3.1 The test door shall be minimum 2 000 mm high, and of any width between 750 mm and 1 200 mm. The test door shall be mounted vertically on hinges or bearings to have a consistent smooth opening with actuating mechanism and closing of the door under the action of the floor spring. It shall have means of attaching weights so that the door mass can be adjusted to suit the power size of floor spring under test in accordance with Table 1. The test door and frame shall be of sufficient rigidity such that no visible distortion takes place during the entire test process.

C-3.2 The position of the centre of gravity shall be nominally at the mid-height position of the test door leaf, and 500 mm from the vertical axis of the hinges or pivots. The test door shall be mounted vertically on hinges or bearings, or, in the case of floor springs that pivot the door, on the unit under test. *See* Fig 9.

C-3.3 The apparatus must have provision to record the number of operating cycles of the test door has successfully completed. The equipment should ensure that the test door has returned fully to the closed position before initiating the next operation.

C-4 Force Measurement

A force gauge or other suitable device with an accuracy of 1.5 % of reading or better shall be provided for determining the opening and closing moments in accordance with this test.

C-5 Actuating Mechanism

The actuating mechanism shall not impede the return of the test door to a fully closed position, under the action of the floor spring being tested. The automatic actuating mechanism shall apply the opening force at a distance between 500 mm to 700 mm from the vertical axis of the rotation of the door.

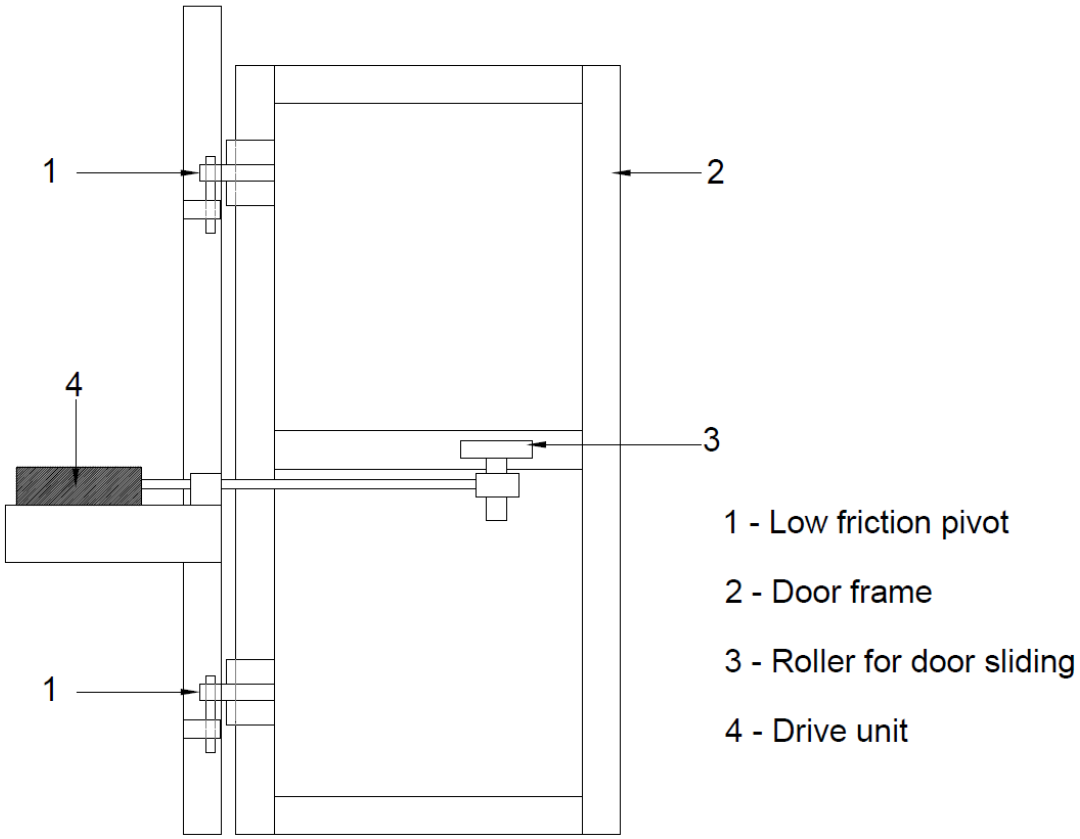


FIG 9 – TYPICAL DOOR TEST APPARATUS FOR CYCLE TEST

Annex D
(*Clause* 10.2.2)

TEST METHODS FOR FLOOR SPRING TESTING

D-1 General

Verify the product information given by the manufacturer used in testing of floor spring including the classification code.

