



ARCHITECTURAL HINGES

SELECTING A HINGE

Determine Type of Hinge

- What is the door material (wood, stainless steel, fiberglass, or hollow metal)?
- What is the frame material (wood, stainless steel, channel iron, or hollow metal)?

Hinges are manufactured in accordance with ANSI/BHMA A156.1. Self-closing hinges and pivots are in accordance with ANSI/BHMA A156.17 using three hinges per opening on a 3'0" x 7'0" x 1-3/4" (914 mm x 2134 mm x 44 mm) door.

Round corners are available in 1/4" (6 mm) (standard) or 5/8" (16 mm) radius.

Full Mortise

Both leaves are mortised, one leaf in the door and one leaf in the frame (wood door or hollow metal door with wood frame or hollow metal frame).

Example: BB1279, 4-1/2" x 4-1/2" (114 mm x 114 mm), US26D

Half Mortise

One leaf is mortised in the door and the other is surface applied to the frame (hollow metal door with channel iron frame).

Example: BB1109, 4-1/2" (114 mm), US26D

Full Surface

Both leaves are applied to the surface, one to the door and the other to the frame (metal core door or hollow metal door with channel iron frame).

Example: BB2171, 5" (127 mm), USP

Half Surface

One leaf is mortised in the frame and the other is surface applied to the face of the door (wood door with wood frame or metal core door with hollow metal frame).

Example: BB1163, 5" (152 mm), US26D

Select the Proper Weight and Bearing Structure

Because of the variety of door sizes and weights, hinges are placed into three groups:

Heavy Weight - Ball Bearing

Example: BB1199, 5" x 5" (127 mm x 127 mm), US32D

Standard Weight - Ball Bearing

Example: BB1279, 4-1/2" x 4-1/2" (114 mm x 114 mm), US26D

Standard Weight - Plain Bearing

Example: 1279, 4" x 4" (102 mm x 102 mm), US10

There are two factors that determine the weight and structure of the hinge: weight of the door and frequency of use. It is advisable to include the approximate weight of additional hardware that will be installed on the door.

Determine the Size of Hinge

The first thing to find is the height of the hinge. Follow the examples below. These are only examples. Job situations will offer many more variables.

Only on the full mortise hinges are there two dimensions, such as a 4-1/2" x 4-1/2" (114 x 114 mm). The first dimension indicates the height and the second dimension indicates the width when the hinge is in the open position.

Thickness of Door	Width of Door	Height of Hinge
1-3/8" (35 mm) Door	To 32" (813 mm)	3-1/2" (89 mm)
1-3/8" (35 mm) Door	32" to 36" (813 to 914 mm)	4" (102 mm)
1-3/4" (45 mm) Door	To 36" (914 mm)	4-1/2" (114 mm)
1-3/4" (45 mm) Door	36" to 48" (914 to 1219 mm)	5" (127 mm)
1-3/4" (45 mm) Door	Over 48" (1212 mm)	6" (152 mm)
2", 2-1/4", 2-1/2" Door (51, 57 & 64 mm)	To 42" (1067 mm)	5" (127 mm) Heavy Weight
2", 2-1/4", 2-1/2" Door (51, 57 & 64 mm)	Over 42" (1067 mm)	6" (152 mm) Heavy Weight

Height of Hinge

There are three dimensions to know in order to determine the minimum width of the hinge: door thickness, backset, and clearance required.

1. When figuring the calculations for a wood door and wood frame, the door is flush with the casing or face of the frame. When figuring the calculations for a wood or metal door with a hollow metal frame, the door is inset approximately 1/8" (3.2 mm).
2. For doors up to 2-1/4" (57 mm) thick, the hinge is set back 1/4" (6.4 mm) from the back face of the door.
3. For doors over 2-1/4" (57 mm) thick, the hinge is set back 3/8" (9.5 mm) from the back face of the door.

Once these dimensions are known, the formula can then be applied. **Take the door thickness, subtract the backset, multiply by two, and add the clearance required.** If the hinge size is not standard, then go to the next larger hinge width. If the width of the hinge is greater than the height of the hinge [example: 4-1/2" x 6" (114 mm x 152 mm)] this is referred to as a wide throw hinge. This would apply only to full mortise hinges.



