What are Standard Parts and Why JW Winco?

There are a lot of options in the market today when looking for machine components, elements, and parts. Why get Standard Parts from JW Winco and what do we mean when we say Standard Parts?

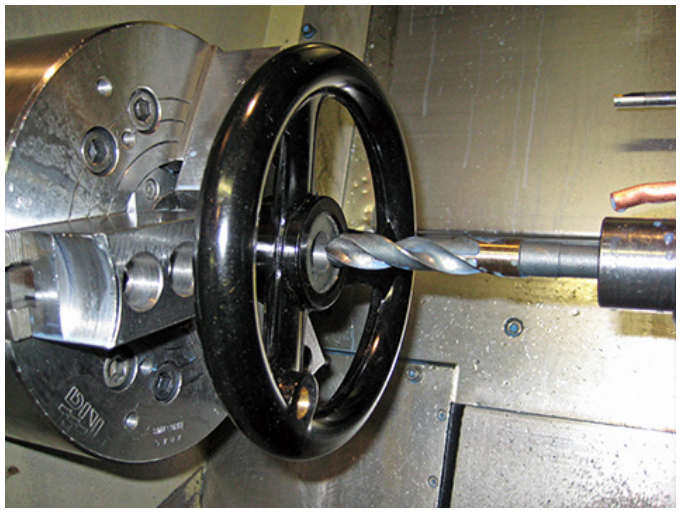
When we say “Standard Parts” we mean machine elements or machine components. Our Standard parts are used as the building blocks for machines and products in many different industries.

We say Standard because all our parts are standardized to common sizes in both inch and metric. We standardize our parts, so the engineers don’t have to customize each knob or handle for every project. Using standard parts makes it convenient and fast for design engineers to find parts by offering multiple different types and sizes. JW Winco also offers free CAD models for all of our parts to speed up the design process.

JW Winco offers a wide range of Standard Parts to allow the engineers and purchasers to order everything they need from one location. JW Winco's core standard parts are Adjustable Levers, Pull Handles, Hand Knobs, Indexing Plungers, Vibration Dampeners, Leveling Devices, Hand wheels, Crank Handles, Toggle Clamps and Casters & Wheels.

Parts like handles and knobs are found in every industry. You can find JW Winco products on packaging machines, automation machines, medical equipment, automotive accessories, marine accessories, staging equipment and a variety of others. Each industry requires different applications and specifications. JW Winco offers standard parts in plastic, steel, stainless steel, cast iron and aluminum to support each industry’s specific requirements. If a Winco product is used on food processing equipment stainless steel and hygienic design are extremely important. JW Winco released the Hygienic Design product family in late 2017 to complement our already expansive line of stainless-steel products.

In some machine designs, the design engineer will need more than a Standard Part. To serve the design engineers custom requests JW Winco has an in-house machining facility. JW Winco is able to modify the standard parts to support the engineers design and help them come up with a new solution. JW Winco is flexible and in order to help the customers, we can make modifications to our standard parts in small quantities.



Because of the many industries JW Winco serves, Winco needs to continue to be innovative and is constantly offering new solutions to the market. JW Winco is always focusing on the customers and is a one stop source for machine parts. JW Winco also offers bar code, UPC code labeling and kit packaging to meet the customers special labeling and packaging requirements.

Choosing the Correct Crank

By definition, a crank is a device for transmitting rotary motion, consisting of a handle or arm attached at right angles to a shaft. Simple enough, but there are some variables.

Balanced cranks:

This type of crank has a center mounting point, which allows for smooth operation in either horizontal or vertical directions. Its design permits precise adjustment, and in applications with vibration, it will remain stationary. An example is our GN 10 series Steel Tri-Ball Handle.

Cranks

Standard cranks are mounted on one end, giving them one-handed leverage that works well for high torque applications and fast operation. They are well suited for clamping, and can be removable. Shown here is our GN 471 series Aluminum Cranks with Revolving Handle. Other options for materials for cranks are zinc die-cast, steel, stainless steel, cast iron and various plastics (nylon, phenolic, technopolymer).

Fold-Away Handle Cranks

Sometimes the application requires, for design or safety reasons, that the handle be retractable. An example is our GN 471.3 Aluminum Cranks with Retractable Handle. The handle firmly locks into position when folded or when in the operating position. We also offer styles where the handle fits neatly into a recess.

Off-Set Handle Cranks

The design of your machine may require a handle that is off-set, so that it clears obstructions when turned. Shown here is one of our DIN 468 series Off-Set Crank Handles. This cast iron crank is offered with a fixed or revolving handle, and round or square bore.

Racheting Cranks

The combination of a crank and a ratchet arm creates high torque. This mechanism also works well in a confined or limited space. The example I show here is our LR 318 series Steel Ratcheting Crank Handles.

Four-Arm Levers

A variation on the crank is the four-arm lever, which is really four cranks combined in one. This obviously increases its clamping capability. It also makes for good control with either one or two hands. Here you see our series GN 213 Four-Arm Turret Levers

Revolving Handle Crank

We close with a unique crank that was patented by J.W. Winco, our WRHC Nylon Plastic Retractable Hand Cranks with Revolving Handle. This crank was designed for use in any application requiring the complete crank handle to be folded out of the way

To see our full line of cranks, visit Section 6 of our online catalog. We offer the following special modifications to cranks:

- plain or tapped holes
- square broached holes
- keyways
- cross holes
- set screw holes
- threaded studs
- colors

Selecting Spring Loaded Devices

When an engineer's objective is to align, hold, or latch different parts of equipment together, you need a spring loaded device. The options for these components are many and varied.

Breaking it down most simply, these sorts of devices consist of a body, an internal spring, and a ball or nose. They may also have a knob, button, or lever for the operator to control by hand. The general purpose of these parts is to use the force in the spring to apply pressure so that the ball or nose will remain nested in some sort of hole or other receptacle. This way two or more elements of the equipment can be aligned or fixed into a determined relative position.

There are countless uses for positioning and locking components. They are used in workholding applications, as well as for indexing, latching, ejecting, and even electrical contacts.

Let's examine the various types of components in this category (featured in our Section 10, Indexing, Spring and Ball Plungers).

Indexing plungers:

These have a beveled or rounded nose that inserts easily into an indexing receptacle. The nose is long enough to fix the position firmly, preventing movement in any direction. In order to move the position of the plunger, the operator must mechanically retract the nose. An example is this GN 617 indexing plunger (non-lock out type).

Spring plungers:

Spring plungers differ from indexing plungers in that they have a nose designed to allow for movement when some side force is applied. In other words, it isn't necessary (or possible) to retract the nose mechanically. Consequently, these plungers are not appropriate if heavy side load is involved in the application. Shown is our SPNL short spring plunger (note the nylon locking element in the side of the threaded body).

Hand-retractable spring plungers:

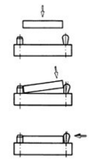
These plungers are sort of a hybrid of the two above types, and include a knob for manual retraction of the plunger. Among other things, they are used for manual or automated holding, as in workholding applications. Here you see our LRSS stainless steel hand retractable spring plunger (lock out type).

Ball plungers:

These have a ball instead of a nose, and no knob. The shallow depth of the ball allows for easy movement in and out of position, but as with spring plungers, they do not perform well with heavy loads. The illustration is our GN 615 steel ball plunger with threaded body (note the slot provided for installation with a screwdriver).

Side thrust pins:

These components are designed for fixturing small parts and holding them in place with constant pressure, as shown in the illustration. In the photo you see the GN 713 zinc-plated steel side thrust pin, which has a threaded body.



Quick release pins

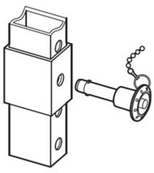
Quick release pins: Instead of body with a nose, these components consist of a rod or stem, from which small side securing pins protrude. A button in the handle retracts or extends these pins so that the quick release pin can be removed or secured in place (see application example to left).

