

Basic Technical Fundamentals of Builders Hardware Door Closers

SARGENT[®]
ASSA ABLOY



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Preface

Ever since people have felt the desire to protect hearth, home and family, they have used locks to protect what is theirs.

There are probably more lock mechanisms in the world than any other mechanical device. You have probably used various types of locks ever since you were a child, without really thinking about them – but how much do you know about these products from a technical perspective?

Over the last 150 years, many industry terms, products, functions and specifications have been created for hardware applied to doors, but what are they and how are they used?

This booklet covers only the fundamentals of the most basic products that Sargent manufactures. Using this basic knowledge, you can build on your expertise by using product catalogs and other related publications.

Specifications

In the mid 1850's, Sargent and Company moved from New Britain to New Haven, Connecticut and began to grow in size. By the late 1800's, the SARGENT catalog exceeded 800 pages and offered a broad array of products. The line included virtually every product a small hardware store might need to fill its shelves. What SARGENT didn't manufacture itself was bought, packaged and resold to meet the hardware stores' needs. The products listed in the late 1800's catalog ranged from cow bells and cake turners to kitchen food choppers, screws, coal shovels, "C" clamps, carpenter squares, animal traps, mop handles, such window and door hardware as hinges and sash fasteners and door locks of many variations. The list of products sold under the SARGENT name at the turn of the century goes on and on. Because the company's product line was so vast, the SARGENT name became known in homes, on farms and in businesses throughout the country. But as the company evolved, it began to

specialize in its more profitable and mechanically complicated products – namely, locks and door closers. Throughout the early to mid-1900's, Sargent pared down its line and introduced its first exit devices, a focus which has intensified in recent years.

The products that SARGENT chose to specialize in - door locks, door closers and exit devices – have made the company a well-recognized supplier of BUILDERS HARDWARE. This term applies to a large group of products used for purposes of protection, security and convenience, as distinguished from heavier and/or simpler materials used in construction such as columns, beams, nails, screws, etc.

SARGENT chose to specialize in high-quality BUILDERS HARDWARE, but also has a small line of lower-end, value-priced products designed for residential hardware or small building use.

Basic Technical Fundamentals of Builders Hardware Door Closers

Doors – (A Brief Review)

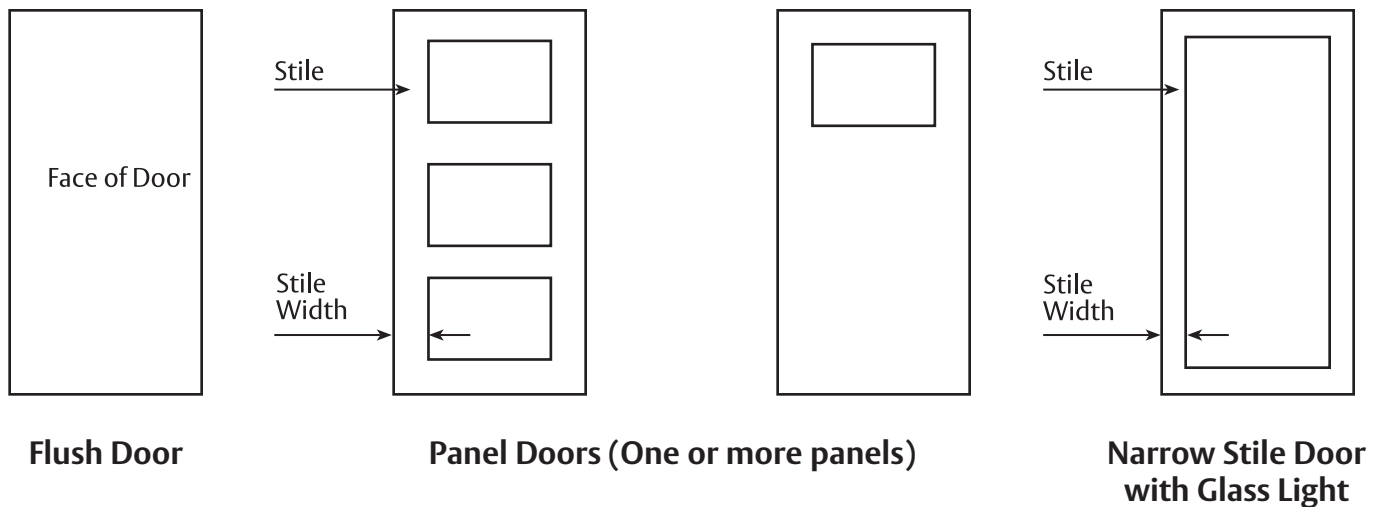
Before we start discussing door closers, we would like to share some facts about what they are used on and with – namely, DOORS. Doors may seem simple, but their use and construction is a whole field by itself. Therefore, this booklet will discuss only the fundamentals you need to know.