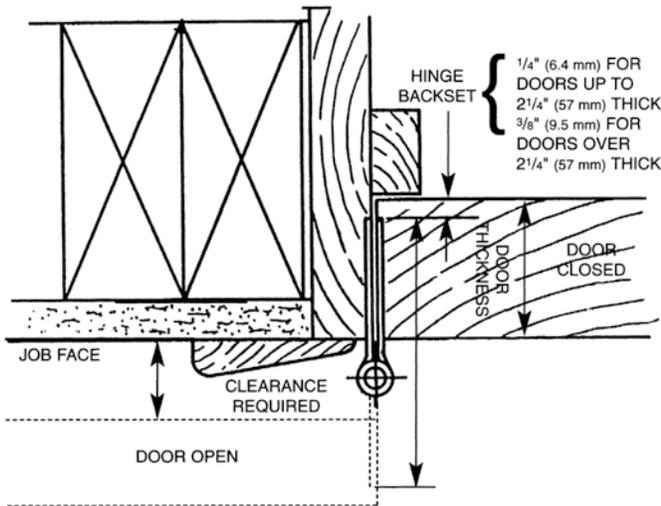
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Doors up to 60" (1524 mm) in height shall be provided with two hinges and an additional hinge for each additional 30" (762 mm). Where spring hinges are used, at least two shall be provided.

Hinge Type

Full Mortise Hinge Height	Frequency of Use	Max Door Weight	Maximum Door Width	Type
4-1/2" (114 mm)	Low	75	36" (914 mm)	1279
4-1/2" (114 mm)	Medium	150	36" (914 mm)	BB1279
4-1/2" (114 mm)	High	150	36" (914 mm)	BB1168
5" (127 mm)	Low	100	36" (914 mm)	1279
5" (127 mm)	Medium	175	36" (914 mm)	BB1279
5" (127 mm)	High	175	36" (914 mm)	BB1168
6" (152 mm)	Low	125	36" (914 mm)	1279
6" (152 mm)	Medium	230	36" (914 mm)	BB1279
6" (152 mm)	High	230	36" (914 mm)	BB1168



Door Thickness	Standard Backset	Max. Clearance Provided	Width of Hinge
1-3/8" (35 mm)	1/4" (6.4 mm)	1-1/4" (32 mm) 1-3/4" (45 mm)	3-1/2" (89 mm) 4" (102 mm)
1-3/4" (45 mm)	1/4" (6.4 mm)	1" (25 mm) 1-1/2" (38 mm) 2" (51 mm) 3" (76 mm)	4" (102 mm) 4-1/2" (114 mm) 5" (127 mm) 6" (152 mm)
2" (51 mm)	1/4" (6.4 mm)	1" (25 mm) 1-1/2" (38 mm) 2-1/2" (64 mm)	4-1/2" (114 mm) 5" (127 mm) 6" (152 mm)
2-1/4" (57 mm)	1/4" (6.4 mm)	1" (25 mm) 2" (51 mm)	5" (127 mm) 6" (152 mm)
2-1/2" (64 mm)	3/8" (9.5 mm)	3/4" (19 mm) 1-3/4" (45 mm)	5" (127 mm) 6" (152 mm)

Minimum Width of Hinge

Determine the Number of Hinges

The next determination is the number of hinges per door leaf. A general rule of thumb: one hinge for every 30" (762 mm) of door height or fraction thereof.

Door Height	Number of Hinges
Up to 60" (1524 mm)	2 Hinges
Over 60" (1524 mm) and not over 90" (2286 mm)	3 Hinges
Over 90" (2286 mm) and not over 120" (3048 mm)	4 Hinges

For doors with a width greater than 37" (940 mm) to 48" (122 mm), an extra hinge could be used for additional strength. The extra hinge helps support the additional weight and tension applied to the frame created by the wider door width.

Minimum Cycle Requirements

Plain Bearing = 350,000

Standard Weight Ball Bearing = 1,500,000

Heavy Weight Ball Bearing = 2,500,000

Determine Type of Material

Steel

This has great strength, but it is a corrosive material. If the atmosphere that steel is used in is not stable, steel will begin to rust. The best application for steel is in a controlled environment, such as inside a building where the temperature and humidity are controlled.

Stainless Steel

This also has great strength. It is rust resistant and can be polished to a satin or bright finish. For highly corrosive areas, 316 grade or clear coat over 304L may be recommended. Hager Companies standard grade stainless steel is 304L.