The component in the illustration is our GN 114.2 steel rapid release pin (photo to right). We offer many other options for quick release pins, including stainless steel components, heavy duty construction, and self-locking features.

So far your choices seem fairly simple--along with, of course, selecting the proper size (we offer these types of components in many sizes, both inch and metric). But there are more options than that to consider.

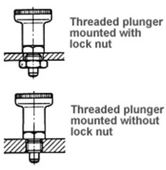
Let's start with balls and noses.

Application Example



Balls and noses:

Balls, as mentioned above, allow for easy position changes. However, their holding force is limited. Noses may be round for reduced friction and similar easy positioning. They can also be chamfered for easier insertion into indexing holes. Flat noses have a larger contact area but will obviously resist side motion. Hex noses can allow installation of the plunger from the front with a hex wrench, but are subject to faster wear. The material chosen for the ball or nose is also key: case hardened steel noses are strong and heat-resistant, but can mar the surface to which they press. Delrin® is a very strong plastic that holds up well, is self-lubricating, and will not mar. Nylon also resists marring and corrosion but doesn't wear as well and can't be used in temperatures above 82ºC (180ºF). Phenolic plastic is an economical option but is more brittle. Stainless steel is the best choice for sterile applications.



Body attributes:

The body of a plunger varies depending upon installation considerations. It may be threaded, it may have a lock nut for securing the mounting (see illustration). Or it might be smooth for push-fit installation, or smooth and weldable. Threaded body plungers may have a locking element or patch. There may be a hex or slot on the end to assist in mounting.

The same material issues apply to the body as to the nose or ball. Case-hardened steel stands up to high forces. Steel may be zinc-plated or have a black oxide finish. Stainless steel tolerates high forces, heat, and corrosion. Brass is another option for metal plungers. As for plastic, a Delrin® body is non-magnetic and resists corrosion but will not tolerate heat.

Space considerations may require you use a short or stubby plunger. An extra-long plunger ("long-travel") or long nose can be used to meet side force holding requirements or for holding up metal sheets. This latter is illustrated by our GN 611 long stroke spring plungers.

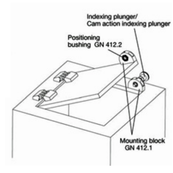
Springs: Springs are generally made of steel or stainless steel, and their end force determines the applications for which the plunger is appropriate. For detents, you will need a heavy or standard end force. If you want an easily retractable plunger, use standard or light end force. Heavy end forces permit the plunger to hold its position by end force alone. Light end forces prevent marring. Many of our plungers are available in all three versions.

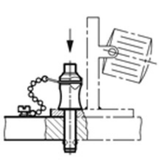
Hand-operating elements: For hand-retractable plungers, the plunger incorporates an element that the hand can hold, pull, or manipulate. Options include knobs with or without knurling, L-handles, T-handles, and pull rings. Some plungers have a threaded end that will accept whatever knob or handle the user wishes to install. There is also the cam-action indexing plunger, which is designed so the turning of a handle in a circular direction causes the nose to retract.

J.W. Winco offers the unique type of cam-action indexing plunger pictured here, which permits the plunger pin to be held in either a retracted or protruding position. View GN 712 and GN 712.1 for full details.

Lock out or non-lock out: Last, but not least, is the issue of whether or not the plunger needs the option of holding a retracted position. Lock out type plungers are designed so the operator can pull the plunger into a retracted position, perform a turn of the knob or handle, and let go, and the plunger nose will stay retracted. Cam-action plungers may be either version.

Receptacles for plungers: Obviously the ball, nose, or pin of a plunger or release pin needs a receptacle. The receiving element need be no more complicated than a drilled hole or indentation. It may also be a flange or a mounting block that is mounted by welding or screws to a surface. See the illustration for an example using a mounting block, our GN 412.2.





Accessories: Spacer bushings are a useful component of plunger applications, and compensate for the body thread lengths on indexing plungers to allow mounting through walls of varying thicknesses. Ball chains and lanyards can be used as ways to "tie" removable plungers and release pins to a piece of equipment so they will not be lost, as you see in the illustration (ourGN 113.3 rapid release pins with a ball chain).

We offer every possible configuration of these handy components, and can also perform the following special modifications:

- threads
- lengths
- knobs
- spring pressure
- colors
- kitting, packaging and labeling

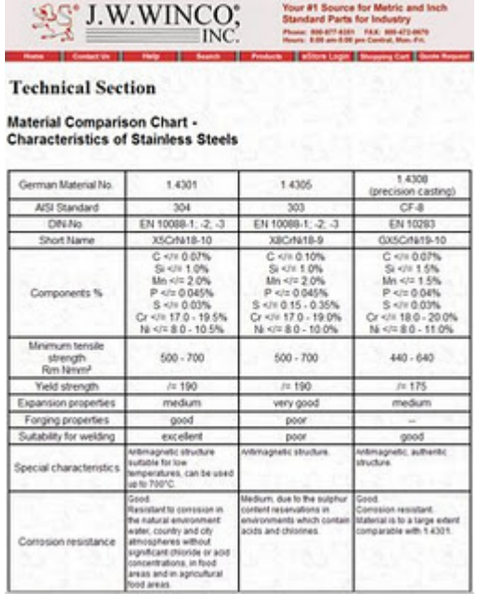
Stainless Steel Characteristics

At J.W. Winco we sell a lot of stainless steel components used in applications in the medical, food, electronics and other industries. It's common knowledge that when corrosion resistance is an essential characteristic of a piece of equipment, stainless steel is the material of choice. But what about if temperature tolerance is an issue?

Engineers understand that there are many different types of stainless steels and they all have slightly different characteristics. Of course, a food industry application suggests using stainless steel. But the specifics of the equipment may require a particular type. For example, let's say you need to find appropriate handles for a cart that is going to need to serve both in high temperature and low temperature environments, like in a bakery operation. For that you would want to use American Standard Series 304 stainless steel (European Standard 1.4301), because it can stand cold as well as heat up to 700° C.

A good choice for such an application would be our GN 426.5 cabinet U-handles, pictured here.

Don't forget the aesthetics of stainless steel, a material that can be attractive as well as functional. For example, these GN 5335 stainless steel hand knobs are solid AISI Standard 303 stainless steel. They would work great as kitchen fittings, with their stylish and ergonomic design.



J.W.WINCO, INC.

Your #1 Source for Metric and Inch Standard Parts for Industry

Technical Section

Material Comparison Chart - Characteristics of Stainless Steels

German Material No.	1.4301	1.4305	1.4308 (precision casting)
AISI Standard	304	303	CF-8
DIN-No.	EN 10088-1; -2; -3	EN 10088-1; -2; -3	EN 10283
Short Name	X5CrNi18-10	X8CrNi18-9	GX5CrNi19-10
Components %	C </= 0.07% Si </= 1.0% Mn </= 2.0% P </= 0.045% S </= 0.03% Cr </= 17.0 - 19.5% Ni </= 8.0 - 10.5%	C </= 0.10% Si </= 1.0% Mn </= 2.0% P </= 0.045% S </= 0.15 - 0.35% Cr </= 17.0 - 19.0% Ni </= 8.0 - 10.0%	C </= 0.07% Si </= 1.5% Mn </= 1.5% P </= 0.04% S </= 0.03% Cr </= 18.0 - 20.0% Ni </= 8.0 - 11.0%
Minimum tensile strength Rm N/mm²	500 - 700	500 - 700	440 - 640
Yield strength	/= 190	/= 190	/= 175
Expansion properties	medium	very good	medium
Forging properties	good	poor	--
Suitability for welding	excellent	poor	good
Special characteristics	Antimagnetic structure suitable for low temperatures, can be used up to 700°C.	Antimagnetic structure.	Antimagnetic, authentic structure.
Corrosion resistance	Good. Resistant to corrosion in the natural environment water, country and city atmospheres without significant chloride or acid concentrations, in food areas and in agricultural food areas.	Medium, due to the sulphur content reservations in environments which contain acids and chlorines.	Good. Corrosion resistant. Material is to a large extent comparable with 1.4301.

