Gears Educational Systems, LLC

GEARS-EDS . . . technology education in a box

Gears LLC 105 Webster St. Hanover Massachusetts 02339 Tel. 781 878 1512 Fax 781 878 6708 www.gearseds.com

Illustrated Catalog of Components

DESIGN - BUILD -TEST - PLAY

The GEARS-IDS™ Invention and Design System gives young designers and engineers the tools they need to turn ideas into working machines, easily and quickly.

Using **basic tools** and **real components**, young designers and engineers can create sophisticated machines capable of playing challenging games or performing complex tasks.

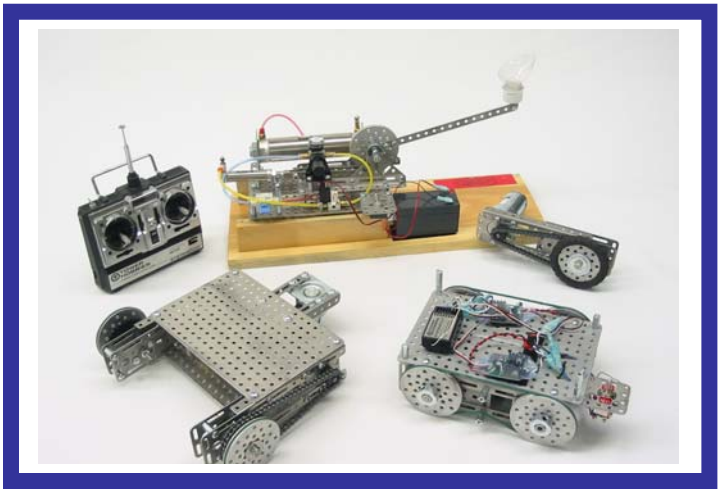
The GEARS-IDS™ Invention and Design System components illustrated and described in this catalog can be used to create basic subassemblies and modules that help designers learn the basics of mechanical design. These parts and components are made from industrial quality materials with standard bores, shaft diameters and hole sizes. The GEARS-IDS™ Invention and Design System offers a basic set of electrical, mechanical and pneumatic components that can be easily and inexpensively expanded from surplus, or salvage sources or direct purchases through hundreds of vendors worldwide.

Engineering Tools not Toys

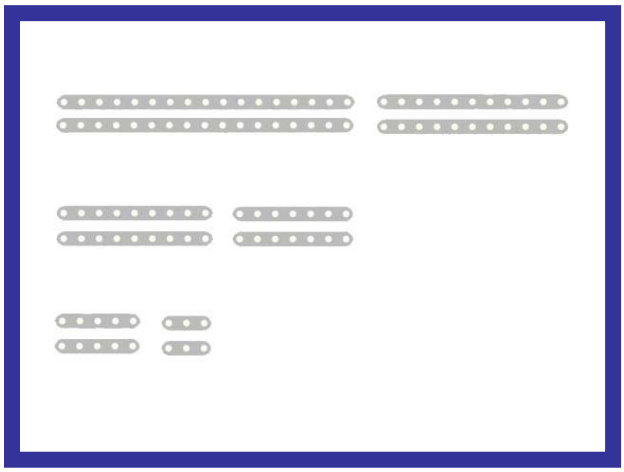
The GEARS - IDS™ Invention and Design System materials and components are the same materials and components used by practicing engineers.

These structural metal parts are machined from stainless steel and aluminum alloys. The motors and power transmission components are industry standard equipment, not toy parts. The pneumatic assemblies are the same assemblies that power automated manufacturing systems worldwide.

The GEARS - IDS™ Invention and Design System gives tomorrows technologists and engineers the best engineering components available today.



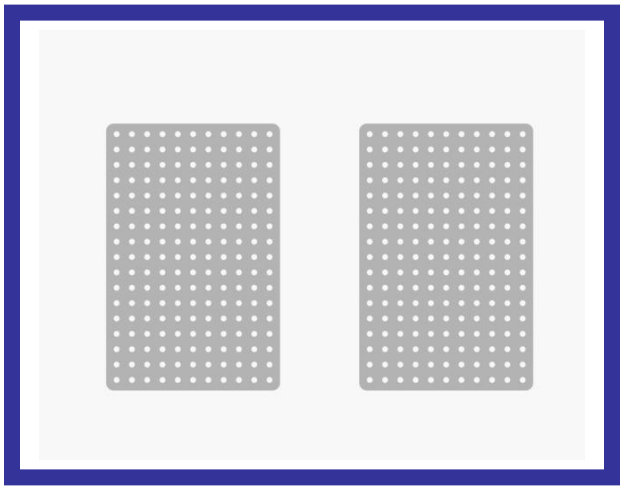
Structural Components



Flat Bar Set 12pcs.

12 Pieces of #304 stainless steel, 0.060” thick.. These assorted flat bars in 3-5-7-9-11-17 hole lengths are useful for struts, spars, booms and other rigid assemblies. They are also useful for adapting “Found” materials to your mechanical designs.