Brass

This material is noncorrosive, rust resistant, and very decorative. However, it has less strength than the steel or stainless steel material. Brass is often used where appearance is of great concern as it may be polished and plated in various finishes.

Both steel and stainless steel hinges may be used on listed fire rated or labeled door openings. Brass material may not be used on fire rated or labeled openings because of the low melting point.



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Determine Type of Finish

All steel and brass material hinges can be plated to match the available finishes that are listed in the American National Standards Institute, standard ANSI/BHMA A156.18 Materials and Finishes.

Special Rust-Resisting Finishes

When using steel base material hinges, special finishing processes can be provided that will afford additional protection to the product. A nickel undercoat may be applied prior to plating. Although this will give added protection and is considered rust-resistant, it is not to be considered rust-proof. If a true rust-resisting hinge is needed, consider using a non-ferrous metal such as brass or stainless steel.

Note: Hager Companies only warrants US10B finish over brass base material. If steel base is necessary, Hager Companies recommends US10A lacquer finish.

Antimicrobial Protection

Hager Companies uses a powder coat process to apply the AgION™ antimicrobial treated coating to guarantee durability and protection. Antimicrobial resistance on products is affected by moisture in the air. Silver ions interact with humidity and are released creating a cleaner surface. AgION™ is not recommended over stainless steel.

Determine Handing

On some applications it will be necessary to order hinges that are handed. Most manufacturers use the suffix RH (right hand) and LH (left hand). Another general rule of thumb, most manufacturers make the half surface, half mortise and full surface hinges for right hand use. Conversion from right hand to left hand is very simple; take the pin out of the knuckle, remove the bottom plug, turn the hinge over, replace the plug

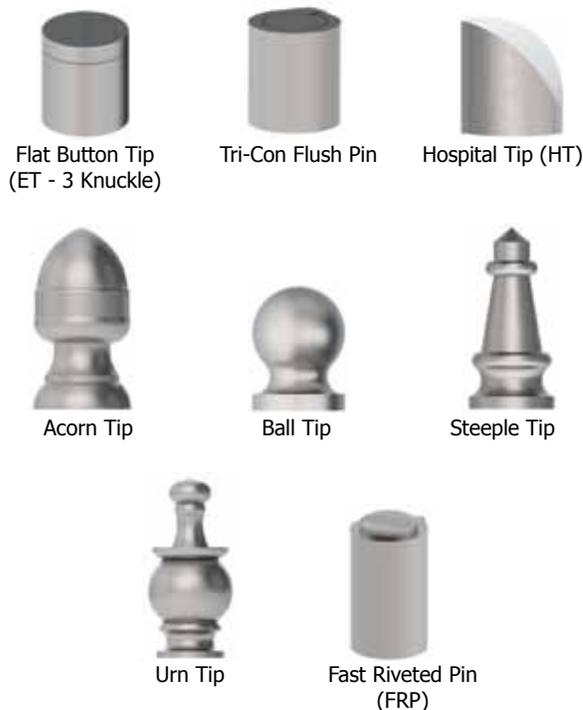
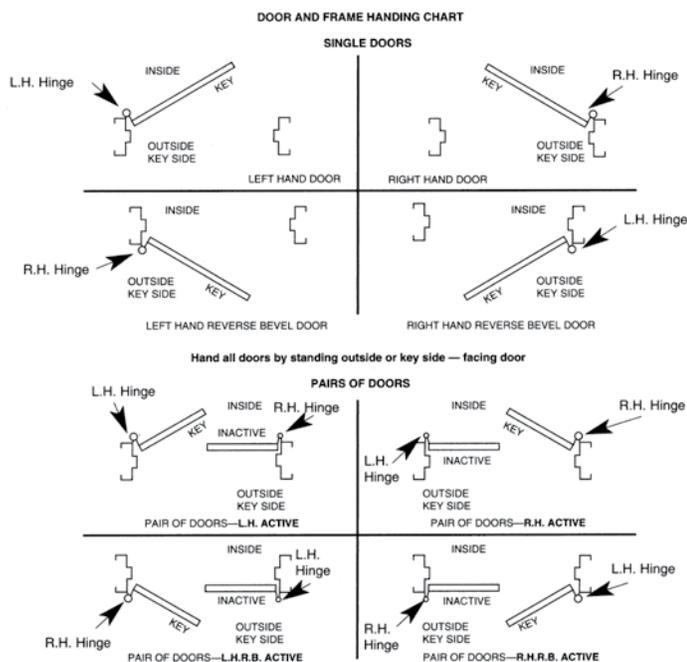
in the bottom and the pin in the top of the knuckle, and the handing is reversed.