We have a great tool in the Technical Section on our Web site for finding a lot of information about stainless steel characteristics in one place: the handy chart pictured here in the thumbnail. Six common types of stainless steel are evaluated, including chemical composition, tensile and yield strength, expansion and forging properties, suitability for welding, corrosion resistance, and other special characteristics. Typical applications for each type are also listed.

Sanitary Machine Design

Are you designing machinery suitable for clean room applications? If a machine is to be used for food processing, medical use, or other sanitary applications, there are a lot of things to consider in the design. And of course, it also means the components utilized are appropriate for sanitary use as well. Here's a checklist of things to consider when designing equipment of this nature.

1. Cleanable to a microbiological level: Food equipment must be constructed to ensure effective and efficient cleaning over the life of the equipment. The equipment should be designed as to prevent bacterial ingress, survival, growth and reproduction on both product and non-product contact surfaces of the equipment.

Our GN 5339.5 stainless steel triangular knobs were specially designed for use on machinery in the food industry. The smooth and enclosed areas as well as the corner radii comply with the requirements of hygiene standards.

2. Made of compatible materials: Construction materials used for equipment must be completely compatible with the product, environment, cleaning and sanitizing chemicals and the methods of cleaning and sanitation.

Our LWKX-TPA casters are corrosion-resistant and can withstand up to 110°C (230°F) sterilization by pressure steam cleaning, so they are perfect for medical, dental, instrumentation, hospital, food service and laboratory equipment.

3. Accessible for inspection, maintenance, cleaning and sanitation: All parts of the equipment need to be readily accessible for inspection, maintenance, cleaning and sanitation without the use of tools.

4. No product or liquid collection: Equipment should be self-draining to assure that liquid, which can harbor and promote the growth of bacteria, does not accumulate, pool or condense on the equipment.

The design of our GN 565.5 stainless steel handle is without hollows or other places that debris might collect.

Of similar material and design is our GN 949 stainless steel handwheel, also appropriate for sanitary applications.

5. Hollow areas should be hermetically sealed: Hollow areas of equipment such as frames and rollers must be eliminated wherever possible or permanently sealed. Bolts, studs, mounting plates, brackets, junction boxes, nameplates, end caps, sleeves and other such items must be continuously welded to the surface not attached via drilled and tapped holes.

Our GN 341.1 leveling feet are designed with a convex bolt head seat on the base to reduce the formation of deposits and simplify cleaning. The adjustable height sleeve shrouds the thread to resist accumulation of impurities.

6. No niches: Equipment parts should be free of niches such as pits, cracks, corrosion, recesses, open seams, gaps, lap seams, protruding ledges, inside threads, bolt rivets and dead ends.

7. Sanitary operational performance: During normal operations, the equipment must perform so it does not contribute to unsanitary conditions or the harborage and growth of bacteria.Obviously one way to achieve this is the use of stainless steel components. Yet another example of our many all-stainless steel parts is the GN 300.5 adjustable lever.

8. Hygienic design of maintenance enclosures: Maintenance enclosures and human machine interfaces such as push buttons, valve handles, switches and touchscreens, must be designed, to ensure food product, water or product liquid does not penetrate or accumulate in and on the enclosure or interface. Also, physical design of the enclosures should be sloped or pitched to avoid use as storage area.

9. Hygienic compatibility with other plant systems: Equipment design must ensure hygienic compatibility with other equipment and systems, such as electrical, hydraulics, steam, air and water.

10. Validated cleaning and sanitizing protocols: Procedures for cleaning and sanitation must be clearly written, designed and proven effective and efficient. Chemicals recommended for cleaning and sanitation must be compatible with the equipment and the manufacturing environment.“Keeping it clean” can be painstaking when you’re designing equipment.

Selecting the Right Hinge

When you're building any sort of enclosure with access to its interior, hinges will be a concern. So here are the factors to consider when choosing the right hinge:

Number one is the weight of the lid or door, which can determine both the size and material of the hinge. Our selection of hinges includes a variety of sizes of hinges in zinc die cast, steel, stainless steel, and plastic, and all of these options have their place.

A less obvious consideration is how the enclosure functions and how the door opens. Will it need to open fully, or just 90 degrees? Which way will it swing? Is there room for external hinges or must they be internal? Will the doors need to hold a particular position? Some examples of hinges with interesting functions from our line include the EN 160 Lift-Off Hinge, which is designed for easy unhinging of the door, and the EN 151.2 Lockable Hinge, with a built-in adjustable lever for locking the door into position.

Meanwhile, our GN 161 Hinges are designed specifically to join standard aluminum profiles, a unique but definitely desirable functionality.

Hinges seem like a very elementary sort of component, but certain design innovations can make them highly functional in a particular application. Our GN 127 Adjustable Alignment Hinges are available in three versions that make them adjustable in different directions. Their design provides for perfect alignment of a door in its frame.

Meanwhile, if security is an issue in your application, you may want to choose a hinge that mounts on the inside of the door, and/or is welded on, like our GN 128 Weldable Hinges.

And of course, the final element in hinge selection is esthetics. All other functions aside, sometimes you just want a hinge to look good. We offer a hinge that incorporates both form and function, the GN 238 Adjustable Alignment Hinge. It combines the adjustable feature of the GN 128 with cover caps that keep the hinge literally clean while also giving it a clean look.

Understanding Bearings

Bearings can trace their origins back to the royal halls of ancient Egypt. The logs that were used to roll immense stone blocks for the pyramids were some of the earliest bearings. Bearings work against both friction and gravity, for the purpose of increasing machinery speed and efficiency.

When designing or spec-ing in a bearing, the engineer must be at his best. If you're creating, say, a U-handle, you can err a bit in size and configuration and still have the part perform its function. Not so with bearings: they require precision, or they will do more harm than good to a machine.

You'll find these durable, high precision components in applications such as computers, VCRs, cars, trains, planes, construction equipment, machine tools, refrigerators and fans.. .wherever there is a requirement for high speed rotation, minimal vibration and noise reduction.

Plain bearings were developed for the automobile industry in the 1920s. Since then, all manner of these useful components have been developed. For example, rod end bearings such as our DIN 648 have an integrated rod that can be used to mount the outer bearing ring. Shown here is the female tapped version; there is also a male version with threaded stem. Various combinations of bearing types can be combined in one housing to manage bearing loads from several directions at once.

For simplicity's sake, let's look at how a plain bearing works. Check out our GLRSW Stainless Steel Series K Spherical Plain Bearings for a good example. You have an inner ring and an outer ring, between which may be sandwiched a set of balls, pins or rollers, which are lubricated (the GLRSW uses chrome plated steel ball bearings). One of the rings is fixed, and the other is free to rotate. Some sort of clamping or pressure fit will be used to affix the stationery ring.

The material used for a bearing is key. For its inner ring, our GLRSW uses a special high-strength bronze (CuSn8) with a PTFE liner.

Proper and stable mounting of the bearing are also essential to good performance. Looseness will result in vibration and noise, shock loads relative to speed, and eventually the actual destruction of the bearing and adjacent parts. Meanwhile, seeing as friction always creates heat, wear and tear, lubrication is an essential part of a bearing. Otherwise, once again bearing destruction is the result. The bearings shown on this page have PTFE liners which make them self-lubricating and maintenance-free.

Guide to British Standard Pipe Threads

This thread type has been adopted around the world as a standard for mating external and internal threads, and is common outside the U.S.

The two types of BSP threads are **BSPT** (British Standard Pipe Taper) and **BSPP** (British Standard Pipe Parallel). BSPT threads have a diameter that increases or decreases along the length of the thread. On the other hand, BSPP threads have a constant diameter.

These two types of threads can be used to achieve two types of joints:

Joining threads joints: A taper male thread is used, in conjunction with either a taper or parallel female thread. The combination creates a pressure-tight joint.

