Analysis on Pneumatic Surface Gringing Machine

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Abstract -- The objective of the project is to prepare a machine which gives good surface finishing to work piece without human efforts but operates pneumatically. Compressed air is used as working media. The compressed air moves tool to give smooth finishing. The idea of the project generated due to a manual surface finishing to wood in our workshop. In that operation work piece is fixed and one sand paper is used to do the finishing operation. But in that operation we need to apply more force to give good surface finishing and workers need to work continuously on particular work piece. For mass production in large scale industry to reduce the human efforts pneumatic machine should chose. Hence for some development of machine, we have chosen this subject for our project. We hope that a good idea will develop and we can use it in many industries in surrounding and our practical knowledge, team-working skill, leadership skills will be improved. Surface finish, also known as surface texture or surface topography, is the nature of a surface as defined by the three characteristics of lay, surface roughness, and waviness. It comprises the small local deviations of a surface from the perfectly flat ideal (a true plane). Surface texture is one of the important factors that control friction and transfer layer formation during sliding. Considerable efforts have been made to study the influence of surface texture on friction and wear during sliding conditions. Surface textures can be isotropic or anisotropic. Sometimes, stick-slip friction phenomena can be observed during sliding depending on surface texture. Each manufacturing process (such as the many kinds of machining) produces a surface texture. The process is usually optimized to ensure that the resulting texture is usable. If necessary, an additional process will be added to modify the initial texture. The latter process may be grinding (abrasive cutting), polishing, lapping, abrasive blasting, honing, milling, lithography, industrial etching/chemical milling, laser texturing, or other processes. Pneumatic systems are safer than electromotive systems because they can work in inflammable environment without causing fire or explosion. Apart from that, overloading in pneumatic system will only lead to sliding or cessation of operation. Unlike electromotive components, pneumatic components do not burn or get overheated when overloaded.

I. INTRODUCTION

The formation of any business begins with someone producing the initial idea for the project. The continued success of an established business depends upon the number and quality of the ideas fed into it. Without a continual flow of new ideas, a business cannot function profitably or expand successfully and must, therefore eventually fade into total obscurity. Ideas for a new business project, a new product, a means of reducing manufacturing costs or for solving industrial labor problems, begin in the human mind. Most people conceive their ideas unconsciously, and because they are unaware of the mental

Mechanics that caused the 'idea' to be produced, they cannot repeat the ideation process to produce further profitable ideas at will. Fortunately, there are available established creative techniques which, when used correctly, do enable a person to produce a large number of first-class ideas at will. One such creative technique, and probably the most widely used in American. Industry, is 'brainstorming'.

An incredible range of manufacturing systems use the force and power of fluids such as water, oil and air. Powered clamps open and close with the force of pressurized air or oil, large presses shape and form metal with hydraulic pressure, and assembly torque tools fasten components with pressurized air. In each example, fluid power provides the energy necessary to exert significant mechanical forces. Systems that use air are called pneumatic systems while systems that use liquids like oil or water are called hydraulic system. The pneumatic systems will be the subject of the first three sessions in the course starting from this session. Pneumatics is all about using compressed air to make a process happens. Compressed air is simply the air we breathe squeezed into a small space under pressure. You might remember that air under pressure possesses potential energy which can be released to do useful work. Their principle of operation is similar to that of the hydraulic power systems. An air compressor converts the mechanical energy of the prime mover into, mainly, pressure energy of the compressed air. This transformation facilitates the transmission, storage, and control of energy. After compression, the compressed air should be prepared for use. A pneumatic system consists of a group of pneumatic components connected together so that a signal (compressed air) is passed through the system to make something happen at the output. These groups of components can be divided into five categories according to their function in the pneumatic circuit as follows:

1. Supply elements: these elements are the sources of power that drives the system which are the compressors.
2. Input elements: these elements are used to send signals to the final control elements and come in two forms; either as components that is actuated by the operator like push buttons or sensors that determine the status of the power elements such as limit switches and proximity sensors.
3. Processing elements: these elements may perform operations on the input signals before sending the signal to the final control elements such as non-return valves, directional control valves and presser control valves.
4. Final control elements: to control the motion of actuators such as directional control valves.
5. Power elements (actuators): these are the outputs of the pneumatic system which use the stored potential energy to perform a certain task such as pneumatic cylinders and motors.

History:

Pneumatics, from the Greek (pneumatikos, coming from the wind) is the use of pressurized gases to do work in science and technology. Pneumatics was first documented by Hero of Alexandria in 60 A.D., but the concept had existed before then. Pneumatic products represent a multi-billion dollar industry today. Pneumatic devices are used in many industrial applications. Generally appropriate for applications involving less force than hydraulic applications, and typically less expensive than electric applications, most pneumatic devices are designed to use clean dry air as an energy source. The actuator then converts that compressed air into mechanical motion. The type of motion produced depends on the design of the actuator. Pneumatics is employed in a variety of settings. In dentistry applications, pneumatic drills are lighter, faster and simpler than an electric drill of the same power rating, because the prime mover, the compressor, is separate from the drill and pumped air is capable of rotating the drill bit at extremely high rpm. Pneumatic transfer systems are employed in many industries to move powders and pellets. Pneumatic devices are also used where electric motors cannot be used for safety reasons, such as mining applications where rock drills are powered by air motors to preclude the need for electric motors deep in the mine where explosive gases may be present.

II. TYPES OF FINISHING

1. Abrasive blasting
2. Burnishing
3. Grinding
4. Mass finishing
5. Tumble finishing
6. Vibratory finishing
7. Polishing

1. Abrasive blasting:

Abrasive blasting is the operation of forcibly propelling a stream of abrasive material against a surface under high pressure to smooth a rough surface, roughen a smooth surface, shape a surface, or remove surface contaminants. A pressurized fluid, typically compressed air, or a centrifugal wheel is used to propel the blasting material (often called the media). The first abrasive blasting process was patented by Benjamin Chew Tilghman on 18 October 1870.

