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## Introduction

Lego is probably the most famous toy manufacturer in the world. Throughout the ages, kids from all over the world adored Lego. Lego is very popular in Europe and North America. In other parts of the world, their penetration is low because of comparative high price and non availability.

Lego (also known as The Lego Group or TLG) is a company based in Denmark founded in early 60's. Lego builds mecnanos. It helps kids to make cars, trucks, planes, houses etc. using small parts (known as bricks and studs in Lego terms).

Lego bricks are designed with high quality chemical polymers. Therefore they retain their quality even after 20 years!

Lego sets have various themes like Trains, Bionicle, Duplo, Technic, Creator etc. Among all these, Technic sets are the most sophisticated. In this article I shall discuss Technic sets only (with some houses in Creator sets).

What makes Lego unique from most other toy manufacturers; is its excellence in providing features in its sets. Don't you feel amazed at 5-speed transmission in toy cars? How about a 4-wheel drive transmission?

Does Lego still build wonderful sets? Unfortunately, the answer is no! Though the company still makes toys, its quality has surprisingly fallen compared to past. Like many Lego fans, I don't know the reason. May be they are trying to capture a different market or so. That means Lego has probably already made its best toys. Lately Lego did come out again with some good sets though.

Lego has several Technic sets. Not all of them are good. However, some are so good that they are more suitable to crazy adults than kids!

At the later part of this article, I have described all good Lego Technic sets in details.

Lego has sets of train models as well. However, I personally never liked Lego train models as Hornby (or similar manufacturer) trains are seemed far more realistic to me. In case you are likely to run Lego trains, please note that Lego official trains are 6-stud wide and track width is 6-stud (with 4-stud gap between rails). Of course, if you fit Technic axles to train wheels you can build wider trains.

Since Lego is a privately owned company, very little information is available about finance and internals of the company. For example, it is not revealed how much revenue/profit the company makes on each theme or how many of quantities of particular sets are sold worldwide etc.

## **Manufacturing of bricks**

Lego components are manufactured to very high precision (with tolerance of 10 micro-meter). These are made of acrylonitrile butadiene styrene (ABS). This material provides bricks a shiny surface yet with excellent resiliency. However, this is susceptible to discoloration by sunlight. This ABS is a polymer which is comes from petroleum. You can get more information here <http://en.wikipedia.org/wiki/Lego>. Due to uniqueness of Lego brick's design, old parts still interlock seamlessly with newer parts. The original design of Lego bricks was patented but this has now expired.

## Features of Lego Technic sets

*Please be aware that not all features are available in all sets! Most single sets have only two or three features available from the following list.*

- Turn wheels using steering
- Differentials on transmission shaft
- Independent suspension on car/truck/bike wheels
- Air tank driven pneumatic cylinder movement (mostly in cranes & trucks)
- Multi-speed gearbox
- 4-wheels drive transmission
- Adjustable seats
- Opening doors, engine hood etc.
- Tilting truck container
- Engine mimicking cylinder movements (*not real petrol engine!*)
- *Battery driven* electric motors to move vehicle or cranes.
- Programmable movements (mostly on Mindstorm/RCX models)
- Rudder and aileron movement in planes
- Turntable movement in cranes
- Telescopic booms in cranes
- Rotor movements in helicopters
- Remote control motor operation via infra red

Lego parts are made of plastic materials. Their precision and manufacturing quality are quite high - they always fit together with one another. Usual play life of Lego sets is around 15-20 years or more (without misusing them). However, motors/sensors/electronics tend to seize operation sooner, often just at 6-7 years.

## What you can learn from Lego?

The advantages of playing with Lego are at least following traits:

Patience – some sets take several hours to build even when following instruction

Creativity – the possibilities are just endless

Spatial ability – expert builders can just glance and figure out which parts fit best for a task

Knowledge – you will discover a great deal of engineering (mechanical/electrical/electronic/civil/architecture based on sets of what theme you play with)

## **Lego resource on web**

I am sure you are going to ask how you can get old Lego Technic sets now. Well, there are several shops who sell those old items but their prices are usually quite high. Following websites may help you.

[www.lego.com](http://www.lego.com) (official Lego site only current modes available for sale)

[www.bricklink.com](http://www.bricklink.com) (unofficial Lego market place for new/used sets)

[www.lugnet.com](http://www.lugnet.com) (Lego fan site - see picture of any Lego set and read review)

[www.brickset.com](http://www.brickset.com) (Lego fan site - see picture of any Lego set and read review)

[www.brickshelf.com](http://www.brickshelf.com) (scanned pages of Lego instruction books)

[www.ebay.co.uk](http://www.ebay.co.uk), [www.ebay.com](http://www.ebay.com) etc. (for used Lego sets)

[www.mocpages.com](http://www.mocpages.com) (for users' creation and modification)

It is even possible to create virtual Lego models on computer. There are CAD like programs available for this. Fortunately, they are free. One such original program is LDRAW ([www.ldraw.org](http://www.ldraw.org)). However, it is a DOS based program. But you can have several of its Window's GUI versions. One such popular GUI is MLCAD ([www.lm-software.com/mlcad/](http://www.lm-software.com/mlcad/)). LDRAW is an open architecture program. That means you can even incorporate custom parts with it.