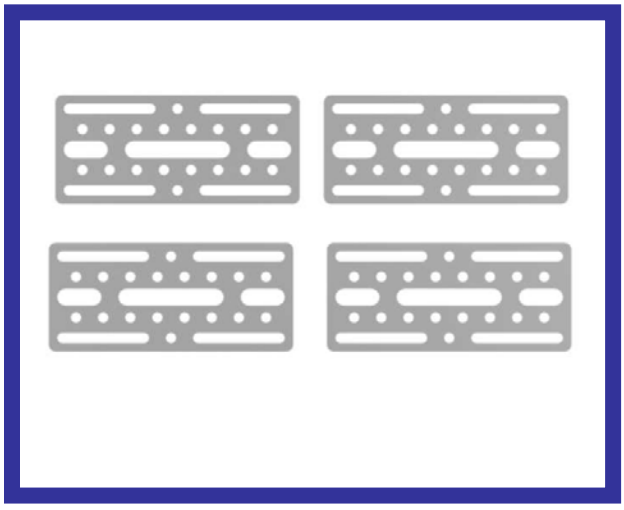
Material: 0.060”/ 1.5mm Stainless Steel



Flat Plate Set, 2pcs.

The **GEARS - IDS™** components are easy to organize and mount on these 0.090” thick panels. Coupled with the 7 and 13 hole rigid angles, these aluminum breadboards are tough enough for the high powered after-market components that young engineers like to add to their designs.

Material: 0.090”/ 2.3 mm Aluminum



Shaft Plate Set 4pcs.

These Shaft Plates have slots that can be used in conjunction with the Bushing Brackets to create a wide variety of geared transmissions.

These plates can also be used as structural and adjustable mounting plates.

Material: 0.090”/ 2.3mm Aluminum

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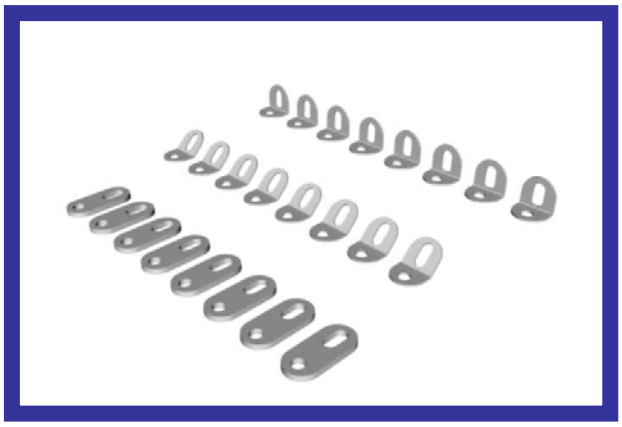
Structural Components

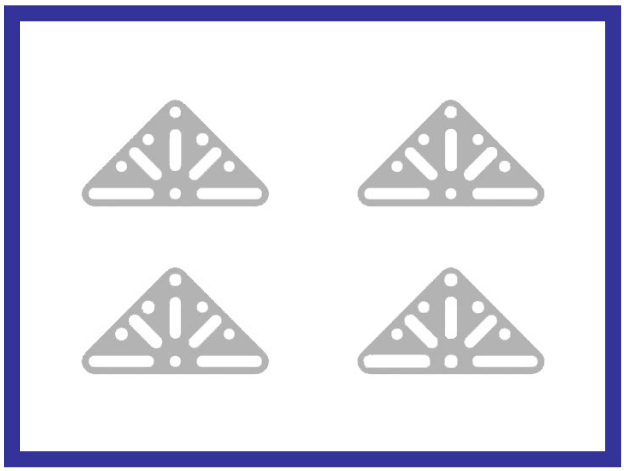


Fish Plate Set 24pcs.

These heavy duty brackets are useful for attaching flat stock and for integrating subassemblies and other components into your mechanical designs.

The fishplates are configured for mounting components at angles of 180, 90 and 45 degrees.

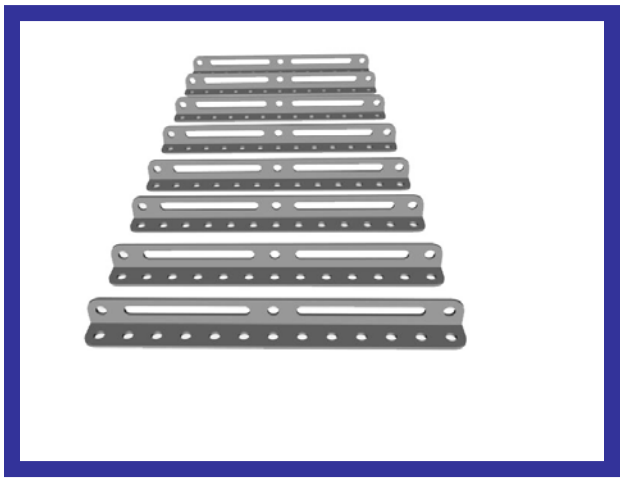
Material: 0.090”/ 2.3mm Aluminum



Sine Triangle Set 4pcs.

These versatile structural elements can be coupled with construction components found in the kit, in the home or in a hardware store. The Sine Triangles will help you engineer the angled mechanical configuration you need to solve your design objective.