There are several variants of the process, using various media; some are highly abrasive, whereas others are milder. The most abrasive are shot blasting (with metal shot) and sandblasting (with sand). Moderately abrasive variants include glass bead blasting (with glass beads) and media blasting with ground-up plastic stock or walnut shells and corncobs. A mild version is soda blasting (with baking soda). In addition, there are alternatives that are barely abrasive or nonabrasive, such as ice blasting and dry-ice blasting.

2. Burnishing:

Burnishing is the plastic deformation of a surface due to sliding contact with another object. Visually, burnishing smears the texture of a rough surface and makes it shinier. Burnishing may occur on any sliding surface if the contact stress locally exceeds the yield strength of the material. And Burnishing is a form of pottery treatment in which the surface of the pot is polished, using a hard smooth surface such as a wooden or bone spatula, smooth stones, plastic, or even glass bulbs, while it still is in a leathery 'green' state, i.e., before firing. After firing, the surface is extremely shiny. Often the whole outer surface of the pot is thus decorated, but in certain ceramic traditions there is 'pattern burnishing' where the outside and, in the case of open bowls, the inside, are decorated with burnished patterns in which some areas are left matte.

This technique can be applied to concrete masonry, creating a polished finish.

Burnishing can also be applied to wood, by rubbing two pieces together along the grain. Hard woods take the treatment best. Burnishing does not protect the wood like a varnish does, but does impart a glossy sheen.

If one wood has a dye in it or is colored in some way, it may rub off onto the other wood. Burnishing can also apply to relief printing.

3. Grinding:

Grinding is used to produce a smooth finish on flat surfaces. It is a widely used abrasive machining process in which a spinning wheel covered in rough particles (grinding wheel) cuts chips of metallic or nonmetallic substance from a work piece, making a face of it flat or smooth.

4. Mass finishing:

Mass finishing is a group of manufacturing processes that allow large quantities of parts to be simultaneously finished. The goal of this type of finishing is to burnish, debar, clean, radius, de-flash, de scale, remove rust, polish, brighten, surface harden, prepare parts for further finishing, or break off die cast runners. The two main types of mass finishing are tumble finishing, also known as barrel finishing, and vibratory finishing. Both involve the use of a cyclical action to create grinding contact between surfaces. Sometimes the work pieces are finished against each other; however, usually a finishing medium is used. Mass finishing can be performed dry or wet; wet processes have liquid lubricants, cleaners, or abrasives, while dry processes do not. Cycle times can be as short as 10 minutes for nonferrous work pieces or as long as 2 hours for hardened steel.

Mass finishing processes can be configured as either batch systems, in which batches of work pieces are added, run, and removed before the next batch is run, or as continuous systems, in which the work pieces enter at one end and leave at the other end in the finished state. They may also be sequenced, which involves running the work pieces through multiple different mass finishing processes; usually, the finish becomes progressively finer. Due to the random action of the processes, mass finishing is as much an art as it is a science.

5. Tumble finishing:

Tumble finishing, also known as tumbling or rumbling, is a technique for smoothing and polishing a rough surface on relatively small parts. In the field of metalworking, a similar process called barreling, or barrel finishing, works upon the same principles.

This process is very similar to the natural processes that produce "sea glass" or "beach glass".

6. Vibratory finishing:

Vibratory finishing is a type of mass finishing manufacturing process used to debar, radius, de scale, burnish, clean, and brighten a large number of relatively small work pieces.

In this batch-type operation, specially shaped pellets of media and the work pieces are placed into the tub of a vibratory tumbler. The tub of the vibratory tumbler and all of its contents are then vibrated. The vibratory action causes the media to rub against the work pieces which yield the desired result. Depending on the application this can be either a dry or wet process.

Unlike rotary tumbling this process can finish internal features, such as holes. It is also quicker and quieter. The process is performed in an open tub so the operator can easily observe if the required finish has been obtained.

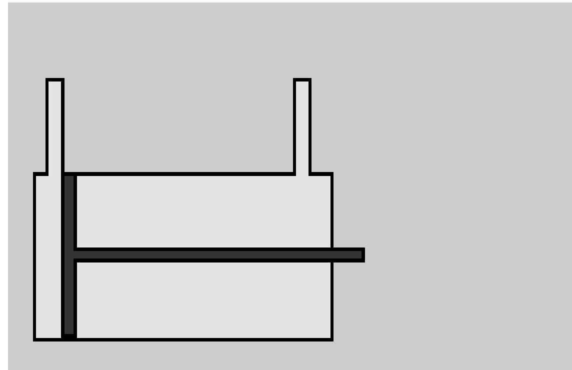
7. Polishing:

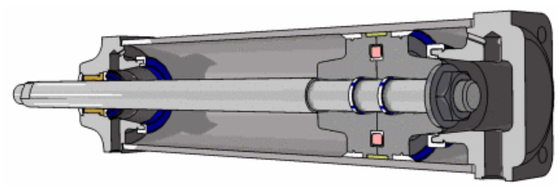
Polishing is the process of creating a smooth and shiny surface by rubbing it or using a chemical action, leaving a surface with a significant specular reflection (still limited by the index of refraction of the material according to the Fresnel equations.)[1] In some materials (such as metals, glasses, black or transparent stones) polishing is also able to reduce diffuse reflection to minimal values. When an unpolished surface is magnified thousands of times, it usually looks like mountains and valleys. By repeated abrasion, those "mountains" are worn down until they are flat or just small "hills." The process of polishing with abrasives starts with coarse ones and graduates to fine ones.