- The hand of a hinge is determined from the outside of the door to which it is applied. This is usually the locked side.
- When standing outside, if the door opens away (into the area) to the right, it takes a right hand hinge (also referred to as RH). If it opens to the left, it takes a left hand hinge (also referred to as LH).
- When standing outside, if the door opens (out of the area) toward the right, it takes a left hand hinge (also referred to as right hand reverse bevel – RHRB). If it opens to the left, it takes a right hand hinge (also referred to as a left hand reverse bevel – LHRB).

ADDITIONAL CONSIDERATIONS

Determine Pin and Tip Style

- The standard in the industry is the Flat Button Tip for 5-knuckle hinges.
- The flush/concealed tip is standard on 3-knuckle. If button tip is required, specify Exposed Tip (ET).
- Hospital Tips (HT) are used primarily for security areas in hospitals and in prisons. This tip prevents hanging any objects on the tip of the hinge. Hager provides all hospital tipped hinges with an NRP set screw in the center of the knuckle, two cross pins, stainless steel hinge pin, and an oil port for lubrication purposes. If the hinge is ball bearing, the components used for the bearing are made of stainless steel.
- Decorative tips such as Acorn, Ball, Steeple, and Urn are used in highly decorative areas of offices and residences.
- Fast Riveted Pins (FRP) are spun on both ends, making the pin permanent.





Fire Rated Application

Door Rating (Hr)	Maximum Door Size		Minimum Hinge Size		Type Hinge
	Width	Height	Height	Thickness	
For 1-3/4" (44.5 mm) or thicker doors					
3, 1-1/2, 1, 3/4, 1/2, 1/3	4 (1.22)	10 (3.05)	4-1/2 (114.3)	0.180 (4.57)	Steel, mortise or surface
3, 1-1/2, 1, 3/4, 1/2, 1/3	4 (1.22)	8 (2.44)	4-1/2 (114.3)	0.134 (3.40)	Steel, mortise or surface
1-1/2, 3/4, 1/2, 1/3	3-1/16 (0.96)	8 (2.44)	6 (152.4)	0.225 (5.72)	Steel, olive knuckle or paumelle
3, 1-1/2, 1, 3/4, 1/2, 1/3	4 (1.22)	10 (3.05)	4 (101.6)	0.225 (5.72)	Steel pivots (including top, bottom, and intermediate)
1-1/2, 1, 3/4, 1/2, 1/3	3 (0.91)	5 (1.52)	4 (101.6)	0.130 (3.30)	Steel, mortise or surface
1-1/2, 1, 3/4, 1/2, 1/3	2 (0.61)	3 (0.91)	3 (76.2)	0.092 (2.34)	Steel, mortise or surface
3, 1-1/2, 1, 3/4, 1/2, 1/3	3 (0.91)	7 (2.13)	4-1/2 (114.3)	0.134 (3.40)	Steel, mortise or surface (labeled, self-closing, spring type)
3, 1-1/2, 1, 3/4, 1/2, 1/3	3 (0.91)	7 (2.13)	4 (101.6)	0.105 (2.67)	Steel, mortise or surface (labeled, self-closing, spring type)
For 1-3/8" (34.9 mm) doors					
3, 1-1/2, 3/4, 1/2, 1/3	3 (0.91)	7 (2.13)	3-1/2 (89.9)	0.123 (3.12)	Steel, mortise or surface
3, 1-1/2, 1, 3/4, 1/2, 1/3	2-2/3 (0.81)	7 (2.13)	3-1/2 (89.9)	0.105 (2.67)	Steel, mortise or surface (labeled, self-closing, spring type)

Source: Table 6.4.3.1, NFPA 80-2007. Re-printed with permission.

Underwriter's Laboratories does not specifically apply UL listings to hinges. Instead, their Builder's Product Directory refers to NFPA80 Standard for Fire Doors and Fire Windows 2007 Edition, Table 6.4.3.1 Builders Hardware Mortise, Surface, and Full Length Hinges, Pivots or Spring Hinges for Swinging Doors, listed above.