D-2 Functional Check

Before performance testing on the floor spring, the functional check shall be done as follows:

D-2.1 After being fitted in its position, when the door or fixture is opened through 90º, the same shall swing back to an angle of 10º ± 5º with set closing speed but thereafter the speed shall get automatically retarded and in case of doors with latches, it shall be regulated so that in its final position the door smoothly negotiates with the latch. The closing time shall be easily adjustable between 3 s to 25 s.

D-2.2 Latch Control (Optional)

A floor spring manufacturer can include separate latch control to the door closing to overcome the resistance of a latch. If incorporated it shall be effective over a maximum range of 15º from the closed position and shall be adjustable.

D-2.3 Back-Check (Optional)

If provided with a back-check function the floor spring shall be capable of stopping the test door before the 90º open position when tested.

D-2.4 Delayed Closing (Optional)

If delayed closing is provided in the floor spring the same shall be adjustable with a separate regulator such that the closing time from 90º to the end of the delay zone at an ambient temperature of (25 ± 5) ºC is not less than 20 s. the delay zone shall not extend below the 65º open position. The moment required to override manually the delay action shall not exceed 150 Nm when tested. After 500 test cycles the delayed time shall be between 10 s and 30 s.

D 2.5 Adjustable Closing Force (Optional)

Floor springs with adjustable closing force function the floor spring shall comply with the performance requirement of **D-3** at both the minimum and maximum power settings declared by the manufacturer.

D-3 Durability, Power Size and Efficiency

D-3.1 Apply the weights to the test door so that the mass and centre of gravity are in accordance with Table 1 for the particular power size of floor spring being tested.

D-3.2 Mount the floor spring on the test apparatus according to manufacturer's installation template and installation instruction. Open the door to the maximum angle specified by the manufacturer and verify if the floor spring closes it completely from a minimum angle of 70º to closed position in a regulated manner. The floor spring control valves shall be such adjusted that the test door closes smoothly from 90º to fully closed within a time of 3 s to 7 s. If the floor spring has additional valve for latch control, adjust it to provide a smooth transition from closing to latching speed to provide a positive closing, but not slamming action. Disable hold open and delayed action feature prior to starting the test or set them to minimum effect. Adjust the test door actuation mechanism to open the test door smoothly to 90º in time between 3 s to 4 s and then allowing the test door to close under the action of the floor spring being tested. Make sure the door has returned fully to the closed position before initiating the next opening cycle.

D-3.3 One opening and closing shall constitute one cycle. Continue cycling test for a total of 5 000 test cycles. Record the ambient temperature. Allow the floor spring body surface to cool to within 2 ºC of ambient temperature.

D-3.4 Adjust the closer to a fully open position and measure both the opening and closing forces of the floor spring. The forces are measured slowly (not faster than 1 °/s) opening and closing the test door using the force gauge positioned perpendicular to the door face when the door is in an open position form 0° to 4°. The maximum value is to be noted, take the average of three readings.

D-3.5 Allow the door to close from its maximum opening angle permitted by the floor spring under test to 2° and note the minimum force obtained during its travel. Take the average of three readings.

D-3.6 After 5 000 test cycles and after the completion of the test, the measured efficiency shall not be less than the values mentioned in Table 1 for the particular power size.

$$\text{Efficiency of the floor spring} = \frac{\text{Average of max. closing force between 0º and 4º} \times 100}{\text{Average of max. opening force between 0º and 4º}}$$

D-3.7 Reset the floor spring parameters set at **D-3.2**, and continue the cycle test for its declared performance for the maximum number of cycles as given in **9.2**, and the regulators remain unlatered till the completion of test. Efficiency shall also be calculated at the end of the test of overall cycles and see that it is not less than the values mentioned in the Table 1. For double action floor springs, the direction of closing to be alternated between clockwise and anticlockwise directions after every 5 000 cycles.

D-4 Corrosion Resistance

D-4.1 Apply the weights to the test door so that the mass and centre of gravity are in accordance with Table 1 for the particular power size of floor spring being tested.

D-4.2 Mount the floor spring on the test apparatus according to manufacturer's installation template and installation instruction. The opening and closing force shall be measured as given in **D-3.4**.

D-4.3 After removal of the floor spring from salt spray test apparatus and post rinsing, the opening and closing force shall be again measured as given in **D-3.4**.

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