Most doors are made of wood or steel. (Doors made of aluminum or glass are also available but are not as common). Wood doors may be made of solid wood or laminate. Steel doors are usually made from formed sheet steel and reinforced

with steel plates to add strength and allow the attachment of hinges and other hardware.

The most common thickness of a swinging door is 1-3/4" thick and 36" wide. Doors may be flush or constructed with panels made of glass, metal or wood. These panels are usually placed below the face of the door.

Here are some examples of door variations that you should be aware of ...



Most doors are used to allow privacy, restrict sound, improve security and control effects of the weather. Another form of door is called a "Fire Door." A fire door is made and constructed of materials that are noncombustible, within limits. A fire door can be a type of wood door treated with a fire-resistant substance that will help contain a low-temperature fire.

Fire doors may also be made of steel. These are constructed to withstand much higher degrees of heat caused by fires. They are sometimes lined with a material to reduce the exchange of heat from one side of the door to the other.

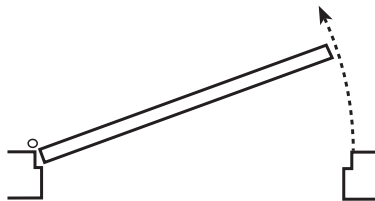
Doors sold as "Fire Doors" have passed certain fire tests conducted by an independent laboratory. This type of door is usually called a "Labeled Fire Door," as the classification listing is shown on the door itself. Hardware used on these doors is also tested and required to meet certain standards.

An exit door is sometimes referred to as a fire exit door, which does not necessarily mean it is a labeled fire door. Whether a labeled fire door should be used depends upon where it will go. (This subject is a study in itself and is not covered in this booklet).

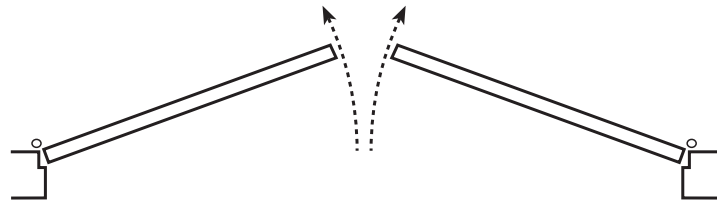
Basic Technical Fundamentals of Builders Hardware Door Closers

Doors – Single Doors, Pairs of Doors

The most common types of doors are swinging doors. This includes swinging single doors or swinging pairs of doors. Other doors are sliding doors, overhead doors, etc.



Single Door

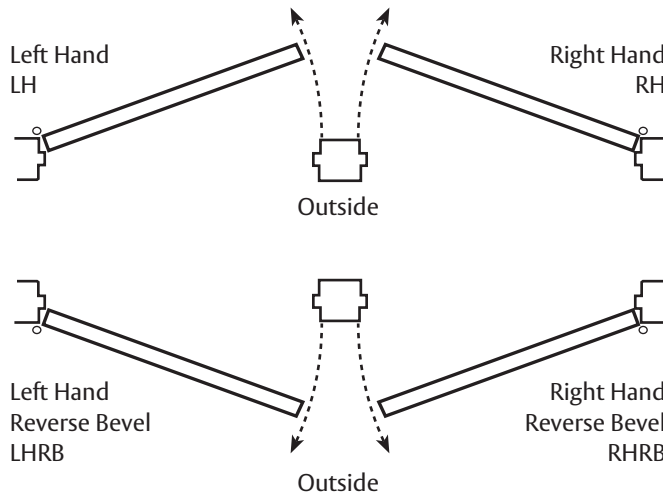


Pair of Doors

Hands of Doors

While there are a few exceptions, doors when fabricated are usually handed. The hands of doors are referred to as follows:

1. Left Hand Door – (LH)
2. Right Hand Door – (RH)
3. Left Hand Reverse Bevel Door – (LHRB)
4. Right Hand Reverse Bevel Door – (RHRB)



The term 'outside' in the illustration not only is used to indicate the outside of a building, but more importantly, to indicate the side of a door which can be locked requiring a key or other means to gain entry.

Why are Door Closers necessary?

A door installed with a properly adjusted door closer will open and close UNDER CONTROL at all times. The door closer will prevent possible bodily injury or damage to the door and door frame. It also reduces the sound of the door closing because it prevents slamming.

Doors Need to be Self-closing for a Number of Reasons:

Security – Doors to secured areas will always close and relock.

Energy Loss – Prevents energy loss for air-conditioned or heated facilities, particularly on exterior doors.

Sound Containment – Minimizes sound intrusion through open doors.

Push/Pull Doors – Holds door closed when the door is not self-latching.