Longscrew thread joints: In this case, parallel pipe threads are used, and the tightness of the joint is achieved by some sort of sealing ring (washer or O-ring) between the end face of the male thread and a socket or nipple face, incorporating the tightening of a backnut.

BSP threads use the Whitworth threadform. That means:

- a symmetrical V-thread in which the angle between the flanks is 55° (measured in an axial plane)
- truncation at top and bottom of one-sixth of this sharp V
- threads are rounded equally at crests and roots by circular arcs ending tangentially with the flanks
- the theoretical depth of the thread is therefore 0.64 times the nominal pitc

Pictured to the right is our GN 743.6 fluid level sight glass that is available in BSPP thread versions. You'll find tables with all the specs for BSP thread on our Web site in the Technical Section here: British Standard Pipe Threads.

Characteristics of Common Plastics Used in Machine Components

In the nearly 150 years since plastic materials were conceived, these man-made materials have evolved into countless types for every possible use. Below is information on a few categories of plastic that are frequently used in industrial parts.

Nylon is a technopolymer, and is typically referred to as polyamide (PA). Nylon was the first commercially successful synthetic polymer.

The wide variety of different modifications that can be made to technopolymer allows it to be produced with different mechanical properties, chemical resistance, temperature resistance and colors, even crystal-clear. Nylon can be used as the matrix material in composite materials, with reinforcing fibers like glass or carbon fiber, and which then have a higher density than pure nylon.

Such thermoplastic composites (25% glass fiber) are frequently used in components where their good heat resistance—up to 150°C (300°F)—making them practical competitors with metals. Glass fiber reinforced nylon is used in the production of J.W. Winco's WN 300 Nylon Plastic Adjustable Levers, shown here.

Polypropylene (PP) is a thermoplastic polymer that is rugged as well as unusually resistant to many chemical solvents, bases and acids. It is resistant to fatigue and tolerates high heat—66°C (150°F). It can be extruded or molded.

Many physical finishing techniques can also be used on polypropylene, such as machining. Surface treatments can be applied to PP parts in order to encourage adhesion of inks and paints.

Fiberglass reinforced polypropylene is used for our MFE Cabinet U-Handles.

Elastomers/thermoplastic elastomers are polymers with the property of elasticity. The term, which is derived from elastic polymer, is often used interchangeably with the term rubber.

Components of these materials can be stretched and bent without exerting great force.Once the deforming force relaxes or no longer acts at all, the parts take their original shape. At ambient temperatures rubbers are relatively soft and deformable.

Their primary uses are for seals, adhesives and molded flexible parts such as wheels. Elastomers can be made in varying degrees of hardness and can be dyed easily.

Elastomer is also often used for non-skid pads like those on the bases of our SNSM Snap-Lock Non-Skid Leveling Mounts.

Thermoplastic elastomers (TPE), sometimes referred to as thermoplastic rubbers, are a class of copolymers or a physical mix of polymers (usually a plastic and a rubber) which consist of materials with both thermoplastic and elastomeric properties.

TPE is used as an outer coating on our EN 5337.6 Softline Star Knobs, to provide a soft, ergonomic grip.

Duroplast is a resin plastic reinforced with fibers (either cotton or wool) making it a fiber-reinforced plastic similar to glass-reinforced plastic. It is light, flexible and strong, but has low elasticity. Phenolic resins are among the most commonly used Duroplast materials.

Unlike technopolymer, Duroplast and phenolic plastics cannot be melted because they remain rigid up to degradation temperature. The coloring and dyeing options of components made of Duroplast are limited.

Duroplast is used in our EN 940 Three Spoked Handwheels to make them strong and durable.

Pros and Cons of Aluminum

Aluminum is an excellent material for machine components, offering many beneficial characteristics. Let's review the advantages and disadvantages of this metal that affect it's appropriateness in various machine design applications.The disadvantages of aluminum make for a short list:

- more rare and more expensive than steel
- abrasive to tooling, or more accurately, the aluminum oxide coating that forms upon it is
- prone to severe spring back
- requires special processes to be welded

On the plus side, there is a lot to recommend the use of aluminum parts:

Corrosion-resistant. Aluminum oxidizes quickly, and the resulting surface coat of aluminum oxide resists further corrosion, by air, water, and chemicals. This protective coating is clear, colorless, and non-staining.

Colorable: Aluminum can be easily colored by anodization, and holds paint extremely well. Aluminum can be finished in various ways.

The GN 565.2 angled cabinet U-handle on the right is shown in the version with a black powder coated finish, but is also available in bright tumbled finish or natural anodized.

Lightweight: Aluminum weighs about a third of what steel does. That makes it inexpensive to ship and can also contribute to making a lighter machine when that is desirable.

Economical. Although we stated above that aluminum is not the cheapest material, it is still more economical than brass or stainless steel, so is often the best option for non-corrosive applications.

Strong: Aluminum has the highest strength-to-weight ratio of any metal.

The GN 322 two-spoked handwheel on the right benefits from all these characteristics.

Electrically conductive. Aluminum conducts electricity even better than copper.

Non-magnetic: For applications where magnetism needs to be avoided, aluminum is an excellent choice.

Recyclable: Aluminum is 100% recyclable without losing any of its natural characteristics.

Pictured to the right are our aluminum ALCK control knob with handle and GN 744 fluid level sight glass, more examples of the many aluminum components we offer.

Ergonomic Design

What if your customer has put "ergonomic" on the wish list for the machine you're designing? What qualities should you be seeking in the components? Here are a few suggestions based upon OSHA principles for ergonomic design.

Look for handles that are smooth (as opposed to having grooves) so any size and shape of hand can use them. If the user's hand doesn't fit the grooves, it results in excessive pressure.

Use knobs and handles covered in soft material—they are more comfortable, provide a firmer grip and reduce slippage.

The EN 5337.6 Softline star knob pictured to the left is a good example of both traits.

Design the machine so that operating components can be manipulated with the wrist in a straight position.

When precision is the requirement, choose components with grips in the 1/4" to 1/2" range. The smaller diameter prevents overexertion of fingers, knuckle joints, and hand muscles.

For operations that require force, look for components whose grips have handle or knob diameters that range from 1 1/4" to 2." This allows for fingers to wrap comfortably in a firm hold.

The 6830-NI toggle clamp on the right has excellent ergonomic features such as these.

Keep in mind the position of the operator and space constraints when positioning operating elements. Avoid awkward work postures and wrist positions.

Whenever possible, design the operating components to be used without pressure on the palms of the hands, which are full of pressure-sensitive nerves and blood vessels.

The No. 906GE ball-ended hex key on the left has a handle designed for a comfortable, ergonomic grip.

Selecting the Correct Knob

No machine component seems more elementary than a knob. But in fact, there are many possible configurations for this simple part, and choosing the right type is key to the optimal function of the machine.

Let's review a dozen or so styles of knobs and their advantages and disadvantages, so you can select the best type for your application.

Ball knobs:

Use these for applications that require movement in any and all directions. These types of knobs are comfortable to grip. They are also easy to clean, but don't use them for situations involving moisture or grease; they become too slippery to handle. Shown here is our DIN 319-ST metric size steel ball knob, available in tapped or blind bore types.

T-handle knobs:

The design of these knobs gives them strong control, in both in-and-out operations and rotating ones. Likewise, they can achieve strong clamping force. If your application involves a limited space where only one hand can reach, these knobs work well. (However, sometimes a prong knob is preferable, if there is the possibility of the operator being at an awkward angle.) Shown is J.W. Winco's GN 563.2 metric size aluminum T-handle knob, available in tapped or blind bore types.

Tapered knobs:

The length of these knobs makes them great for side-to-side or up/down movements. They are particularly good for applications that operate by grasping and rotating from a 90 degree angle. But bear in mind that unless fluted or knurled, they can be slippery in wet or greasy environments. You see here the MVP metric size PVC cylindrical handle, which has a push-fit mounting.