Material: 0.090”/ 2.3mm Aluminum



13 Hole Angle Set 8pcs.

Coupled with the **GEARS - IDS™** bearing plates, these slotted angle components provide the flexibility and range of adjustment necessary to accurately position the center to center distances of sprockets and gears. They are particularly useful as framing members for rigid robot chassis.

Material: 0.090”/ 2.3mm Aluminum

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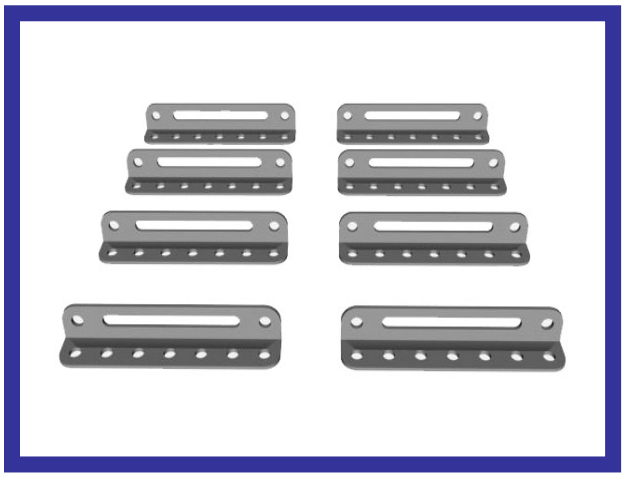
Structural Components

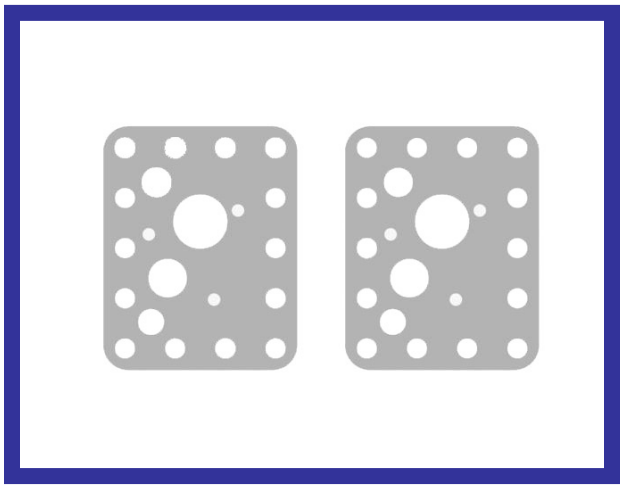


7 Hole Angle Set 8pcs.

These function just like the larger 13 hole angles, but they are useful where space is tight or extra reinforcement is required.

The 7 hole angles are particularly useful for mounting servo brackets and motors.

Material: 0.090”/ 2.3mm Aluminum

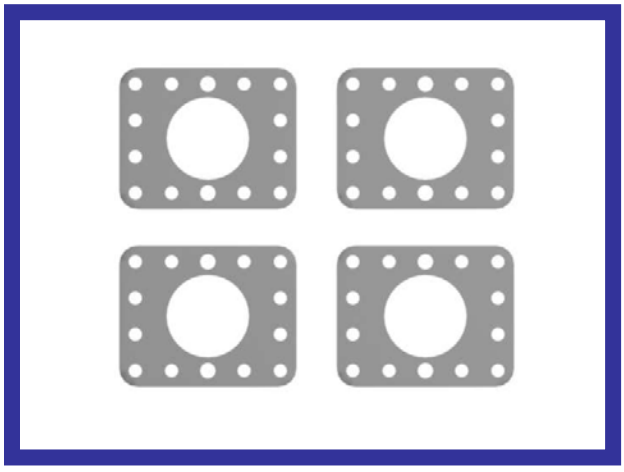


M13 Motor Mount Set 2pc.

The three small holes in the center form an industry standard bolt hole pattern for small gear head motors produced by several manufacturers.

These versatile mounting brackets can also support ¼”, 3/8” and ½” shafts.

Material: 0.090”/ 2.3mm Aluminum



M15 Motor Mount 4pcs.

Two perimeter holes in addition to the large center hole, form an industry standard bolt pattern for larger gear head motors produced by several manufacturers. These mounting brackets are also used to mount the pneumatic reservoir.