Fire Doors – Underwriters Laboratories (UL) requires that any fire-listed door must be self-closing to stop the spread of fire.

Note: A device to hold the door open is used when desired. This hold-open device may be accomplished through the use of a hold-open door closer arm assembly. Other hold open devices are available and applied to the door independently of the physical door closer.

Door Closer Closing Force

The closing force desired by a door closer varies in consideration of the following.

1. Size of door (width and weight).
2. Wind or draft conditions.
3. Strength of person usually using the door.

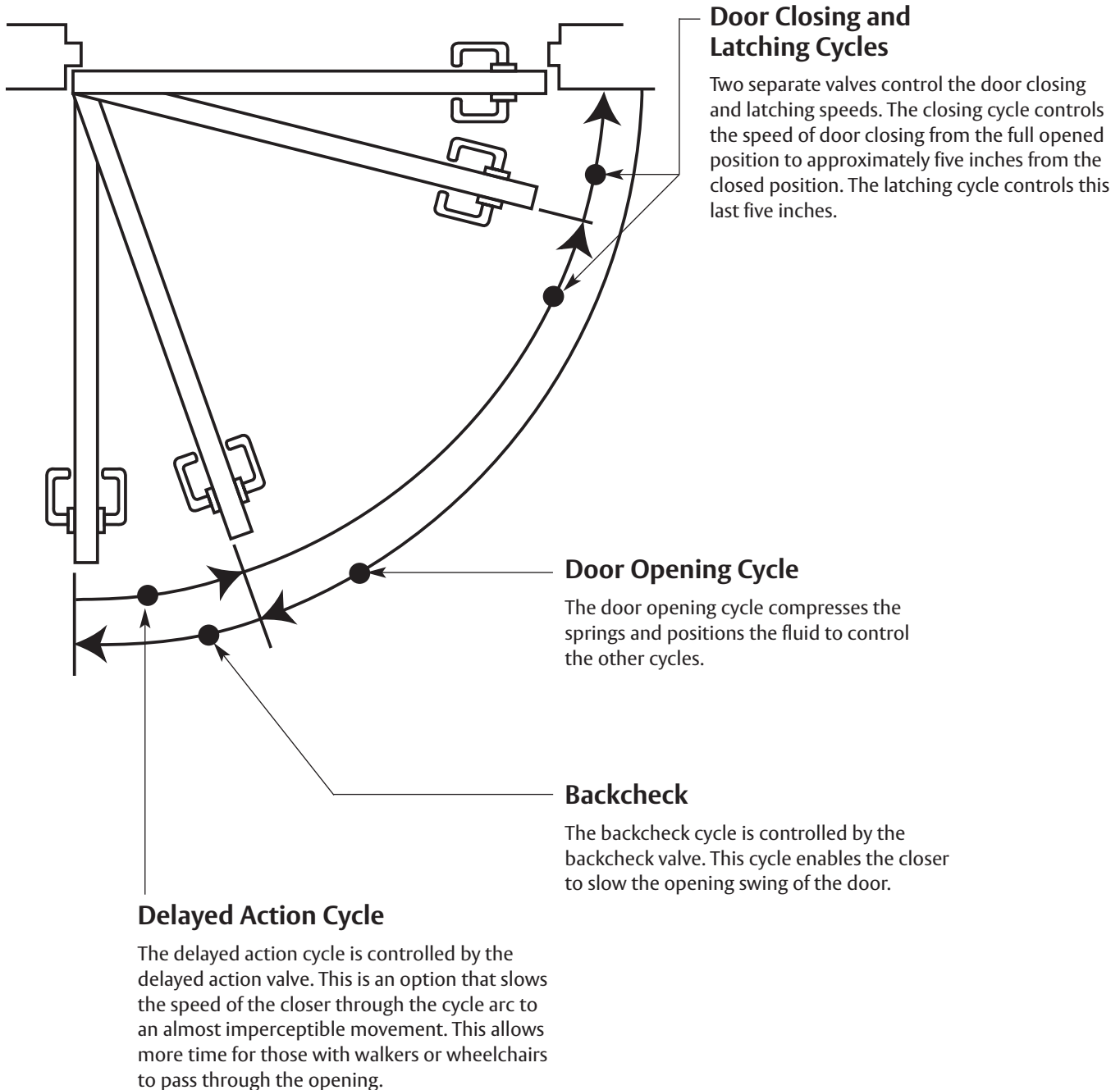
Door closers with a "power adjustment feature" may be adjusted to desired closing force after installation.

Door Closers Without the Power Adjustment Feature

Some door closer series are produced by size, i.e., without the "power adjusting feature." The main spring within the door closer body varies in size depending on the closing force desired for the various usages.