Push-pull knobs:

These simple knobs vary in style but generally speaking are easy to operate and control. Solid push-pull knobs are simple to clean; remember that open-backed styles can collect dirt or other contaminants. If the application will involve lots of use or stress, opt for a type made of metal or with a metal insert. Again, these knobs can get slippery, so you may want to consider a style that is knurled. Shown is the GN 676.1 metric size steel push-pull knob with tapped blind hole, available with plain or knurled rim. GN 676.1

Lamping knobs:

This category of knob includes a number of styles--star, scalloped and lobed--designed to work in applications that require turning and clamping. The indentations in the rim allow for the achievement of mild to medium torque. These types of knobs are also easy to grip and work well in slippery environments. (Bear in mind that for higher torque requirements, a pronged knob or even a handwheel may be preferable.) Pictured is our GN 6336.10 metric size, nylon plastic hand knob with stainless steel threaded stud, with brass or nylon tip.

Prong knobs:

Speaking of, here's a design of knob perfect for higher torque requirements. The protrusions on a prong knob are longer (certain star knobs may also fall in this category), increasing the leverage of the operator's fingers. In light torque situations, one finger may be all that is required to turn a prong knob. The downside of this style is the increased surface area, which makes it harder to clean. And if steady, unbroken turning is required, go with a crank or handwheel. Shown is our CKS inch size aluminum extruded four-prong clamping knob, which comes in tapped, tapped through hole, blind bore and blank types. CKS

Wing nuts/screws:

These knobs are basically a two-pronged prong knob. Consequently, they function in applications where the operator needs to apply torque using thumb and finger only. Metal or metal-insert wing nuts can achieve quite good clamping force. Here you see the EN 634 inch size, technopolymer plastic Ergostyle® wing screw with tapped brass insert.

Knurled rim knobs:

This group encompasses a variety of knob styles (ball, push-pull, clamping, mushroom, tapered) but utilizes ridges or knurls at the rim to improve grip. The knurled rim is the answer for greasy or wet environments where slipperiness must be reduced. But knurling sacrifices easy of cleaning, so may be a problem in clean room and food applications, etc. Pictured is the KRSK inch size, stainless steel knurled rim knob, available with tapped or blind bore. KRSK

Control knobs:

Control knobs are used for the fine control or adjustment of devices, and may be referred to as instrument knobs, electronic knobs, or electrical knobs. They come in a variety of styles, and may include a revolving handle and/or scale markings for measurement. Pictured is the VU phenolic plastic five-lobed control knob with steel hub, which can be used interchangeably for inch or metric.

Pointer knobs:

This specific type of control knob is designed in a pointer shape. The design makes it easy to operate with thumb and finger. It works well when the application involves a few options (off/on, open/closed, etc.), or when it employs some sort of scale markings. You see here the MRI phenolic plastic pointer knob, blind bore type with set screw, which can be used interchangeably for inch or metric. MRI

We offer a vast array of knobs to meet every application requirement. To explore the selection, visit our Revolving and Operating Handles section, our Clamping Knobs section, and our Control Knobs section. Meanwhile, J.W. Winco offers the following special modifications:

- plain or tapped bores
- square broached holes
- tapped holes
- cross holes
- set screw holes
- threaded studs
- stud configurations
- hub lengths
- keyways
- colors
- graduations and markings
- kitting, packaging and labeling

Industrial Colors and Powder Coating

Designing machinery may not be the most artistic pursuit in the world, but sometimes the issue of color can be essential even in industrial design. For example, many of our products are offered in orange so that they will stand out on a machine for safety reasons. Obviously it's not difficult to make plastic parts in colors...and metal parts can be produced with color finishes as well, sometimes as simply as by applying paint.

A better method for coloring metal parts is to use powder coating. The powder is made of pigment and finely ground resins. The part to be coated will be electrically grounded, and an electrostatic spray gun is used to charge the powder as it is applied. After application, the part is heated to a temperature of 160-220° C, which makes it a smooth, continuous coating. Powder coating can be done in any color, so in large enough quantities, we can have components produced in custom colors. The other advantages are that powder coating is much tougher and more chip-resistant than paint, and doesn’t show any streaks.

The color standards for our products, many of which are manufactured in Europe, are typically the RAL standard. This system was developed in Germany in 1925 by an organization called "Reichsausschuss für Lieferbedingungen," which means "Imperial Commission for Delivery Terms and Quality Assurance." There are several other color naming systems in use, like Sweden’s NCS, Britain’s BS 4800 and BS 381C standards, and the U.S. federal standard known as FED-STD-595.

Converting from one color system to another can be tricky. Case in point: Our GN 300 zinc die cast adjustable levers are available in a variety of colored powder coated finishes identified by their RAL names. A customer of ours purchases these levers in orange, silver, red and blue. He needed to know the precise color names so another component of the machines he builds could be produced to match, and for this he needed the Pantone system names. He consulted with one of our Technical Sales Associates for assistance in determining the conversion.

Choosing the Right Leveling Device

Leveling devices are also known as leveling feet, leveling mounts, leveler bolts, antivibration pads, antivibration mounts, Level-It mounts, Level-It pads, machinery mounts, levelers, leveling devices, Glide-Rite mounts, Glide-Rite pads, machine feet, articulating feet, machinery foot, leveling foot, and swivel mounts. These simple devices support your machine, and therefore, are as varied in design as machines themselves.

Will the equipment be motionless or will it involve vibration that needs to be controlled? How much weight must the feet support? What type of floor will the machine stand on, and will the environment be wet, hot, caustic, sterile? Let's talk about some of these considerations and how they affect your choice for best leveling device.

Tapped type:

First, the two basic styles are:

These are mounts that have a tapped hole for attaching to a threaded fastener, i.e, the "female" style. Your advantage is a lower profile, but what you lose is the ability to adjust the height, as you would with a stud type. Pictured to the right for illustration is a tapped version of the Ny-Lev mounts we manufacture right at J.W. Winco.

Stud type: These types of leveling feet have a threaded stud for both attachment and leveling. The stud is easy to attach, and the position can be locked using a jam nut, typically included. Standard stud lengths are available, and you also have the option of cutting the stud to length. Shown here to the left is the stud version of our Ny-Levs. We offer tapped and stud Ny-Levs in inch and metric sizes, in many base sizes, stud lengths, and different threads. Second, choose your materials. In the interest of strength, in most cases the socket (tapped type) or stud is made of metal. However, the base material varies:

Second, choose your materials. In the interest of strength, in most cases the socket (tapped type) or stud is made of metal. However, the base material varies:

Plastic base: Pros are the lighter weight and reduced cost. Also can add vibration control. Cons are reduced load tolerance and durability. Shown on the right is the GN 343.4, a technopolymer plastic base alternative to our Ny-Levs.

Metal base: Supports heavier loads and provides greater durability. Downside is you are adding more weight than with a plastic base. Also, you'll have poor vibration control unless you also add a vibration-dampening pad. Here on the left you see the GN 340 steel base leveling mount, offered with or without an elastomer pad like so many of our levelers.

Stainless steel: For food industry,medical, and other sterile applications, you may need a stainless steel base or all-stainless steel leveling mount. Many of our levelers are offered in stainless steel versions. We also have a special mount for sanitary applications, the GN 341.1 that you see pictured here on the right.

Now consider some special features:

Non-skid: If slipping and sliding of the machine is a concern, you may want to add a non-skid pad to your leveling foot. Many of the mounts in our offering include this option. We also offer the Snap-Lock mount, pictured to the left, which is designed with a special snap-on non-skid pad that resists peeling off.

Swivel-ability: Whether tapped or stud type, these types of levelers include a bearing surface or other means for the base to swivel up to 15° off axis on uneven surfaces. This allows the leveling mount to adjust to uneven surfaces for maximum surface contact and greatest possible stability of equipment. Many of our levelers offer the swivel feature, like the Level-It mount, shown here on the right

Anti-vibe/heavy duty: Of course your choice of leveler will be determined in part by the weight of the machine it must support. Our leveling mounts dimensional tables also include load information. A corollary issue to load is the amount of vibration the machinery generates. If vibration is a concern, look for mounts designed to be "anti-vibration," like our Anti-Vibe line, sample pictured here on the left.