Material: 0.090”/ 2.3mm Aluminum

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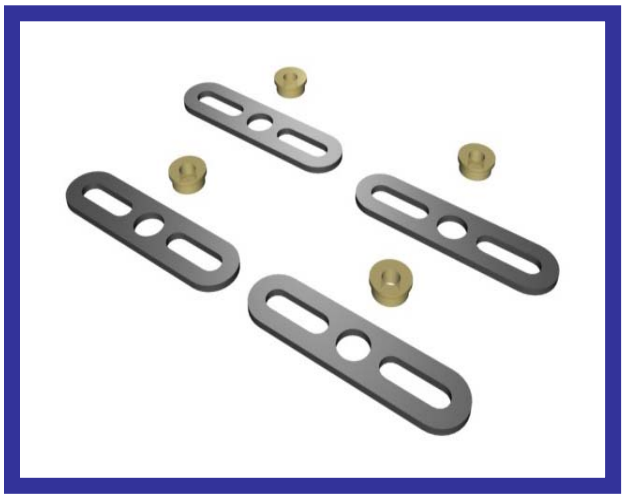
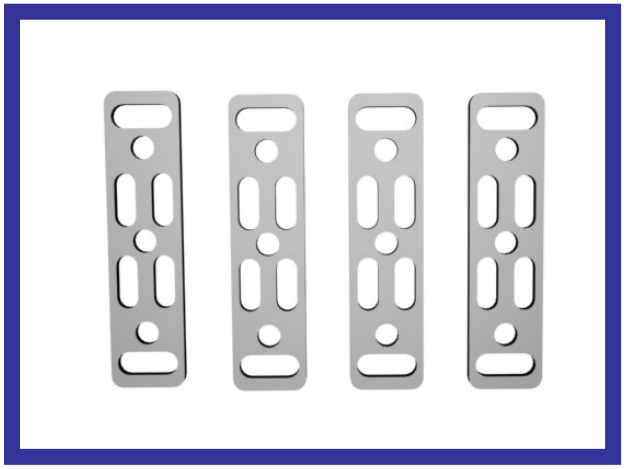
Structural Components



Bushing Bracket Set 4pcs.

These 0.060” Stainless Steel slotted brackets are designed with press fit, 3/16” ID, bronze bushings. Bronze bushings provide accurate and robust constraints for transmission shafts, axles and powered drive train shafts.

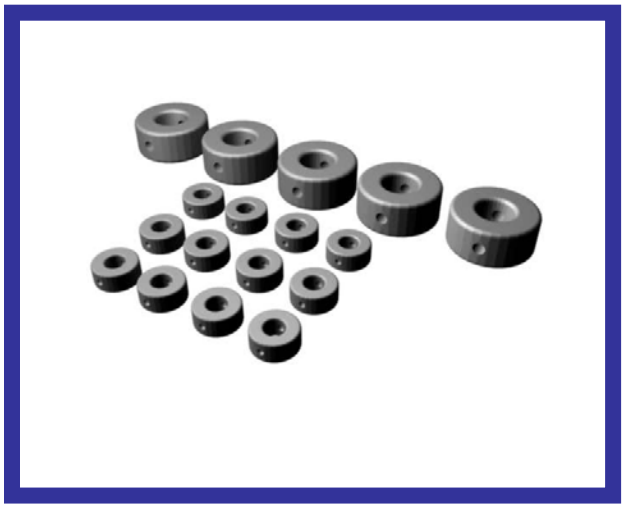
Material: 0.060”/ 1.5mm Stainless Steel and bronze



Servo Brackets 4 pcs.

Custom brackets that make it possible to mount any size hobby servo to your mechanical inventions. The two directional slots make these brackets useful for a variety of design applications.

Material: 0.090”/ 2.3mm Aluminum



Shaft Collar Set 17 pcs.

5 pieces ½” ID collars with set screw. The ½” shaft collars are used to lock wheels, sprockets and other assemblies to the Hex Adapters pictured below.

12 pieces 3/16” ID collars with set screw. The 3/16” shaft collars are used to constrain axles and other rotating parts.

Material: Zinc chromate coated steel

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Structural Components

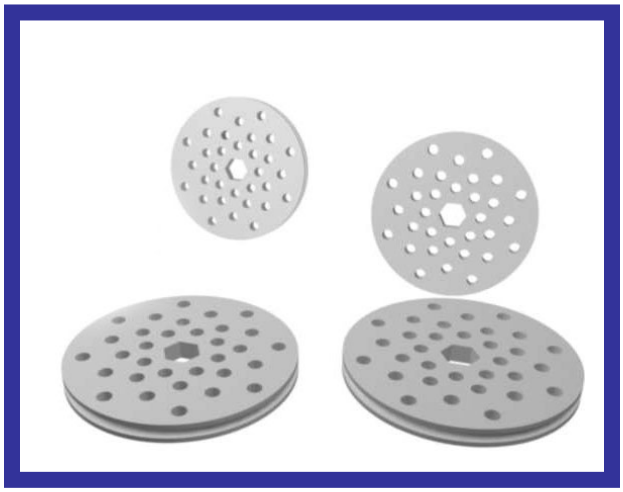
Hex Adapter Set 6pcs.

4 pieces with 3/16” bore are used to fit sprockets and wheels to the 3/16” axles and shafts

2 pieces with ¼” bore fit the IM15 motor shafts.

These 304 Stainless Steel adapters are part of the wheel assembly system shown in the illustration below.

Material: 304 Stainless Steel



3” Wheel Set 4pcs.

The 3” diameter wheels are machined from ¼”, 6061 T-6 Aluminum. They can be fitted with high traction rubber tires or polycord treads (included). They can even be assembled as paired pulleys with polycord tank style tracks. The complete wheel assembly is illustrated below.

Material: 0.250”/ 6.35mm Aluminum

Nylon Gear Sets

Nylon gear sets include:

2pcs 36 tooth x 24 pitch x ¼” face
2pcs 60 tooth x 24 pitch x ¼” face

Durable nylon gears have #10-32 set screws to stabilize the gears on the hex adapters.

Material: White nylon.