Notes:

1. All hinges or pivots, except spring hinges, shall be of the ball bearing type. Hinges or pivots employing other anti-friction bearing surfaces shall be permitted if they meet the requirements of ANSI A156.1, Standard for Butts and Hinges. Spring hinges shall be labeled and shall meet the requirements of ANSI A156.17, Standard for Self Closing Hinges and Pivots, Grade 1.
2. Hinges 4-1/2" (114 mm) high, 0.180" (4.57 mm) thick shall be permitted for use on wide and heavy doors or doors that are subjected to heavy use or unusual stress.
3. Some manufacturers can provide fire doors with hinges of lighter weight that are not of the ball bearing type where they are part of a listed assembly and meet the requirements of ANSI A156.1, Standard for Butts and Hinges, and have been tested to a minimum of 350,000 cycles.
4. Pivot sets made up of components that are smaller or of a lighter gauge than shown in this table shall be permitted to be used, provided they meet the requirements of ANSI A156.4, Door Controls (Closers) and are in accordance with the manufacturer's label service procedures.

Special Hinges

Spring



NFPA 80 has restricted the use of architectural grade spring hinges to fire rated doors of a maximum size of 3'0" x 7'0" (914 mm x 2134 mm). Hager spring hinges have been tested and labeled for up to a 4'0" x 8'0" (1219 mm x 2438 mm) door when a minimum of three springs are used. Spring hinges must be used with ball bearing hinges. Do not use plain bearing hinges with spring hinges.



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Special Hinges (Continued)

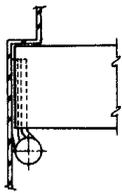
Air Transfer Hinge (ATH)



One other product that can be used for a power transfer hinge is an air or pneumatic transfer hinge. This is used to transfer as much as 120 pounds of air pressure through the hinge in order to operate an air modified lock or exit device. Pneumatic power may be used in explosion-proof areas or where electric power is not sufficient to perform the necessary job.

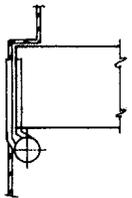
Raised Barrel

This option is used when the door is set back into the frame. The hinge knuckle is offset to allow it to clear the obstruction of the frame. There are three different types of applications:



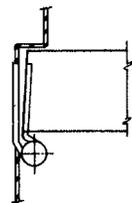
Jamb Surface Mount

On the **Jamb Surface Mount (JSM)** application, the door is mortised to accommodate both hinge leaves; it is sometimes referred to as double mortised. The Jamb Surface Mount may be applied to either a square or beveled edged door.



Raised Barrel Square

The **Raised Barrel for Square Edged (RBS)** and the **Raised Barrel for Beveled Edged (RBB)** door applications are mortised into the frame and door as a standard full mortise hinge. Standard offset is 3/8" (10 mm). Depending on the depth of the frame, all three of these applications may restrict the degree of opening.



Raised Barrel Beveled

Swing Clear



This is used when the passage area must be the full width of the opening. Swing clear hinges are designed to swing the door completely clear of the opening when the door is opened 95°.

Detention

Investment cast full mortise hinges (IHTHB953 Series) are the standard 4-1/2" x 4-1/2" (114 mm x 114 mm) size with a mortise depth of 0.187" (4.7 mm). These hinges can carry doors weighing up to 600 pounds.

Anchor



The anchor hinges are intended for use on heavy wood or hollow metal doors in high frequency applications such as hospitals, schools, and public use buildings. These hinges are especially designed for use on doors where additional hardware (door closers or holders) may cause excessive strain or abuse to the door, frame, and/or hinges.

Anchor plates may be attached to either the frame and/or door. Their screws are placed in shear to the screws from the normal hinge plate. With the screws in shear, this prevents the hinges from pulling loose on the door or the frame.

There are two variations of the reinforcing/anchor hinge: one has a single extension leaf which is mortised into the frame only; the second has two extension leaves. One leaf is mortised into the frame and the other leaf is mortised into the top edge of the door. It will be necessary to know if the doors are square edged or beveled edged.

Aluminum Entrance



A slip-in hinge, plain bearing or ball bearing, is used with aluminum doors and frames. These hinges are manufactured for low to average frequency and medium weight aluminum doors and frames.

1277 or BB1277 – Both leaves are drilled and tapped for insertion into a slot in the door and the frame.

1278 or BB1278 – One leaf has the standard template hole punch and countersinking and the other leaf is drilled and tapped for insertion into a slot in the door or frame.