Got an extreme situation like drill presses, CNC equipment, stamping presses or injection molding equipment? You may require a mount designed for super high vibration, like our "Mighty Mount" levelers, example shown here to the right.

Anchorable mounts: All types of levelers can offer lag bolt holes, enabling the leveling foot to besecured to the floor or platform with bolts. There is also the option of a specially configured base (teardrop shape) with hole for mounting bolt, like the PolyMount shown to the left. The advantage of this type of foot is that it prevents "walking" of the machine. Disadvantage is that more effort is required if you want to move the equipment. Also, if you are dealing with high vibration levels, holes can add additional stress to the base and possibly result in failure.

Glides: These are designed with a pad or base material that allows the supported equipment to be easily moved by sliding. This type of foot permits easily movement and relocation. Glide base material is typically harder and more abrasive-resistant than an anti-vibration base. Downside is that vibration can cause walking and movement. Shown here to the right is one of our Glide-Rite mounts, which offer a nylon or elastomer pad.

Low-profile design: This type of mount is used when equipment height is restricted, and permits equipment to sit lower to floor or platform. Con is that weight distribution in the pad may be limited due to thinner material. Our LP 100, illustrated here on the left, is a low profile mount available in many variations.

Low-cost: Sometimes weight, vibration, and unevenness are not worries, and you simply need an inexpensive foot to do the job. In that case a simple leveler of one-piece design can provide cost savings, like our Rattle Mounts shown on the right.

This gives you a number of issues to consider in selecting the right leveling device for your application. Check out even more options in our Leveling Elements section. Meanwhile, J.W. Winco offers the following special modifications:

- stud configurations
- threaded stud lengths
- thread sizes
- base sizes and configurations
- mounting holes

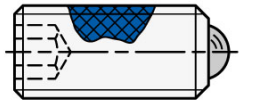
Guide to Vibration-Proof Fasteners

How do you insure the fasteners won’t loosen in an application that is prone to vibration? Engineers frequently debate that question. Along with proper torque, common possible solutions boil down to these:

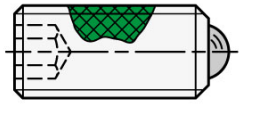
- Use of washers to lengthen the ratio of clamped length
- Threadlockers
- Safety wire (aka lockwire)
- Vibration-proof fasteners

There doesn't seem to be too much controversy regarding threadlockers. These are chemical adhesives applied to the fastener, most notably Loctite. Keep in mind however that Loctite acts like a lubricant when wet and can affect torque. It also is not appropriate for high temperature situations.

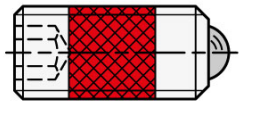
Depending upon the application, safety wiring can be anything from completely useless to the ideal solution. Obviously one "con" of this approach is the time it takes to do. Also, proper technique or lack thereof are huge factors. Meanwhile, adding holes to your fasteners will reduce their integrity.



Thread locking **PFB**
Polyamide patch
for type **K** and **KN**



Thread locking **PFB**
Polyamide patch
for type **KS** and **KSN**



Thread locking **MVK**
Micro encapsulation precote
(for all types)

GN 615.3 Patch options

Fasteners themselves can be designed to cope with vibration. For one thing, you can look for bolts and screws with nylon-patches pre-installed. These will hold up for approximately five cycles of removal and reuse. J.W. Winco offers a number of spring and ball plungerswith locking nylon patches such as the SPNL series shown here.

Our technical section includes some excellent information on the polyamide locking patch (PFB) as well as the micro encapsulation precoat 80 patch (MVK), designed for thread locking sush as the GN 615.3 series technical image seen above.

Fasteners designed specifically to cope with vibration include hex nuts with nylon inserts, jam nuts, lock nuts, slotted hex nuts, tooth lock washers, lock washers and spring washers. Again, there is some debate as to the efficacy of these depending upon the application. J.W. Winco sells a broad array of vibration proof fasteners in metric sizes, viewable in our catalog in section 3.1 Indexing, Locking, Blocking with Pins and Ball-Shaped Elements under under spring plungers.

Applied Force and Component Selection

Sometimes the best way to selecting the right component for an application is to base your choice on what it needs to do. In other words, start with the motion or action required of the operator, considering the requirements of the application and the environment in which it will be used. Is a knob appropriate, or would a U-handle be better? What sort of U-handle?Below we review the "applied forces" that an application may require, and examine the best types of components for each motion.

1. Lift. You can use a knob for lifting if the force required is less than a pound, but typically U-handles are the best choice. Directly fighting the force of gravity generally requires a more heavy-duty handle, like a bridge handle (see here our EN 628 bridge handle), and you'll definitely need to know the load capacity, to be sure it can hold up to the strain. Our online catalog includes load capacity for our U-handles.
2. Up-Down. This refers to the direction of motion applied, and differs from lift in that you are not lifting the entire weight of the apparatus. Because the force is significantly less, you could use a ball knob, push-pull knob, a U-handle, or a handle.
3. Left-Right. Obviously, 90 degrees off from #2 above, you can use similar components
4. Pull. Again, ball knobs, push-pull knobs, and U-handles all work. But when choosing the right one, take into account how much force will be used (for more force, use a U-handle), and consider the ergonomics involved (for two-finger pulling, use a knob that allows for grip, is comfortable, and is non-slip, like our GN 76 mushroom knobs).
5. Push. Use a ball knob or push-pull knob. If the application requires a larger knob, make sure it fits comfortably in the palm. If using a smaller knob, you may want to choose one with a concave surface to prevent the finger from slipping.
6. Push-pull. When both motions are significant, you may be looking at an application that requires more force, and therefore a larger component. Make sure the knob or U-handle is comfortable to operate and allows for a good grip.
7. Circular To determine the best component for a circular motion, you must consider many aspects of the application. If you're looking for fine, precise adjustments, a control knob is best. If you want a larger range of motion or are moving more mass, choose a crank handle or a handwheel. (Handwheels with digital indicators to measure the motion are an option, like the EN 953 series.) A control lever is another possible choice.
8. Circular for clamping. If the circular motion is being used to clamp or release, an adjustable (clamping) lever could be your best choice. We offer the unique torque-free component shown here, the GN 927 clamping lever with eccentrical cam. If you want to use a knob instead, a lobe or prong knob would be your best bet, as these allow for the grip required for turning. Handwheels are another option.
9. Rotate. Your options for rotating motion are many, and depend upon the torque and speed needed, as well as the space accommodations. In confined spaces, use a lever with a ratcheting feature or an adjustable lever. For low torque, use a knurled, lobe, T-handle, or prong knob. For higher torque, use a crank handle or handwheel. The latter is the best choice if speed is crucial.
10. Rotate-pull. The ideal choice for this is an adjustable lever, like our GN 300.4 zinc die-cast adjustable levers with secure clamping force.
11. Rotate-push. Any knob that provides a good rotational grip will work, such as a fluted, knurled, lobed or prong knob.
12. Multiple motions. A ball knob could work (knurling may be a boon), although a handle would offer more leverage. Choose fixed or rotating based on whether rotation will be required.

Types of Retaining Magnet Assemblies

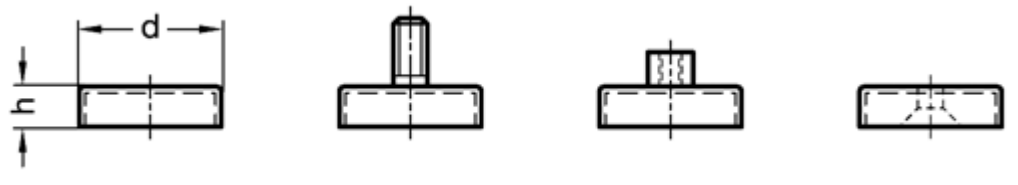
The use of retaining magnet assemblies is a simple solution for no-wear magnetic holding of an object.