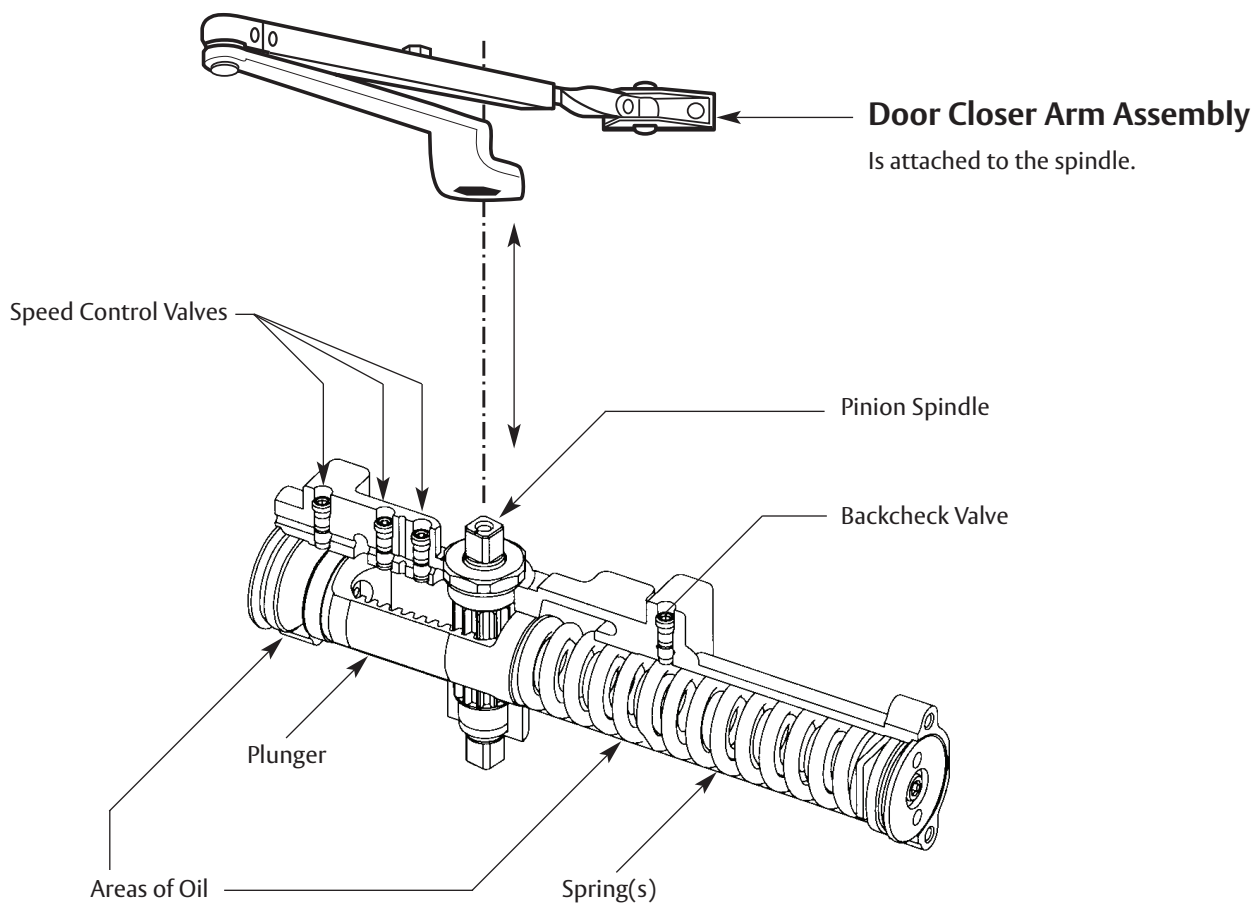
Size	Closing Force (Minimum when door is opened 1 to 3 inches)	Door Closer Usage
2	3 pounds force	Light weight interior doors
3	5 pounds force	Average weight interior doors
4	8 pounds force	Interior doors subject to draft
5	11 pounds force	Interior doors or exterior doors subject to draft
6	14 pounds force	Heavy exterior doors

Control Points



Internal Parts of the Door Closer

Name of parts and how a door closer works.



As a door is opened, the door closer arm assembly rotates the spindle. This causes the piston to move in a direction which compresses the spring. This compressing of the spring stores up energy. The movement of the piston also causes the hydraulic oil to flow from the area around the spring to the area being vacated by the moving piston. The oil during this operation flows through valve holes.

When the person opening the door releases the door, the compressed spring forces the piston back to its original position. The moving piston causes the spindle to rotate. This rotating force causes the door closer arm to return to its original position, where the door is closed.

During the movement of the piston, the hydraulic oil flows back and forth through valve holes. The amount of oil which can flow through these valve holes can be controlled by valve adjustment screws. The speed at which a door closes can be varied by adjusting these valve screws.