Main Components of Pneumatic Surface finishing Machine:

1. Double acting cylinder
2. Air compressor
3. 2way operated Solenoid valve
4. Flow Control valve
5. Direction control valve
6. Grinding Wheel
7. Pneumatic Silencers
8. Pneumatic Pipes

1. Double acting cylinder:





Pneumatic cylinder(s) (sometimes known as air cylinders) are mechanical devices which use the power of compressed gas to produce a force in a reciprocating linear motion.

Like hydraulic cylinders, something forces a piston to move in the desired direction. The piston is a disc or cylinder, and the piston rod transfers the force it develops to the object to be moved. Engineers sometimes prefer to use pneumatics because they are quieter, cleaner, and do not require large amounts of space for fluid storage.

Because the operating fluid is a gas, leakage from a pneumatic cylinder will not drip out and contaminate the surroundings, making pneumatics more desirable where cleanliness is a requirement. For example, in the mechanical puppets of the Disney Tiki Room, pneumatics are used to prevent fluid from dripping onto people below the puppets.

Rod stresses:

Due to the forces acting on the cylinder, the piston rod is the most stressed component and has to be designed to withstand high amounts of bending, tensile and compressive forces. Depending on how long the piston rod is, stresses can be calculated differently. If the rods length is less than 10 times the diameter, then it may be treated as a rigid body which has compressive or tensile forces acting on it. In which case the relationship is:

$$F = A\sigma$$

Where:

F is the compressive or tensile force

A is the cross-sectional area of the piston rod

σ is the stress

However, if the length of the rod exceeds the 10 times the value of the diameter, then the rod needs to be treated as a column and buckling needs to be calculated as well.

In stroke and outstroke:

Although the diameter of the piston and the force exerted by a cylinder are related, they are not directly proportional to one another. Additionally, the typical mathematical relationship between the two assumes that the air supply does not become saturated. Due to the effective cross sectional area reduced by the area of the piston rod, the in stroke force is less than the outstroke force when both are powered pneumatically and by same supply of compressed gas.

The relationship between the force, radius, and pressure can derived from simple distributed load equation:

$$F_r = PA_e$$

Where:

F_r is the resultant force

P is the pressure or distributed load on the surface

A_e is the effective cross sectional area the load is act

Outstroke:

Using the distributed load equation provided the can be replaced with area of the piston surface where the pressure is acting on.

$$F_r = P(\pi r^2)$$

Where:

F_r represents the resultant force

r represents the radius of the piston

π is pi, approximately equal to 3.14159.

In stroke:

On in stroke, the same relationship between force exerted, pressure and effective cross sectional area applies as discussed above for outstroke. However, since the cross sectional area is less than the piston area the relationship between force, pressure and radius is different. The calculation isn't more complicated though, since the effective cross sectional area is merely that of the piston surface minus the cross sectional area of the piston rod.

For instroke, therefore, the relationship between force exerted, pressure, radius of the piston, and radius of the piston rod, is as follows:

$$F_r = P(\pi r_1^2 - \pi r_2^2) = P\pi(r_1^2 - r_2^2)$$

Where:

F_r represents the resultant force

r_1 represents the radius of the piston

r_2 represents the radius of the piston rod

π is pi, approximately equal to 3.14159.

2. *Air compressor:*

An air compressor is a device that converts power (using an electric motor, diesel or gasoline engine, etc.) into potential energy stored in pressurized air (i.e., compressed air). By one of several methods, an air compressor forces more and more air into a storage tank, increasing the pressure. When tank pressure reaches its upper limit the air compressor shuts off. The compressed air, then, is held in the tank until called into use. The energy contained in the compressed air can be used for a variety of applications, utilizing the kinetic energy of the air as it is released and the tank depressurizes. When tank pressure reaches its lower limit, the air compressor turns on again and re-pressurizes the tank.

3. *2Way operated solenoid valve:*

5/3 WAY HAND LEVER VALVE DETENT

Model : 3ARMHLV-5

Size : 1/4", 1/2"

Body : Aluminum Press. Die Cast

Seals : Nitrile

Pressure : 0 to 10 Kg/cm²

Temp : Up to 80°C

Leakage : Bubble Tight

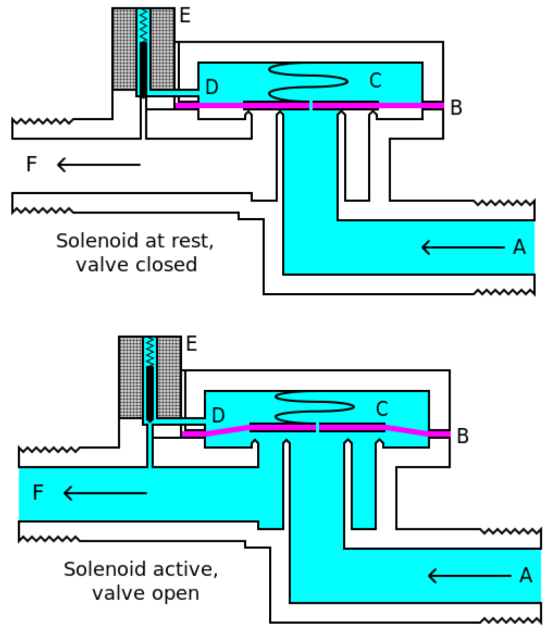
Type : PAN | PHN | PRN

Media : Air (Filtered & Lubricated)

A solenoid valve is an electromechanically operated valve. The valve is controlled by an electric current through a solenoid: in the case of a two-port valve the flow is switched on or off; in the case of a three-port valve, the outflow is switched between the two outlet ports. Multiple solenoid valves can be placed together on a manifold.