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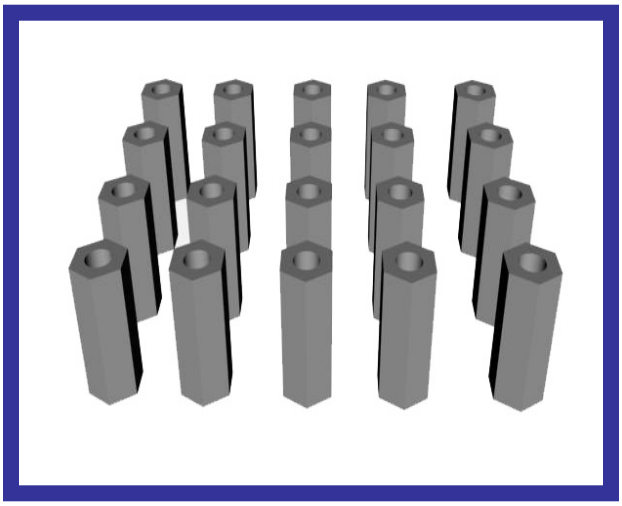
Structural Components



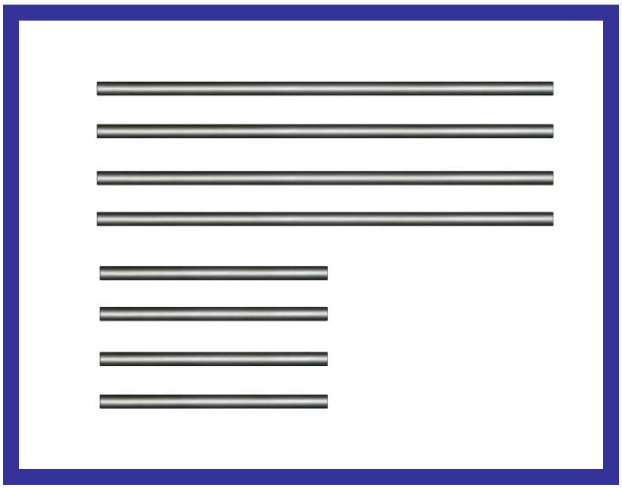
Standoff Set 25pcs.

These threaded standoffs are used to separate components such as bearing plates and flat plates, or for adding rigidity and height to machine designs.

Hardware Set.

More than 450 nuts, bolts and washers are included in the kit. The majority of components are assembled with #10-24 machine screws, nuts, lock washers and flat washers.

Note: The motors are attached with #10-32 machine screws.



3/16” Axle Set 8pcs.

2 Pieces 8” x 3/16”
2 pieces 4” x 3/16”.
4 pieces 1.25" x 3/16”
4 pieces 2.5" x 3/16”

Note: These precision stainless steel axles can be easily cut to any required size using a Hack Saw and a Vice.

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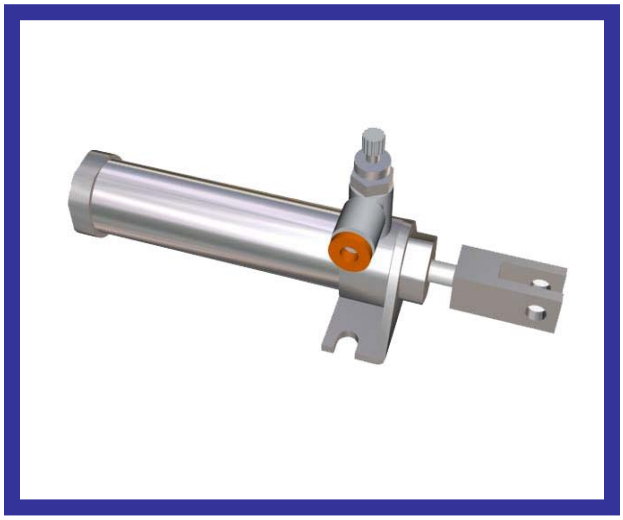
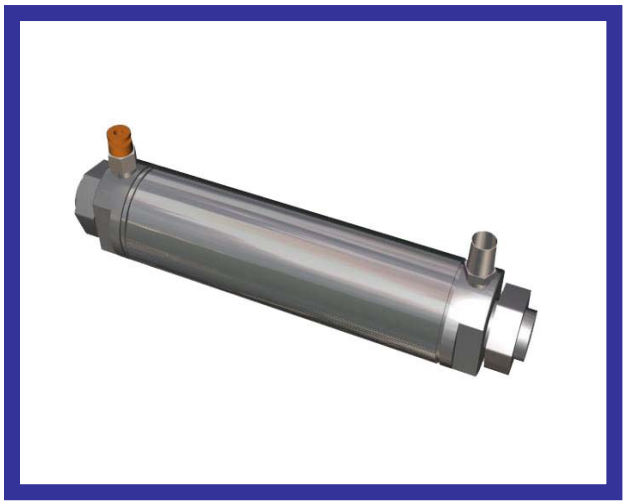
Pneumatic Components