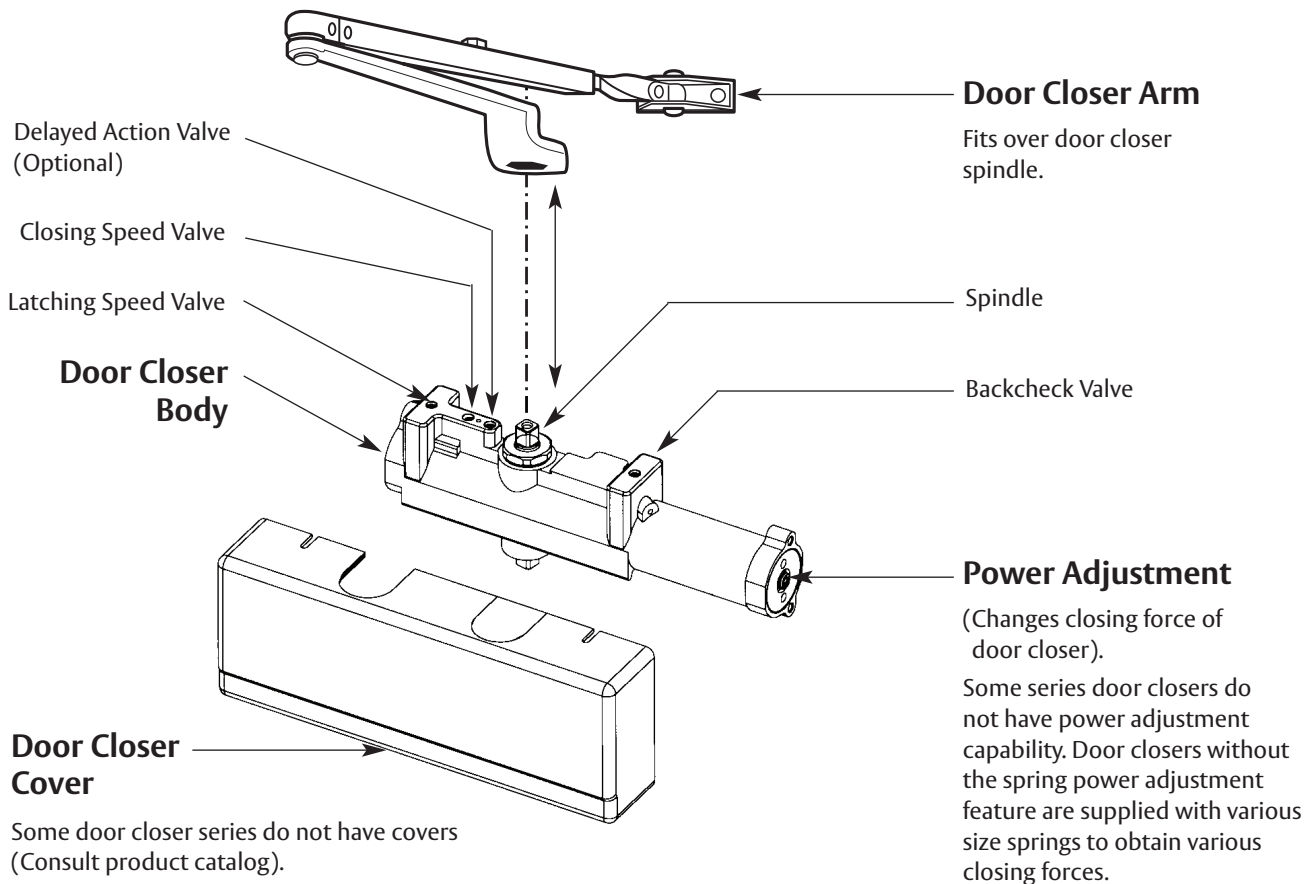
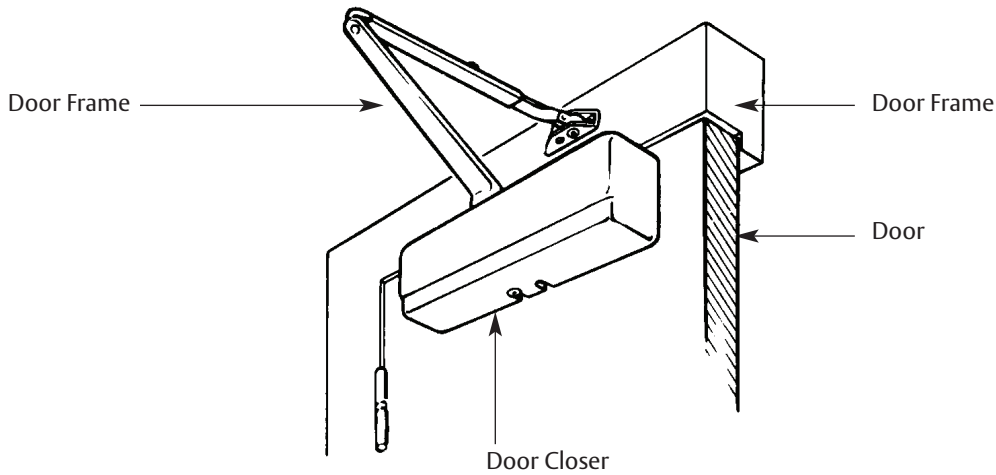
Every quality door closer should have a backcheck relief feature to eliminate the negative effect of excessive pressure caused by the complete locking down of the backcheck valve. This eliminates the door closer from being a door stop. This feature is accomplished in several different ways.