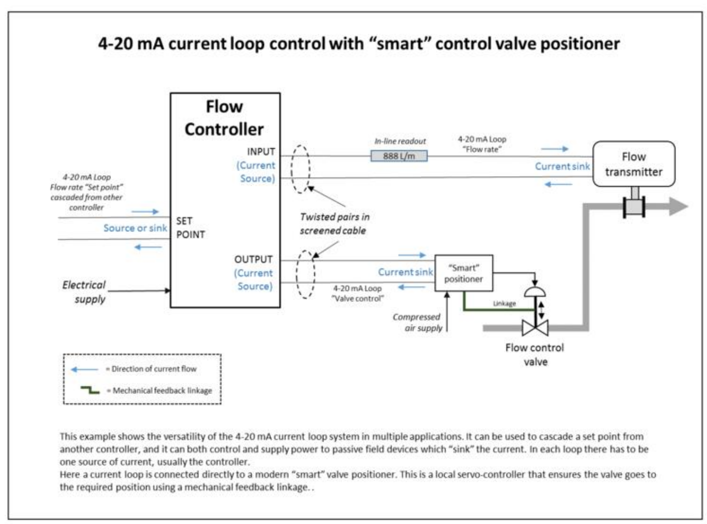
Solenoid valves are the most frequently used control elements in fluidics. Their tasks are to shut off, release, dose, distribute or mix fluids. They are found in many application areas. Solenoids offer fast and safe switching, high reliability, long service life, good medium compatibility of the materials used, low control power and compact design.

Besides the plunger-type actuator which is used most frequently, pivoted-armature actuators and rocker actuators are also used.



4. *Flow control Valve:*

A flow control valve regulates the flow or pressure of a fluid. Control valves normally respond to signals generated by independent devices such as flow meters or temperature gauges.



5. *Direction Control Valve:*

Directional control valves are one of the most fundamental parts in hydraulic machinery as well as pneumatic machinery. They allow fluid flow into different paths from one or more sources. They usually consist of a spool inside a cylinder which is mechanically or electrically controlled. The movement of the spool restricts or permits the flow, thus it controls the fluid flow.

6. Grinding wheel:

A grinding wheel is a wheel composed of an abrasive compound and used for various grinding (abrasive cutting) and abrasive machining operations. Such wheels are used in grinding machines.

The wheels are generally made from a composite material consisting of coarse-particle aggregate pressed and bonded together by a cementing matrix (called the bond in grinding wheel terminology) to form a solid, circular shape. Various profiles and cross sections are available depending on the intended usage for the wheel. They may also be made from a solid steel or aluminum disc with particles bonded to the surface. Today most grinding wheels are artificial composites made with artificial aggregates, but the history of grinding wheels began with natural composite stones, such as those used for millstones.

The manufacture of these wheels is a precise and tightly controlled process, due not only to the inherent safety risks of a spinning disc, but also the composition and uniformity required to prevent that disc from exploding due to the high stresses produced on rotation.

Grinding wheels are consumables, although the life span can vary widely depending on the use case, from less than a day to many years. As the wheel cuts, it periodically releases individual grains of abrasive, typically because they grow dull and the increased drag pulls them out of the bond. Fresh grains are exposed in this wear process, which begin the next cycle. The rate of wear in this process is usually very predictable for a given application, and is necessary for good performance.

7. Pneumatic silencer:

A muffler (silencer in many non-US English speaking countries) is a device for decreasing the amount of noise emitted by the exhaust of an internal combustion engine.

Applications:

*Metal filters are available for high temperature and pressure environment, and they are durable against impact.

*Easy to weld and used for virtually every industry.

8. Pneumatic pipe:

Pneumatic tubes (or capsule pipelines; also known as Pneumatic Tube Transport or PTT) are systems that propel cylindrical containers through networks of tubes by compressed air or by partial vacuum. They are used for transporting solid objects, as opposed to conventional pipelines, which transport fluids. Pneumatic tube networks gained acceptance in the late 19th and early 20th centuries for offices that needed to transport small, urgent packages (such as mail, paperwork, or money) over relatively short distances (within a building, or, at most within a city). Some installations grew to great complexity, but were mostly superseded. In some settings, such as hospitals, they remain widespread and have been further extended and developed in recent decades.[1]

A small number of pneumatic transportation systems were also built for larger cargo, to compete with more standard train and subway systems. However, these never gained popularity.

III. CONSTRUCTION

Raw Material Used:

1. Cylinder fittings like fork end, base plates, support links.
2. Nut for fitting blade.
3. Connecting link.
4. Blade link.

Ready Items Used-

1. Pneumatic double acting cylinder.
2. Direction & flow control valves.
3. Pneumatic pipe & pipe fittings.
4. Pneumatic silencer.
5. Pneumatic pipe.

Machines Tools Used-

1. Cutting Machine.
2. Electric Arc Welding Machine.
3. Surface Grinding Machine.

Specifications:

1. Pneumatic cylinder:

   Type: Double acting cylinder

   Bore size: 25mm

   Stroke length: 50mm

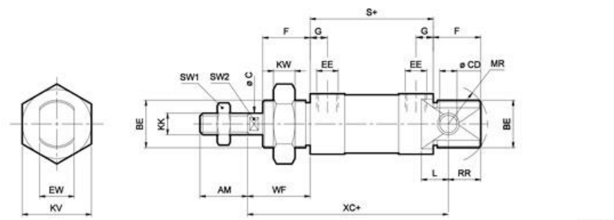
   Medium: air

   Working pressure: 0.5-10bar

   Medium temperature: 5-60˚c

Cylinder bore Ø (in mm)	Rod Ø (in mm)		Working pressure in bar								
			2	3	4	5	6	7	8	9	10
12	6	Extend	20	30	40	50	60	70	80	90	100
		Retract	15	22	30	38	46	53	61	68	76
16	6	Extend	36	54	72	90	108	126	144	162	180
		Retract	31	46	62	78	94	108	124	140	156
20	8	Extend	56	84	112	140	169	196	224	254	282
		Retract	47	71	95	118	142	166	189	214	237
25	10	Extend	88	132	176	220	264	308	352	396	440
		Retract	74	111	148	185	222	260	296	334	371