Due to their structure, these magnet assemblies have only one magnetic pulling force level. The full magnetic force is focused directly onto the adhesive surface by means of iron magnetic poles.

The spatial effect of the magnetic field is limited by shielded systems, so that surrounding objects are not magnetized.

Flat gripper:

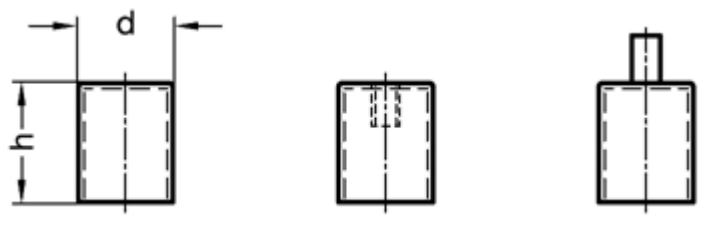
Ø d = 6-125 mm h = 4.5-26 mm
Housing: Steel, zinc plated, red lacquered finish, or stainless steel.



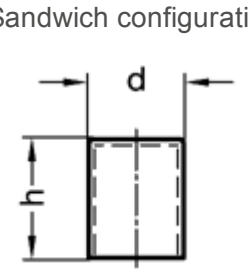
Ø d = 12-88 mm h = 6-8.5 mm
Housing: Steel, zinc plated, with rubber jacket.

Rod Gripper

Ø d = 4-63 mm h = 10-65 mm
Housing: Steel, zinc plated, red lacquered finish.

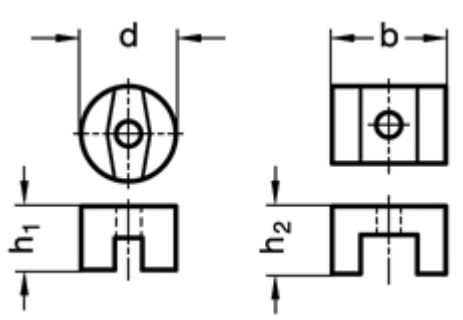


Ø d = 6-32 mm h = 20-40 mm
Sandwich configuration of the steel poles, housing brass.



Button-type / U-Magnets:

Ø d = 13-32 mm h1 = 10-25.4 mm
b = 22-79 mm h2 = 17-54 mm
Cast, unshielded system, red lacquered.



Pulling Force Information for Retaining Magnet Assemblies

Other factors aside from the magnet material and the size of the magnet affecting the magnetic pulling force are:

- an air gap (magnetically non-conductive materials act like an air gap)
- the quality of the surface (roughness and shape)
- the temperature
- the content of ferro-magnetic material in the steel; the components must also be sufficiently thick to be able to absorb the entire magnetic flux.

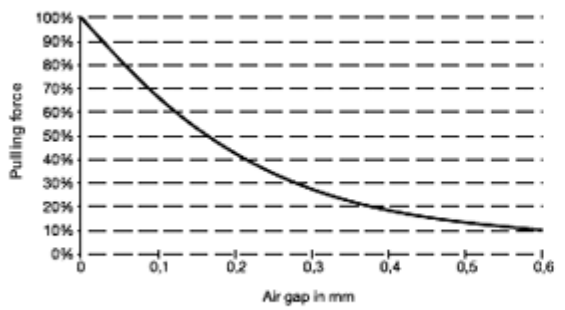
The magnetic pulling force can also be impaired by alternating thermal stress and by chemical factors (aggressive baths, gases, etc.).

The diagrams and graphs below show guide values relating to the impact on the magnetic pulling force caused by different mechanical specifications.

The nominal magnetic pulling forces shown in the tables of the standard pages are minimum values which are achieved at:

- room temperature
- perpendicular "tear-off" under full surface contact of the magnet
- workpieces made of low-carbon steel with a minimum thickness of 10 mm

Influence of the air gap

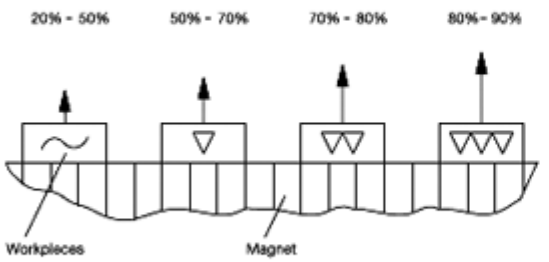


Influence of the material (steel grade)

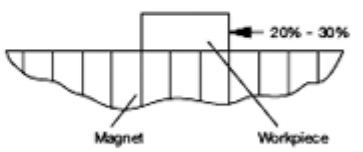
100%	technically pure iron	86%	C60
95%	St37	84%	42CrMo4
95%	C15	75%	St50
94%	34CrNiMo6	72%	X155CrMo12
93%	St52-3	65%	X210CrW12
92%	90MnV8	50%	20MnCr5
90%	C45	30%	GG
87%	Ck45	0%	non-ferrous metals

Hardened workpieces are bad conductors of the magnetic flux. The magnetic pulling force is therefore lower.

Influence of the workpiece surface on the magnetic pulling force



Displacement force = 20% - 30% of the magnetic pulling force



The displacement force is also influenced by the surface roughness and the magnetic pulling force

Force Measure

1 Newton (N = .225 lbs.)

Materials Composition of Retaining Magnet Assemblies

Hard ferrite (HF)

SrFe (Strontium ferrite).
Magnets made of hard ferrite (80% iron oxide) are made by sintering process.
Like all ceramic materials, these magnets are very hard and brittle and virtually non-machinable.
The magnetic adhesive force drops when the magnet is heated.

AlNiCo (AN)

Aluminium nickel cobalt.
Magnets made of AlNiCo (main constituents include aluminium, nickel, cobalt and iron) are made by sintering or casting process.
The material is very hard and tough, but can be redressed.
These magnets are used in applications in which the magnetic field is to remain as static and stable as possible; also under higher temperature fluctuations.

SmCo (SC)

Samarium cobalt.
Magnets made of SmCo (main constituents include samarium and cobalt) are made by sintering process.
The material is very hard and brittle and is virtually non-machinable.
The magnetic adhesive force drops when the magnet is heated.

NdFeB (ND)

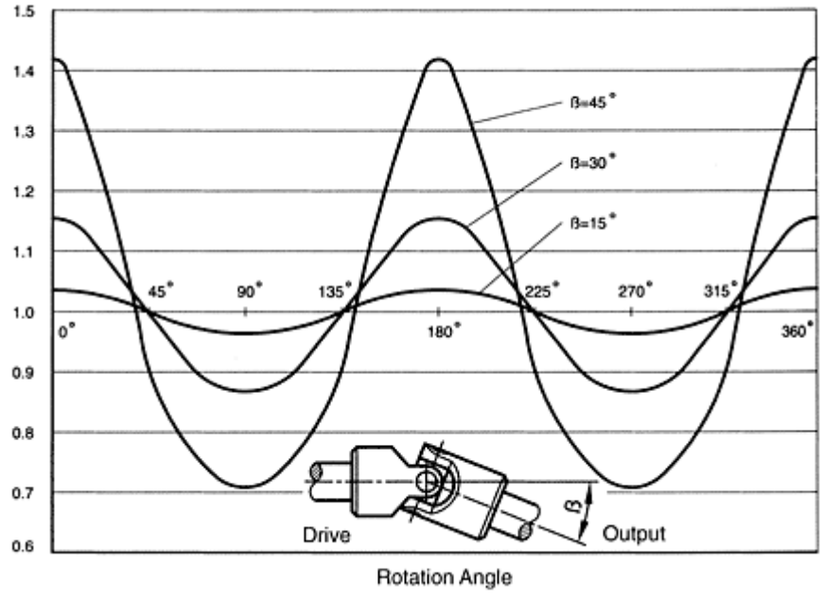
Neodymium iron boron.
Magnets made of NdFeB (main constituents include neodymium, iron and boron) are made by sintering process.
The material is very hard and brittle and is virtually non-machinable.
This material delivers ultimate magnetic holding power.
The magnetic adhesive force drops when the magnet is heated.