1. A special relief valve (PRV).
2. A backcheck valve with a relief orifice.
3. A separate intensity valve.

Door Closer Parts and Features

A door closer of the types discussed in this booklet are made up of various parts.

Standard Door Closer Application Shown



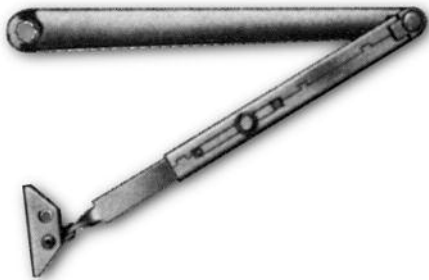
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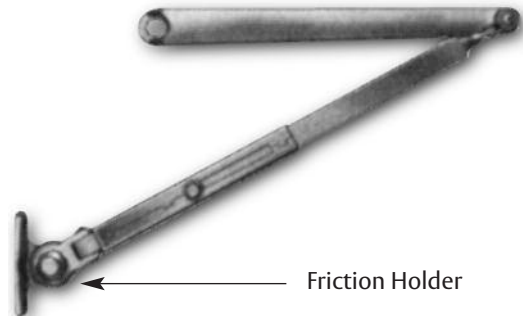
Door Closer Arms

The illustrations below are of some typical door closer arms. There are many door closer arms, brackets, etc. to meet the many various applications. (Consult product catalog for more detailed information).

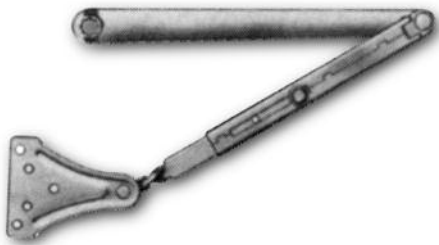
Arm for standard application or top jamb application.



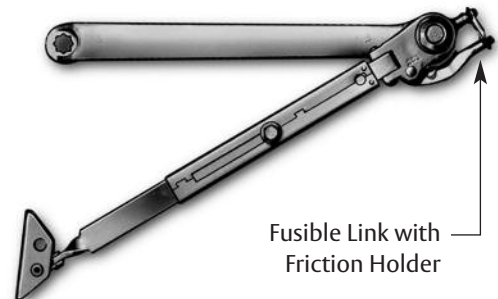
Arm with ability to hold door open.



Arm for parallel arm application.

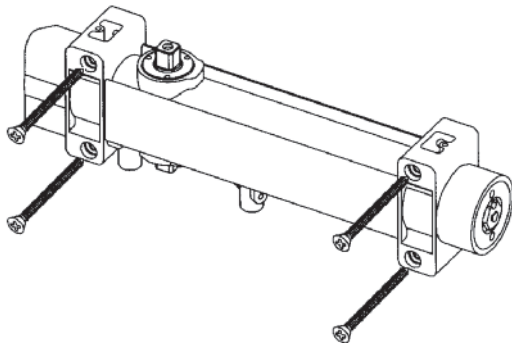


Arm with ability to hold door open but closes automatically when fire melts fusible link.



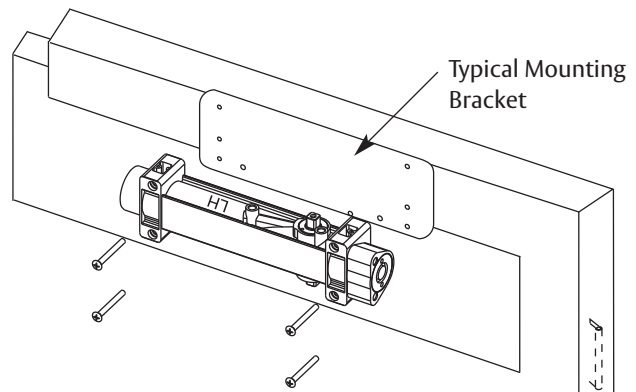
Two Methods of Attaching Door Closer Body to Door and/or Door Frame

#1



Four mounting screws attach door closer body directly to door or door frame depending on application.