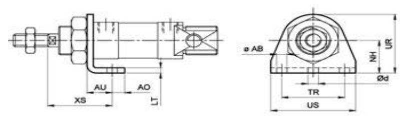
(Above values have been worked out taking frictional loss into consideration)



+ Add stroke

Cylinder bore Ø	MR	BE	F	CD H9	RR	L	G	EE	S	KW	C	SW1	SW2	KK	AM	WF ±1.2	XC ±1	EW d13	KV	Stroke tol 10 - 100	Stroke tol Above 100
12	17	M16x1.5	17	6	15	9	6	M5x0.8	$51^{\pm 0.5}$	8	6	10	5	M6x1	16	22	75	12	24	+ 1.5 + 0	+ 2.5 + 0
16	17	M16x1.5	17	6	15	9	6	M5x0.8	$58^{\pm 0.5}$	8	6	10	5	M6x1	16	22	82	12	24		
20	20	M22x1.5	20	8	16	12	8	G1/8	$67^{\pm 0.7}$	10	8	13	7	M8x1.25	20	24	95	16	32		
25	21	M22x1.5	22	8	17	12	8	G1/8	$71^{\pm 0.7}$	10	10	17	9	M10x1.25	22	28	104	16	32		

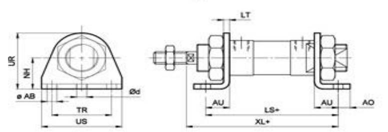
Front Foot Mounting



Cylinder bore Ø	LT	AU	AO	d*	XS ±1.4	NH ±0.3	TR Js14	US	AB H13	UR	Ordering no.
12	2	12	6	4.8	32	20	32	42	5.5	33	ML016
16	2	12	6	4.8	32	20	32	42	5.5	33	ML016
20	4	16	8	5.8	36	25	40	54	6.6	45	ML022
25	4	16	8	5.8	40	25	40	54	6.6	45	ML022

* Suitable for reaming

Double Foot Mounting

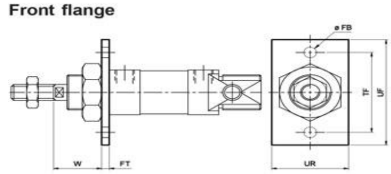


+ Add stroke

Cylinder bore Ø	UR	AB H13	TR Js14	NH ±0.3	AO	AU	d*	LT	US	LS	XL ±1	Ordering no.
12	33	5.5	32	20	6	12	4.8	2	42	$75^{\pm 0.7}$	85	MS016
16	33	5.5	32	20	6	12	4.8	2	42	$82^{\pm 0.7}$	92	MS016
20	45	6.6	40	25	8	16	5.8	4	54	$99^{\pm 0.9}$	107	MS022
25	45	6.6	40	25	8	16	5.8	4	54	$103^{\pm 0.9}$	115	MS022

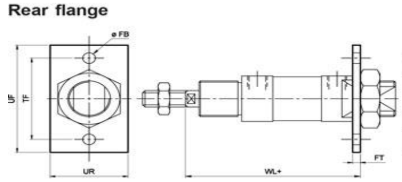
* Suitable for reaming

Front flange



Cylinder bore Ø	TF Js14	UF	UR	FB H13	FT	W ±1.4	Ordering no.
12	40	50	30	5.5	4	18	MF016
16	40	50	30	5.5	4	18	MF016
20	50	66	40	6.6	5	19	MF022
25	50	66	40	6.6	5	23	MF022

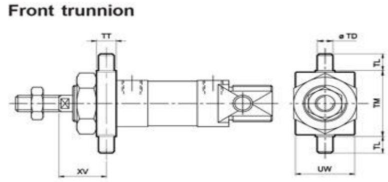
Rear flange



+ Add stroke

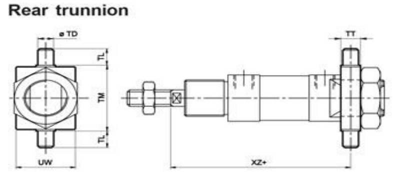
Cylinder bore Ø	TF Js14	UF	UR	FB H13	FT	WL ±1.2	Ordering no.
12	40	50	30	5.5	4	77	MF016
16	40	50	30	5.5	4	84	MF016
20	50	66	40	6.6	5	96	MF022
25	50	66	40	6.6	5	104	MF022

Front trunnion



Cylinder bore Ø	TM h14	UW	TD e9	TT	XV ±1.4	TL h14	Ordering no.
12	30	25	6	8	18	10	MT016
16	30	25	6	8	18	10	MT016
20	40	30	8	10	19	10	MT022
25	40	30	8	10	23	10	MT022

Rear trunnion

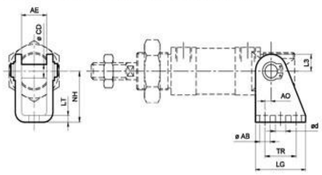


+ Add stroke

Cylinder bore Ø	TM h14	UW	TD e9	TT	XZ ±1.2	TL h14	Ordering no.
12	30	25	6	8	77	10	MT016
16	30	25	6	8	84	10	MT016
20	40	30	8	10	96	10	MT022
25	40	30	8	10	104	10	MT022

For trunnion brackets see " Accessories "

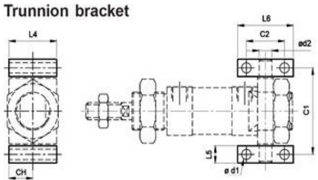
Clevis foot bracket (CETOP - RP 107 P)