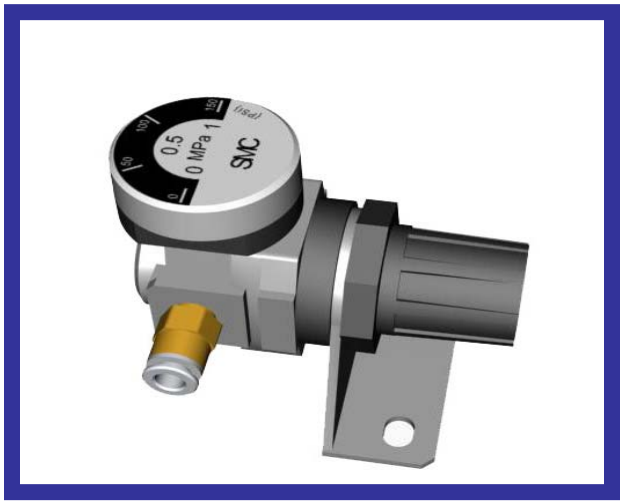
Pneumatic Cylinder 1pc.
Rated pressure:100psi

This 1” stroke cylinder can produce usable forces in excess of 15 lbsf at 60psi. The cylinder includes 1 flow valve, clevis and custom mounting bracket. (pictured)



Storage Tank 1pc.
Rated pressure: 145 psi

This 6” reservoir can store enough air to fire the pneumatic cylinder dozens of times Tank assembly includes a 4mm one touch valve and a Schrader one way fill valve.



Pneumatic Regulator 1pc.

This regulator is adjustable from 0-145 psi. and offers a built in overpressure relief system for enhanced safety and protection.

The regulator includes 2, 4mm one touch fittings, a pressure gauge and a mounting bracket.

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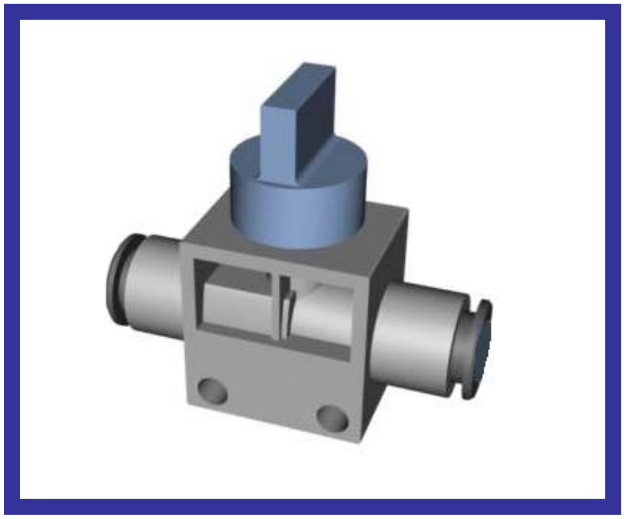
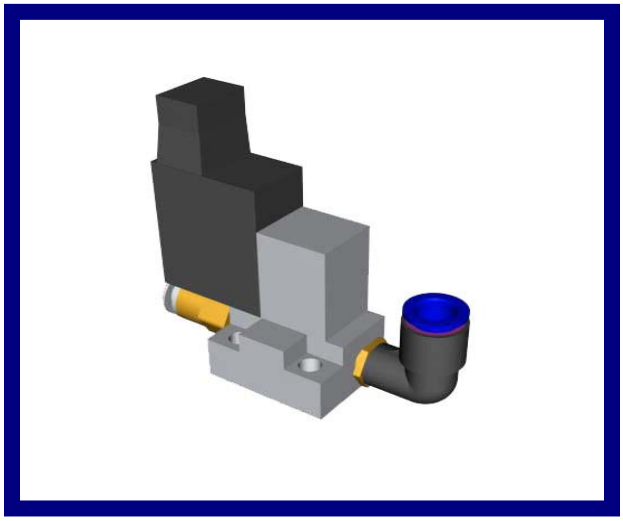
Pneumatic Components



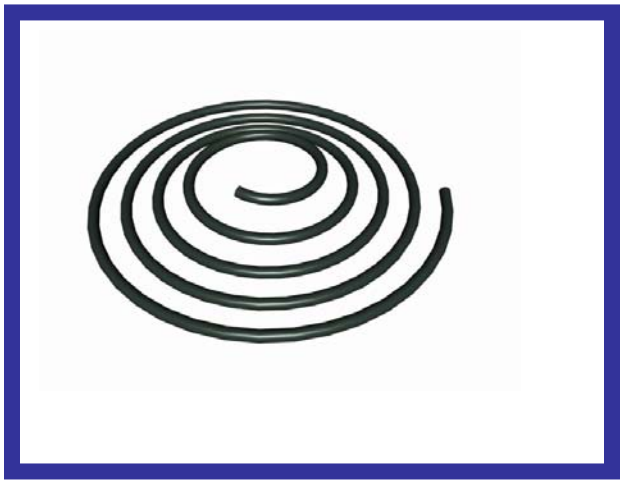
On/Off Purge Valve 1pc.

In addition to hand operated on/off control, this valve offers an automatic safety feature that purges downstream pressure each time the valve is closed.



Solenoid Valve 1pc.

This 3 way valve allows for electronic actuation of pneumatic circuits and components. The valve operates on 12 volts and can be triggered remotely using either RC Radio or microprocessors control in conjunction with the **GEARS - IDS™** valve controller.



4 MM tubing

Plastic, pressure rated tubing designed for use with SMC pneumatic components.