Electric Hinges

The electric hinge provides an easy means to monitor the opening as well as transferring power from the frame into the door.

Electric hinge modifications can be either exposed on the surface of the hinge or concealed in the hinge. When concealed, the modifications are not visible and normally go undetected by personnel using the openings.

All of the Hager Companies electric hinges have been tested through UL in order that our products can be used on fire rated or labeled openings.





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Electric Hinges (Continued)

Another important point to remember, an electrically modified hinge is for **low voltage power transfer only (48 volts or under)**. Higher voltages are not allowed because of the potential dangers. Also a consideration is the Amperage rating of the power transfer hinges. Hager hinges include amperage ratings of 3.5 AMPS/continuous duty and 16.0 AMPS/intermittent duty (pulse).

Normally, modifications are made to full mortise hinges. For other applications, consult Hager Engineering for availability.

It is recommended that the **CENTER HINGE LOCATION** be used with all electrically modified hinges.

Hager Companies recommends the use of a mortar box or jamb box in order to protect the wire terminations on the inside of the frame. If this box is not used, the grout that may be poured into the frame will destroy the wiring and usually void the warranty on the product.



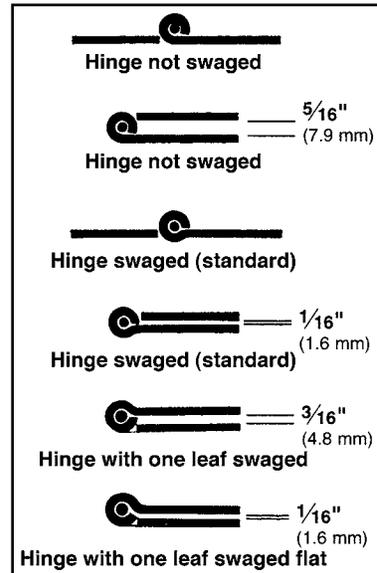
E2 E1S E2/E1S
Exposed Electric Hinge Modification



EMN ETW ETM
Concealed Electric Hinge Modification

Swaging

Swaging is a slight offset of the hinge leaf at the barrel. This offset permits the leaves to come closer together when the door is in the closed position. If the hinge were to be left in the natural state after the knuckle was rolled, the hinge would be referred to as a "flatback". A flatback hinge has a gap between the leaves of approximately 5/16" (7.9 mm). This would allow heat and air-conditioning to escape, not to mention the unsightly gap between the door and frame.



The swaging on standard weight and heavy weight full mortise hinges provides 1/16" (1.6 mm) clearance between the leaves when the leaves are in the closed position. Full mortise hinges used on beveled doors will affect lockside clearance, especially for wide throw applications.

Security Features

Three additional features that are commonly used are: Non-Removable Pin (NRP), Safety Stud (SH), and Reverse Security Stud (RSS). **These features are intended as deterrents only.**

Non-Removable Pin



The **Non-Removable Pin (NRP)** has a small set screw in the body of the barrel. This set screw is tightened down against the pin. The pin has a groove in the position where the set screw makes contact, allowing the set screw to seat. The set screw is positioned so it cannot be reached unless the door is opened. If pin removal is necessary, the set screw is merely removed and the pin tapped from the bottom in the usual manner.

Safety Stud



The **Safety Stud (SH)** 3/16" (4.8 mm) projection is a feature that places a stud on one leaf and a locking hole on the other leaf. When the door is closed, the stud is anchored into the opposite leaf. Even if the hinge pin is removed, the door is secure because the leaves are locked together.

Reverse Security Stud



The **Reverse Security Stud (RSS)** 7/16" (11.1 mm) projection is a feature that has a stud projecting from the back of both leaves into the reinforcing plate of both the frame and the door. It is intended to keep the hinge locked in place from abuse of battering or trying to shear the hinge and screws. This feature is primarily used in prisons and psychiatric areas.





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BEARING OPTIONS

When using steel based hinges, special options are available such as stainless steel pins, stainless steel bearings and stainless steel raceways.

Ball Bearing (BB) - Ball bearings are engineered to throw the knuckle weight against specially hardened steel raceways, which ride on the bearing surfaces. The one-piece cup protects the bearings from moisture and dust. The cup supports no weight so it is not subjected to functional friction, pressure or wear. Lateral wear is minimized because the pin is held against thrust by the hardened steel top and bottom raceways. The bearing units are securely press-fit to the leaf knuckle to prevent loss when the hinge is disassembled.