Cylinder bore Ø	AE	AB H13	LT	NH	L3	CD e8	d*	TR Js14	LG	AO	Ordering no.
12	12.1	5.5	2	27	7	6	3.8	15	25	2	AA016
16	12.1	5.5	2	27	7	6	3.8	15	25	2	AA016
20	16.1	6.6	4	30	10	8	4.8	20	32	4	AA022
25	16.1	6.6	4	30	10	8	4.8	20	32	4	AA022

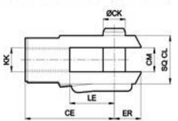
* Suitable for reaming

Trunnion bracket



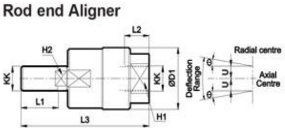
Cylinder bore Ø	C1	C2 Js14	d1 H13	L4	L5	L6	CH	d2 H9	Ordering no.
12	38	20	4.3	25	8	30	16	6	AT016
16	38	20	4.3	25	8	30	16	6	AT016
20	50	24	6.6	30	10	35	20	8	AT022
25	50	24	6.6	30	10	35	20	8	AT022

Rod end Fork (ISO 8140)



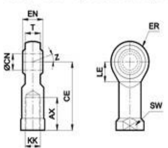
Cylinder bore Ø	KK	LE	CM B12	CE	CK f8	CL	ER	Ordering no.
12	M6X1	12	6	24	6	12	9.5	AF006
16	M6X1	12	6	24	6	12	9.5	AF006
20	M8X1.25	16	8	32	8	16	13	AF008
25	M10X1.25	20	10	40	10	20	16	AF010

Rod end Aligner



Cylinder bore Ø	KK	L1	L2	L3	D1	H1	H2	± θ°	U	Ordering no.
12 / 16	M6X1	12	8	38	18	10	4	5	0.75	AR006
20	M8X1.25	15	10	48	20	12	7	5	0.75	AR008
25	M10X1.25	20	14	65	28	17	8	5	0.75	AR010

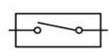
Rod end spherical eye



Cylinder bore Ø	KK	CN H9	T	EN h12	CE	LE min	ER max	AX	SW h13	Z	Ordering no.
12 / 16	M6X1	6	6.75	9	30	11	10	12	11	13°	AP006
20	M8X1.25	8	9	12	36	13	12	16	13 /14		AP008
25	M10X1.25	10	10.5	14	43	15	14	20	17		AP010

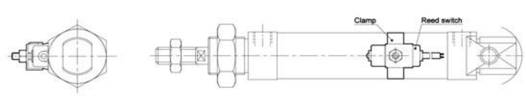
ACCESSORIES FOR MAGNETIC CYLINDERS Series A52, A55

REED SWITCH



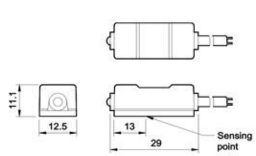
Function

The reed switch and clamping kit assembly is mounted on the Air cylinder (Series A52, A55), for proximity sensing. The piston of the cylinder is equipped with a permanent magnet which activates the reed switch on approaching it. The reed switch closes the circuit giving an electrical signal, which could be used further as required. The accuracy of the sensing distance depends on the speed of operation of the piston.

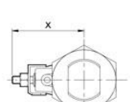


Technical Specifications - Reed Switch

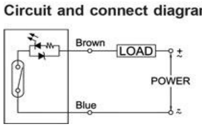
Model	880006
Operating voltage	DC / AC 5 - 240V
Switching current	100mA max
Switch rating	10 W max
Voltage drop	3.5V max.
Response time	On + off <1ms
Switching logic	SPST, Normally open
Operating temperature	-10° to +70° C
Shock	30 G
Vibration	9 G
Protection circuit	None
Type of protection	IEC 529, IP67
Colour of LED	Green
Cable	Ø4, 2C, 2meter



Bore Dia	X	Ordering no. for Clamp (a)	Ordering no. for Reed Switch (b)	Ordering no. (a+b)
12	32	810000	880006	AM1012
16	34	810001		AM1016
20	36	810002		AM1020
25	38	810003		AM1025



Circuit and connect diagram



A ○○ ○○○ ○○○ ○

Model	
51	Standard cylinder
52	Magnetic cylinder

Bore Ø (mm)	
012	- Ø 12
016	- Ø 16
020	- Ø 20
025	- Ø 25

Stroke (mm)	
010	- 10
025	- 25
040	- 40
050	- 50
080	- 80
100	- 100
125	- 125
160	- 160
200	- 200
250	- 250
300	- 300

Mountings	
O	- Basic
L	- Front Foot Mounting
D	- Double Foot Mounting
F	- Front Flange
R	- Rear Flange
M	- Front Trunnion
N	- Rear Trunnion

Example:

Ordering no. for standard cylinder with 16 dia bore, 50 mm stroke with Double foot mounting : **A51 016 050 D**

Note:

If ordered as16 dia, 50 mm stroke cylinder, Basic cylinder **A51 016 050 O** will be supplied.
For repeat order when the details are taken from cylinder nameplate, mention the mounting style separately.
For ordering **Accessories:** mention part numbers in corresponding tables.
For ordering individual **Mounting** kits (If needed separately): mention the ordering numbers as below

Cylinder bore Ø	Front Foot mounting	Double Foot mounting	Flange (Front or Rear)	Trunnion (Front or Rear)
				
12	ML016	MS016	MF016	MT016
16	ML016	MS016	MF016	MT016
20	ML022	MS022	MF022	MT022
25	ML022	MS022	MF022	MT022

For your special requirements of cylinders or for further informations contact your regional dealer or **JANATICS**