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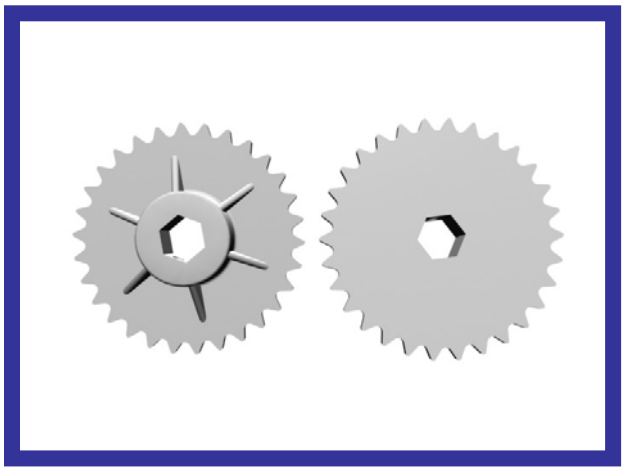
Mechanical Components

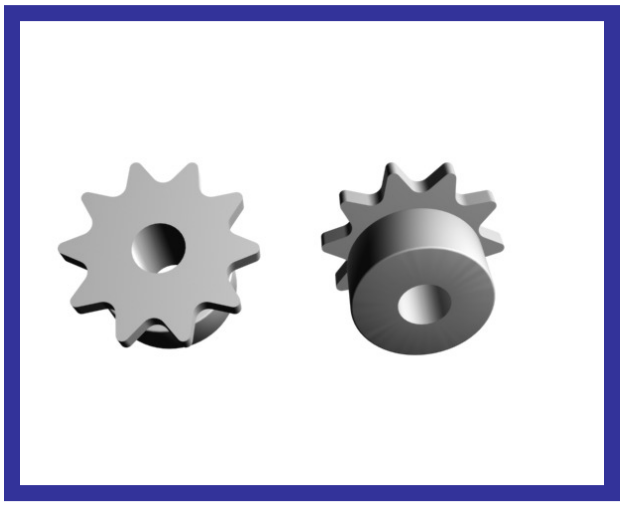


30 Tooth Sprockets 2pcs.
25 pitch

Tough , molded sprockets of nylon/fiberglass reinforced plastic, with hexagonal bore to accommodate rapid attachment and removal from the **GEARS - IDS™** hex adapter shaft.

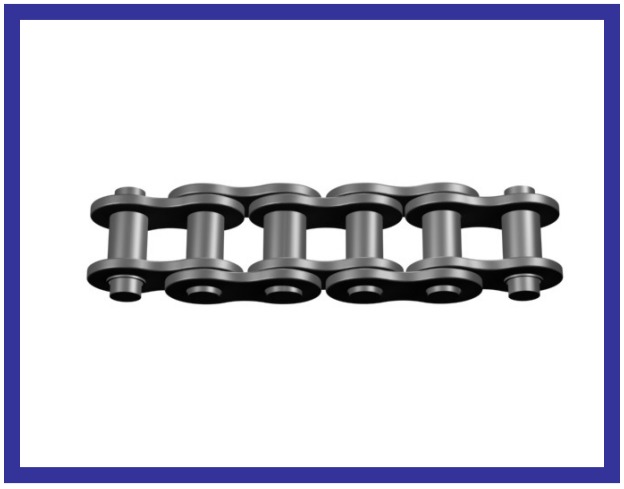
#10-32 set screw included. Compatible with standard #25 pitch steel and plastic chain.

Material: Nylatron



10 Tooth Sprockets 2pcs.
25 pitch
Tough steel sprockets attach to the gear head motor shafts with #10-32 set screws.

Material: Carbon steel



#25 Pitch Chain 4ft.

Nylatron plastic chain. 65 lbs test strength. Separated and snapped together using a jewelers flathead screwdriver and a pair of needle nose pliers.

Material: Nylatron

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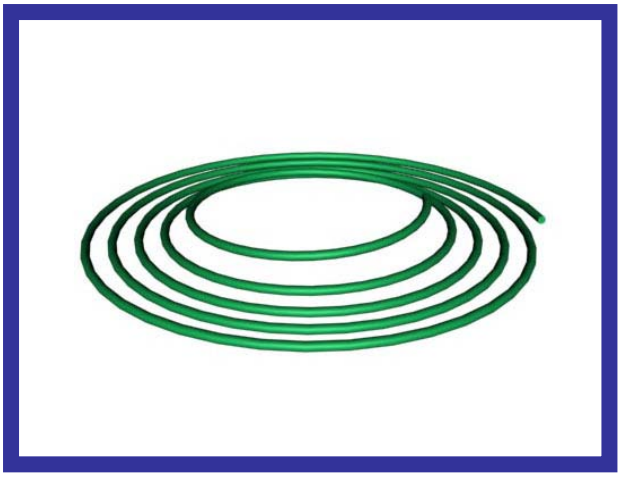
Mechanical Components

3” Rubber Tires 4pcs.

3” Traction Compound rubber tires designed to slip snugly over the **GEARS - IDS™** 3” aluminum wheels pictured above. These tires provide maximum traction and design flexibility

2” Swivel Caster 1pcs.