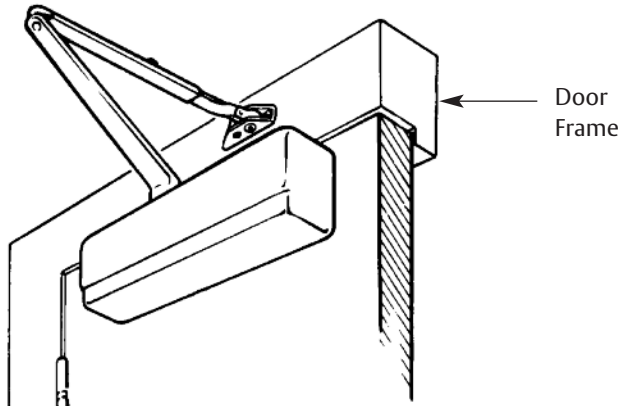
#2



Mounting bracket attached to door or door frame. Door closer body attached to mounting bracket. Mounting brackets and mounting plates vary in size and shape depending on application requirements (consult product catalog).

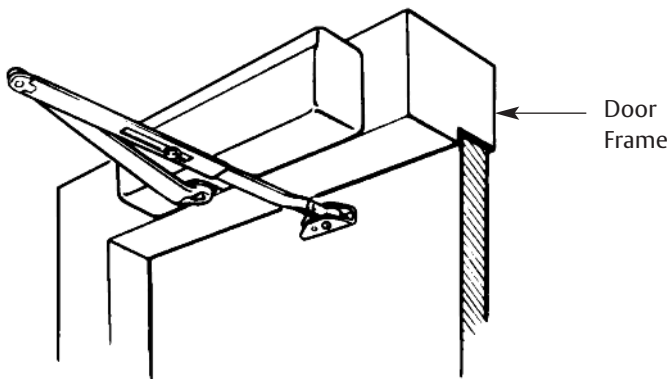
Door Closer Applications

This page covers the most common applications for door closers.



Standard Application

This door closer application is the most common and the most desirable. However, to protect the door closer from the weather, it should not be used on the exterior side of a door.

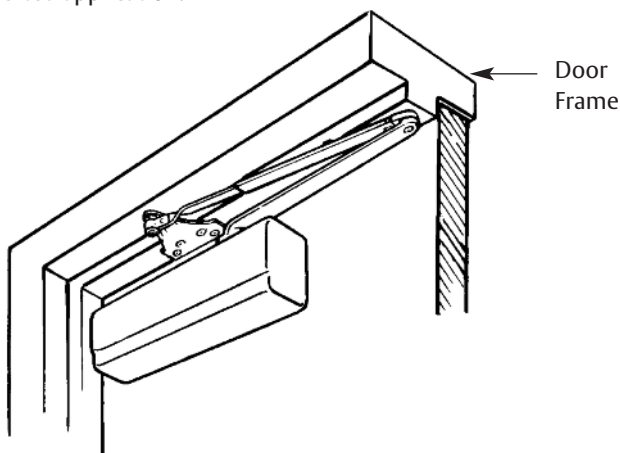


Top Jamb Application

This door closer application is meant for use on exterior doors that open out, protecting the door closer from the weather. The door frame at the top must be wide enough to allow the application of the door closer body.

This application is also used if it is preferable for the door closer to be on the opposite side of the door than in the standard application.

Note: The top jamb application is also referred to as an inverted application.



Parallel Arm Application

This door closer application is meant for use on exterior doors that open out, protecting the door closer from the weather.

This application is also used if it is preferable for the door closer to be on the opposite side of the door than in the standard application.

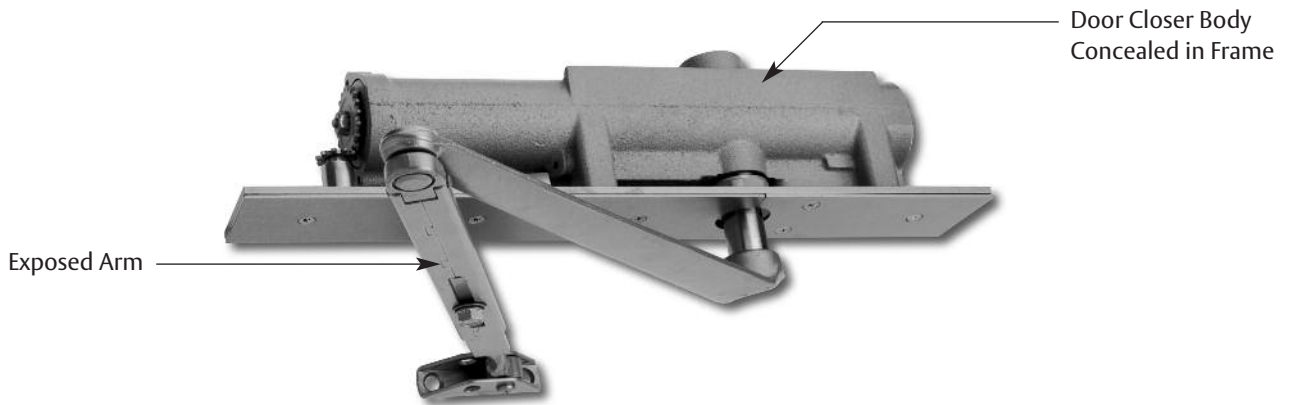
Note: Additional features and/or limitations (Parallel Arm Application):