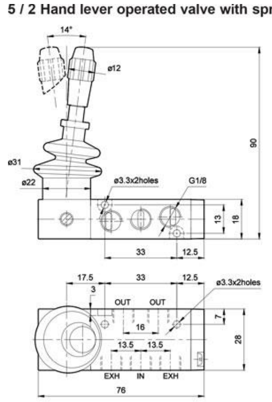
2. Direction Control Valve:

3/2, 5/2 valves
Compact size
Suitable for panel mounting
Mounting provision for individual unit

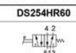
Model	DS2
Type	3/2, 5/2
Design	Spool type
Port Size	Inlet, Outlet, Exhaust - G1/8
Medium	Compressed air - Dry, filtered, lubricated
Max. Working Pressure	8 bar
Recommended oil for lubrication	ISO VG32 (Servo system 32)
Ambient / Medium temperature	5° - 60° C
Flow @	450 lts/min
Materials of construction	Aluminium, Nitrile, Brass, Acetal

@ Inlet pressure 6 bar, and pressure drop 1 bar

5 / 2 Hand lever operated valve with spring return



1 - Inlet, 2,4 - Outlet, 3,5 - Exhaust

Ordering No	DS254HR60
Symbol	

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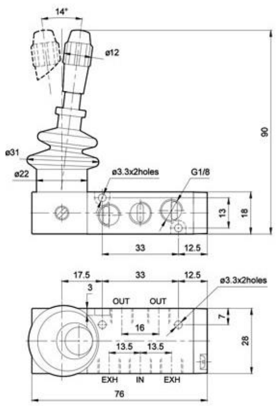
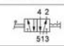
5 / 2 Hand lever operated valve with detent

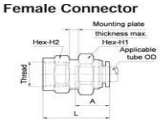


1 - Inlet, 2,4 - Outlet, 3,5 - Exhaust

Ordering No	DS264HD60
Symbol	

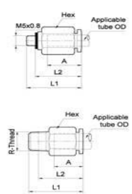
3. Connector:

Bulk Head Female Connector



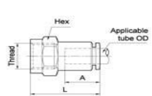
Applicable Tube OD	Thread (G)	Hex H1	Hex H2	L	A	Mounting plate thickness max.	Mounting hole dia	Ordering No
6	1/4	17	17	32	15.5	8	14.5	WP2520661
8	1/4	19	17	32	16	7	16.5	WP2520861

Male Connector



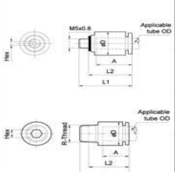
Applicable Tube OD	Thread	Hex	L1	L2	A	Ordering No
4	* M5 x 0.8	10	21	17.5	14.5	WP2110470
	R1/8	10	21.5	18	14.5	WP2110450
	R1/4	14	18	12.5	14.5	WP2110451
6	* M5 x 0.8	12	22	18.5	15.5	WP2110670
	R1/8	12	23	19.5	15.5	WP2110650
	R1/4	14	25.5	20	15.5	WP2110651
	R3/8	17	20	14	15.5	WP2110652
8	R1/8	14	25.5	22	16	WP2110850
	R1/4	14	27	21.5	16	WP2110851
	R3/8	17	22.5	16.5	16	WP2110852
	R1/2	22	25.5	18	16	WP2110853
10	R1/4	17	29.5	24	18	WP2111051
	R3/8	17	30	24	18	WP2111052
	R1/2	22	26	18.5	18	WP2111053
12	R1/4	22	36	30	22.5	WP2111251
	R3/8	22	34.5	29	22.5	WP2111252
	R1/2	22	32.5	25	18.5	WP2111253
14	1/2	24	34	26.5	19	WP2111453
	3/4	27	30	21	19	WP2111454
16	1/2	24	35	27.5	21.5	WP2111653
	3/4	27	32	23	21.5	WP2111654
	1	36	37	27	21.5	WP2111655

Female Connector



Applicable Tube OD	Thread (G)	Hex	L	A	Ordering No
4	1/8	14	27	14.5	WP2120460
	1/4	17	31	14.5	WP2120461
6	1/8	14	27	15.5	WP2120660
	1/4	17	31.5	15.5	WP2120661
8	1/8	14	27	16	WP2120860
	1/4	17	31.5	16	WP2120861
	3/8	22	33.5	16	WP2120862
10	1/4	17	33	18	WP2121061
	3/8	22	35	18	WP2121062
12	3/8	22	35	18.5	WP2121262
	1/2	27	39.5	18.5	WP2121263
14	1/2	27	39	19	WP2121463

Male Connector (Internal Hexagon Socket)



Applicable Tube OD	Thread	Hex	ØD	L1	L2	A	Ordering No
4	* M5 x 0.8	2	10.5	21	17.5	14.5	WP2130470
	R1/8	2.5	10.5	21.5	18	14.5	WP2130450
	R1/4	2.5	13.5	17.5	12	14.5	WP2130451
6	* M5 x 0.8	2	12.5	22	18.5	15.5	WP2130670
	R1/8	4	12.5	23	19.5	15.5	WP2130650
	R1/4	4	13.5	22.5	17	15.5	WP2130651
	R3/8	4	17	19	13	15.5	WP2130652
8	R1/8	4	14.5	25.5	22	16	WP2130850
	R1/4	6	14.5	27	21.5	16	WP2130851
	R3/8	6	17	22.5	16.5	16	WP2130852
	R1/2	6	21.5	21.5	14	16	WP2130853
10	R1/8	4	18	28	24.5	18	WP2131050
	R1/4	6	18	29.5	24	18	WP2131051
	R3/8	6	18	30	24	18	WP2131052
	R1/2	6	21.5	23.5	16	18	WP2131053
12	R1/4	6	20	32	26.5	18.5	WP2131251
	R3/8	8	20	30.5	24.5	18.5	WP2131252
	R1/2	8	21.5	32.5	25	18.5	WP2131253