Oilite Bearings (OB) - The oilite bearing is made of porous metal that has been press-formed and impregnated with oil. The slight pressure and heat generated when the door is operated causes the oil to come to the surface of the bearing causing the surface to be slick and smooth.

Anti-Friction Nylon Bearings (AB) - These are made of resilient engineering plastics that provide a self-lubricant and very strong bearing surface. The nylon acts as a cushion for the door yet it allows the door to flow smoothly on the surface of the nylon with an extremely low wear factor.

ARCHITECTURAL FINISH SYMBOLS

Powder Coat Finishes

Hager	Description	Steel	Brass & Bronze	Stainless Steel	HEWI#
L1	Flat Black	693	693	N/A	N/A
L2	Dark Bronze	695	695	N/A	N/A
L3	Medium Bronze	694	694	N/A	N/A
LS	Luma Sheen® Aluminum Paint	689	689	N/A	N/A
13P	White	N/A	N/A	N/A	1
14P	Off White	N/A	N/A	N/A	5A
15P	Grey	N/A	N/A	N/A	5
33P	Yellow	N/A	N/A	N/A	14
34P	Red	N/A	N/A	N/A	33
35P	Green	N/A	N/A	N/A	6
36P	Blue	N/A	N/A	N/A	52
83P	Black	N/A	N/A	N/A	8
84P	Olive	N/A	N/A	N/A	62
85P	Brown	N/A	N/A	N/A	9
86P	Burgundy	N/A	N/A	N/A	30
87P	Dark Green	N/A	N/A	N/A	60
88P	Dark Blue	N/A	N/A	N/A	50

Note: Available only on architectural grade full mortise plain bearing hinges, full mortise ball bearing hinges, both standard and heavy weight, in both steel and brass material.

B.H.M.A. Symbol Base Material

Hager	Description	Steel	Brass & Bronze	300 Series Stainless Steel
2C	Plain Zinc Plate	603	N/A	N/A
H2H	Mechanical Galvanized; steel only	N/A	N/A	N/A
3	Bright Brass	632	605	N/A
3A	Bright Brass - Unlacquered	N/A	N/A	N/A
3SC*	Brass SecureCoat® Stainless Steel Lifetime Finish	N/A	N/A	N/A
4	Satin Brass	633	606	N/A
5	Satin Brass, Antique	638	609	N/A
9	Bright Bronze	637	611	N/A
9A	Bright Bronze, No Lacquer	N/A	N/A	N/A
10	Satin Bronze	639	612	N/A
10A	Antique Bronze, Lacquered	641	N/A	N/A
10B	Antique Bronze, Oiled	640	613	N/A
10D	Black Nickel, Oiled	N/A	N/A	N/A
14	Bright Nickel	645	618	N/A
14B	Black Nickel, Bright	N/A	N/A	N/A
15	Satin Nickel	646	619	N/A
15A	Antique Satin Nickel, Highlighted	647	620	N/A
17A	Black Nickel, Dull	648	621	N/A
26	Bright Chromium Plated	651	625	N/A
26D	Satin Chromium Plated	652	626	N/A
32	Stainless Steel Metal, Bright	N/A	N/A	629
32D	Stainless Steel Metal, Satin	N/A	N/A	630
P	Prime Coat	600	600	N/A
PS	Plain Steel	N/A	N/A	N/A

*US3SC only available on AB800, AB850, and CB1191.

CARE AND MAINTENANCE

- Hinges must be free swinging without any binding. The use of shims to align hinges, if required, is satisfactory.
- Hinges should be well greased and checked on a regular basis for lubrication. We recommend that hinges used in commercial, high-frequency applications or those in extreme environmental conditions be lubricated annually to ensure quiet operation and long life.
- Standard hinges are best lubricated by removing the pin, applying a generous coating of lithium grease, and reinserting the pin by driving it completely down to the shoulder of the pin head.
- Hospital Tip (HT) hinges that have fixed hinge pins have an oil port on the knuckle for the purpose of lubrication.
- Water displacing sprays such as WD-40 are not recommended for hinge lubrication.
- To remove dirt, simply wipe with a soft damp cloth. Abrasive cleaners or lacquer thinner should not be used to clean the surface of hinges. To do so will void any warranty for the product.