1. Door closer arm does not project into room.
2. Unlike the Top Jamb Application, the top of door frame can be quite narrow.
3. Closing force is not as strong.

Door Closer Applications

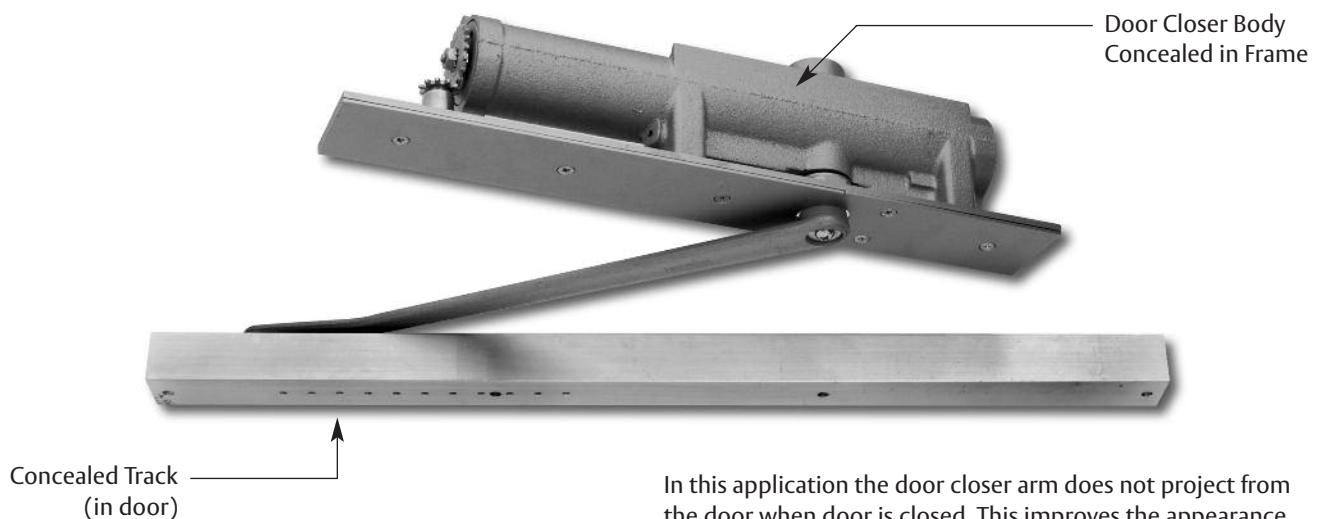
Shown below are some other applications of door closers which are not as common as those previously mentioned.

Concealed Door Closer Body with Exposed Arm



Door closer and installation costs are higher but not having the door closer body exposed enhances the appearance.

Concealed Door Closer Body with Track Arm



In this application the door closer arm does not project from the door when door is closed. This improves the appearance, but due to lack of mechanical leverage in the arm assembly, the closing force is reduced.

Basic Technical Fundamentals of Builders Hardware Door Closers



Some Abbreviations Used in the Builders Hardware Field

1. Associations Involved in Building Codes

- NFPA** - National Fire Protection Association
- UBC** - Uniform Building Code
- BOCA** - Building Officials and Code Administrators
- SBCC** - Southern Building Code Conference

2. Testing Laboratories – (Door and Hardware field)

- UL** - Underwriters Laboratories
- ULC** - Underwriters Laboratories of Canada
- WHI** - Wernock Hersey, Inc.

3. Doors and Hardware Association

- DHI** - Door and Hardware Institute
- AHC** - Architectural Hardware Consultant

4. Miscellaneous

- ADA** - Americans with Disabilities Act

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Founded in the early 1800s, SARGENT[®] is a market leader in locksets, cylinders, door closers, exit devices, electro-mechanical products and access control systems for new construction, renovation, and replacement applications. The company's customer base includes commercial construction, institutional, and industrial markets.

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