4. Pneumatic pipe:

Tube

Tube OD in mm		Ø4	Ø6	Ø8	Ø10	Ø12
Ordering no. for	Nylon	WH01W04	WH01W06	WH01W08	WH01W10	WH01W12
	PU	WH00B04	WH00B06	WH00B08	WH00B10	WH00B12

Colour : Nylon - White PU - Blue

Usage instructions

(For maximum efficiency)

- Cut the tube - end burr free and square, using **Tube cutter** (**WC1**) and clean the edge to ensure leak tight joints. (Do not use blunt tools / hacksaw / chisel etc,.)
- Ensure the tube is fully inserted into the fitting - until the positive stop, beyond the **'U' seal**.
- Tightening torque for threaded components

Thread size	Tightening torque Nm
M5	1 - 1.5
1/8	7 - 9
1/4	12 - 14
3/8	22 - 24
1/2	28 - 30

- Minimum bend radius of the tubing to avoid leakage

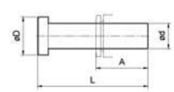
Min. bend radius for (in mm)	OD of tube	Ø4	Ø6	Ø8	Ø10	Ø12
	Nylon	15	30	50	65	90
	PU	10	15	25	30	35

Tube Cutter

Ordering No	WC1

Can cut tubes upto Ø12mm OD

Plug



Applicable Fitting size Ød	ØD	L	A	Ordering No
4	10	42	14.5	WP2600400
6	12	44	15.5	WP2600600
8	14	46	17	WP2600800
10	16	48	20	WP2601000
12	18	52	20.5	WP2601200

5. Pneumatic silencers:

- Brass body and sintered bronze silencer elements
- Button, Conical, Silencer cum flow control (with lock nut), Silencer cum flow control (with spring) types
- Good flow and silencing characteristics
- Can be cleaned by kerosene and soap water

Silencer cum flow control (with lock nut)

Thread	Ordering No
G1/8	ASL0160
G1/4	ASL0161
G3/8	ASL0162
G1/2	ASL0163

IV. WORKING PRINCIPLE OF PNEUMATIC SURFACE GRINDING MACHINE

The compressed air goes to the flow control valve. The flow control valve is used to control the flow of air. It is adjustable one. We have to adjust the lever, so that the required pressurized air goes to the Solenoid Valve. In our project, the solenoid valve is used as a direction control valve. This solenoid valve is lever. The compressed air goes to the pneumatic double acting cylinder. The tool is fixed at one end of the pneumatic cylinder. The compressed air pushes the pneumatic cylinder, so that the piston moves forward direction by giving air supply in one direction of pneumatic cylinder. The solenoid valve is changing the air flow in the opposite direction by the operating the lever. In this time the pneumatic cylinder piston moves backward due to changing of the air flow direction. This air flow direction is controlled by the solenoid valve.

V. DESIGN AND CALCULATIONS:

Pressure available from the compressor = 1000000Pa (10 bar)

Diameter of the piston = 25 mm

Cross sectional Area of the cylinder = π*25*25/4 = 490.873mm2

Force = Area * Pressure

PISTON AND PISTON ROD: The piston is machined to the specified to the specified dimension in a lathe and piston rod is mated (tight fit) in the bore of the piston and then turned in a lathe. Surface grinding is done on piston and piston rod.

The nature of fit between cylinder and piston is clearance fit – running fit.

Tolerance = 25 ± 0.02

Total stroke length = 50mm

Working stroke length = 22 mm

The diameter of the piston = 25 mm

The piston force F = P * A = 10e6*490.873*10e-6= 490.873N

VI. CONSTRUCTION

1. The frame for all components of Pneumatic Grinding Machine is made.
2. FRL Unit is mounted at the left side at upper corner. At right upper corner, there is a junction of connecting lines.
3. At the right side there is a check valve attached to connecting lines, the check valve is non return type check valve.
4. From the junction two connecting lines comes, one of them goes to check valve and another one goes to 3/2 DC Valve
5. One connecting line from the valve is connected to one end of the piston as to move the double acting cylinder.
6. Another connecting line from 3/2 DC Valve is attached to another side of double acting cylinder.
7. A tool bit is attached to piston rod. We have various types of grinding tools, attaché the required tool to tool bit.

ADVANTAGES

1. It is environment friendly.
2. Running cost of project is very less
3. Unskilled worker can be work
4. Manufacturing cost is less.
5. Less maintenance.

LIMITATIONS

1. Possibility of leakages.
2. It operates on limited pressure so high torque generation is not possible.

APPLICATIONS

1. Used in foundries.
2. Used in machine shops.

VII. RESULTS AND DISCUSSIONS

The grinding tool can be handled by an operator without feeling uneasiness. No separate skill is required to operate this grinding tool. The operation is quick and hence it is a time saving one. The operation is easy and consumes less cost. Due to the above reasons it finds its extensive application in manufacturing industries. It has an extensive application in both large scale and small scale industries because of its economy and easy handling. The time consumption for finishing operation is reduced greatly. Skilled labor is not required. Easy operation it can be transported easily from one place to another since dismantling and assembling is simple. It reduces more labor for ramming operation. Maintenance is easy.

VIII. CONCLUSION

Uniform finishing of wood is obtained by this rammer. The time consumption for finishing is reduced considerably. It eliminates more labor for finishing operation and hence the labor cost is reduced. Skilled labor is not required to operate this machine. Transportation of this machine is easy. Maintenance is also easy, the reduction of production time and elimination of more labor for ramming operation reduce production cost, and thereby the economy is greatly achieved.

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