Comparison of Magnet Materials:

Description	**Hard ferrite (HF)**	**AlNiCo (AN)**	**SmCo (SC)**	**NdFeB (ND)**
Pulling force	good	medium	strong	very strong
Max. working temperature*	~ 390°F (200°C)	~ 840 °F (450°C)	~ 390°F (200°C)	~ 175 °F (80°C)
Corrosion resistance	very good	very good	good	less good
Machineability	not possible	diamond cutting, grinding	not possible	not possible
Demagnetization capability	moderate - by demagnetizing fields	easy - by demagnetizing fields	very difficult - only by large demagnetizing fields	difficult - only by large demagnetizing fields
Price	very reasonable	high	very high	reasonable

*The maximum temperature used is only a guide value, because it also depends on the dimensions of the magnet.

Directions for Assembly Universal Joints and Drive Shafts



The single joints transfer the initiated uniform motion non-uniformly, because in one revolution of the driving shaft the driven shaft is accelerated twice and slowed down twice. The size of the cyclic irregularity depends on the working angle ß.

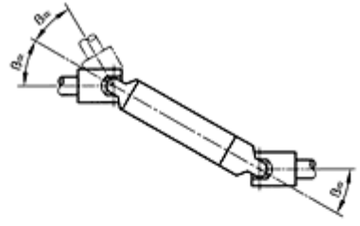
To keep the motion uniform, two single joints (or one drive shaft) or one double universal joint must be used. If minor irregularities in rotation are acceptable or the working angles are only small, just one joint may also be used.

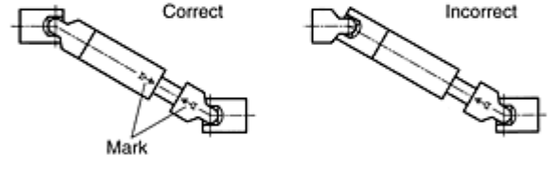
The working angle ß must be equal at each end of the intermediate shaft for uniform transmission of motion.

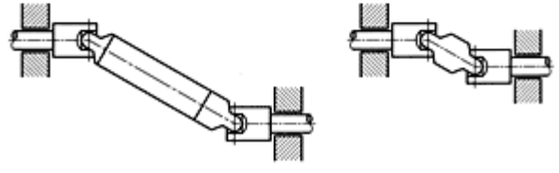
Improperly assembled drive shafts reinforce the irregularities of the rotary motion instead of compensating for them. This may destroy the joint bearings and splines. For this reason, the marks on the splined shaft and the socket must be in line when assembling the two halves of the drive shaft.

It is also important for the bearings to be installed as close as possible to the drive shafts.

Proper lubrication of drive shafts in friction bearings is essential for sustained operation. If drip-feed lubrication is not possible, the joints should be greased once a day. The joint may also be covered with a GN 808.1 protective boot which is filled with oil or grease.







Safety Handwheels

According to the safety regulations, handwheels must be secured to the shafts in such a way that during mechanical drive they do not rotate. These safety handwheels comply with this requirement.

Procedure: By axial displacement of the wheel (pushing or pulling) a set of mating internal and external serrated gear teeth are engaged. The wheel is now positively engaged to the shaft. When the wheel is released, it automatically disengages.

The clutch components are assembled together in an enclosed unit – the clutch mechanism. This clutch mechanism is constructed so that it may be easily attached to all current types of handwheels and other machine parts. For further details of clutch mechanisms, see GN 000.4 and GN 000.5.

The same handwheel and clutch mechanism can be arranged to require either a pushing or pulling action to engage. Greater protection against an accident is provided by the ‘pulling’ arrangement; the wheel cannot be engaged by inadvertent pressure.

Our standard Safety Handwheels are available in aluminum, with a keyway, and with or without revolving handle.

Originally intended for only a limited range of applications, safety clutch handwheels are now applied to an extremely wide range of machines and equipment. In order to ensure the utmost security against accidents, the following guidelines are offered; we can, however, not accept any liability for any possible consequential damage, which may be caused through the use of our clutch mechanisms.

1. Handwheels with friction bearing (clutch mechanismGN 000.4**)**

Model D (with revolving handle)

The range of application of these handwheels is limited to relatively low shaft velocities or higher velocities of only short duration (e.g. lead-screws for milling machines with fast traverse speed). A very high risk of pollution (grinding dust) can limit its scope still further.

Should the declutched handwheel be put deliberately into motion in the same direction as the revolving shaft, the handwheel will tend to turn continuously due to bearing friction. At higher handwheel speeds, this could lead to vibration caused by the rotating mass of the handle and create a certain danger.

Model A (without revolving handle)

Due to the absence of a handle, admittedly this gives these wheels a tendency to turn, but this does not create any danger because minimal contact holds them stationary. For this reason, these safety wheels can be used with appreciably higher speeds. The bearing load is negligible. At high velocity, however, the unbalanced handwheel could cause vibration.

Lubrication at regular intervals is in every case a pre-requisite for troublefree functioning of the friction bearing clutch mechanisms.

2. Safety Handwheels with needle bearings (clutch mechanism GN 000.5)

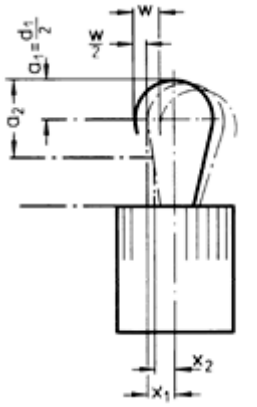
In principle, the details specified under paragraph 1 will also apply to these safety handwheels.

The needle bearings offer a great advantage over friction bearings through lower friction, and they are less prone to break down through lack of lubrication at higher velocities.

The increased bearing length and lower friction (bearing surface is hardened), as well as the finer teeth, make it in addition easier to declutch the handwheels.

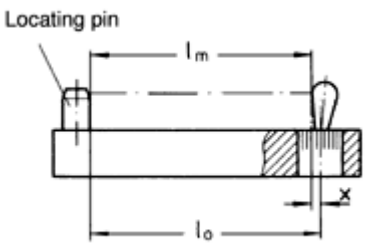
Side Thrust Technical Details

w	=	movement of pin
F	=	side thrust [N] initial thrust = F end thrust = 1.1 x F
a2-a1	=	clamping range for workpiece
x	=	distance center line. thrust point at w / 2; x1-for highest thrust point (a1) x2 for lowest thrust point (a2)
l_o	=	distance end stop. bore of thrust bush
l_o	=	l_m + x l_m = average length of workpiece (lmax. + lmin.) / 2

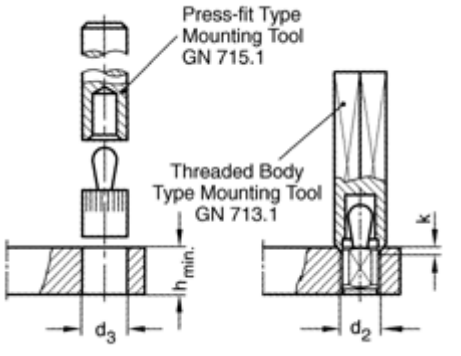


For contact points (workpiece height) between a1 and a2, a value-for x has to be used lying between x1 and x2 (interpolating).

By observing the above values, the full movement of the side thrust pin is available to cover the tolerance of the workpiece.



For inserting press-fit type side thrust pins, the use of mounting tool GN 715.1 is recommended. For inserting threaded body type side thrust pins, GN 713.1 mounting tool is recommended.



Eccentric bushings GN 715.2 are a tooling accessory. They allow the precise-setting of the side thrust pins. This allows the alteration of distance lo for bridging of a larger tolerance on a workpiece than the actual scope of the pin.