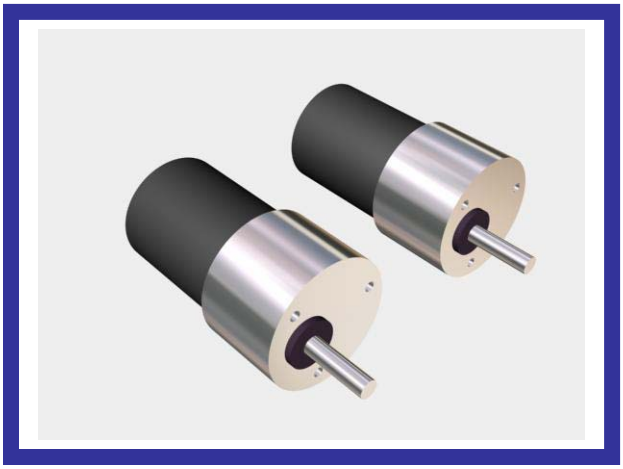
2” diameter wheels mounted to ball bearing swivel plates. These rugged casters can support 75 lbs. each and provide two wheeled robots with the stability and maneuverability needed to play the most demanding games. Casters mate to the slotted angle pieces in the kit.



1/16” Polycord

Make O-ring tires, pulley belting and tracks for your robot or other mechanical creations. Simply cut the material to the required size, melt both ends simultaneously and while they are melted, press both ends together and hold until solid (about a minute). Trim the excess with a razor knife and you have a joint that is nearly as strong as the parent material.

Electric Components



2” Gear Head Motors 2pcs.

Highly efficient motors that provide maximum power while consuming minimum current.

Transmission Ratio 19.7:1 *Gearbox Efficiency 73%*!

- **KT** Torque constant 3.29 ounce inches/ampere or 0.0232 Newton meter/ampere.
- **Continuos Torque (max rating)** *(OutputShaft)* 175 ounce inches.
- **Stall Torque @ 12 volts** *(OutputShaft)* 420 ounce inches
- **KE** Back EMF Constant 2.43 Volts/Thousand RPM or *0.0232 Volts/Radian/second.
- **RT** Armature resistance 1.26 Ohms.
- **INL** No-load current 0.564 amperes (at rated voltage of 15.1 Volts)*(With Transmission)*.

12 Volt Battery Charger

Fully automatic three-stage lead-acid battery charger charges at 0.75 amp rate. Can be used to charge SLA batteries with capacities of 1 through 10 amp hours. Alligator clips and leads for fast, easy and flexible connection to GEARS-IDS SLA Batteries, or any other wet cell or gel cell, SLA batteries you might have available.

12V, 1.2 Amp Hour SLA Battery

Every **GEARS - IDS™** Invention and Design System kit includes an easily maintained SLA battery and wall mount charger.

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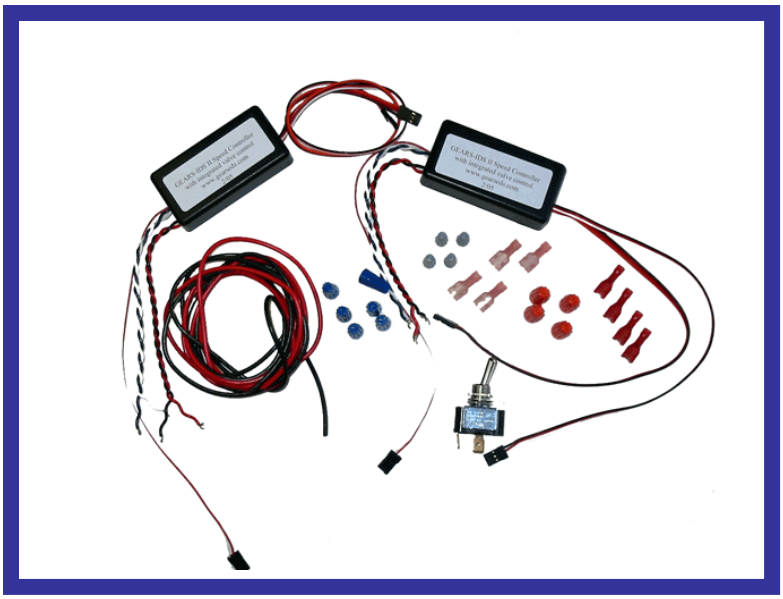
Electric Components



2 Channel Electronic Speed Controllers (2)

Includes power switch connectors and wire.

Channel One-The Power Channel controls up to 12 amps of current at 12 volts for a total of 144 Watts of power.

Channel Two-Relay Control provides on-off, forward and reverse current control of up to 300 milliamperes of 12 volt current. The switching is controlled using a standard RC/PWM signal of approximately 1100ms fwd and 1900ms reverse. This channel is useful for controlling many devices including relays, pneumatic solenoids, lights, and other electronic switching demands.

Miscellaneous

20” Storage Box

Large heavy-duty storage case with dual latches, comfort grip plastic handle and inside tote tray.

This rugged tote box is particularly useful for difficult storage problems in crowded classrooms and makes fast work of set up and tear down between classes.