## **Buying and selling**

When buying used Lego, be careful about its completeness! Often seller claims items as 100% complete and which after purchase turns out to be not so. If some minor parts are missing, you can probably replenish them from your other Lego sets, however, if any critical part is missing, it might render your entire model incomplete! Also, battery operated motors (and associated electrical components) tend to become faulty with older used models. I recommend that you buy Lego as

new from shops if possible. If you buy when they are no longer available in shops, you will end up paying more with no guarantee if all parts are there, if used. Once released new, most Lego sets are sold for at least a year or two before they are retired. Some people buy Lego just for making a profit by reselling it later! Although in recent years some older sets fell in value in secondary market.

## Lego Technic

Description of best (*in my opinion although it does match with general consensus*) Lego Technic sets (includes set number, year of release, brief description, indicative market price where possible - please note that price may vary widely between seller to seller and old Lego sets tend to appreciate value). For old sets, parts count will give you rough idea how much it may cost. Some older sets are ridiculously expensive and I wonder why someone would buy them at those prices!

In the tables below, only the description of primary (or A) model has been shown. Usually all big Technic model sets can construct another model known as B model. In older days, Lego used to manufacture Universal sets – which could construct simple but multiple models out of same box.

*Table items are not in any particular order however, the color coding shows complexity and similarity of the models. All models in same shade of color denote similar features and functions. The darker the (same) color, more complex the model is within same colored group. If you own any darker colored models, you will probably find lighter colored (in same group) models as simpler versions. If a set number is not having any color, then it means it can't be easily grouped with any similar sets. For example, 8455, 8069 and 8862 are all Backhoe loaders. But if you own 8455 already, then you probably won't get any more functionality in 8069 or 8862. If you can't get 8455 then probably second best is 8069 and so on. Take another example, among the super cars, the 8466 and 8880 are the most complex sets closely followed by 8448.*

The price marked is the retail price at Lego stores when the sets were originally released. The price of same set in used market can be drastically different.

Price stated in UK Pound £ or US Dollar \$.

## Cars

Set #	Model	Year	Engine	Gearbox	Suspension	Differential	Seat	Steering	Other	Style	Motor	Parts count	Price
8466	4x4 Off Roader	2001	V8 front mounted	5+1 speed synchronous	All wheels	front, central, rear - 4WD	2 static	front	opening gull wing doors and running board	Studless	0	1102	£80
8880	Super Car	1994	V8 rear mounted	4 speed synchronous	All wheels	front, central, rear - 4WD	2 static	front and rear	pop up head lamps, opening bonnet	Studded	0	1343	\$130

8448	Street car sensation	1999	V8 front mounted	5+1 speed synchronous	All wheels	rear - RWD	2 static	front	opening doors and bonnet	Studless	0	1408	\$130
8865	Test car	1988	rear V4 square cylinder	3 speed	All wheels	rear - RWD	2 adjustable	front	pop up head lamps	Studded	0	892	
8860	Auto chassis	1980	V4 square cylinder	2-speed	Rear wheels	Rear – RWD	2 adjustable	front		Studded	0	662	£25
853	Car chassis	1977	I4 front	2 speed	No	RWD	2 adjustable	front		Studded	0	610	£25
8437	Future Car	1997	V4 rear mounted	No	Rear wheels	Rear – RWD	2 static	front	opening doors and bonnet	Studless	0	413	\$54
8428 8432	Concept Car	1998	V4 front	No							0	472	\$44
8461	Williams Racer	2002	V10 rear	No	All wheels	Rear – RWD	1 static	front	65 cm length	Studless	0	1483	£100
8458	Silver Champion	2000	V10 rear	No	All wheels	Rear – RWD	1 static	front			0	1413	£100
8386	Ferrari	2004	V10 rear	No	No	Rear – RWD	1 static	front	rear body cover removable	Studless	0	719	£50
9398	4x4 Crawler	2012	None	No	All wheels	Front , Rear AWD	2-seat	All wheels	Fully motorized movement via remote control. Each axle is powered by individual motor.	Studdless	2 L 1 Servo Remote	1327	£140
8070	Super Car	2011	V8 front	No	All wheels	Rear – RWD	2 static	Front Dummy cab steering	Motorized opening of doors, hood and spoiler Motor does not provide forward/reverse motion	Studless	1 M	1281	£100
8297	Off Roader	2008	V8 front	No	All wheels	Rear - RWD	2-seat	Front	Motorized winch Raise/lower suspension Working lights Opening doors, hatch	Studless	1 M	1097	£100
8081	Extreme Cruiser	2011	V4 front	No	All wheels	Rear – RWD	2-seat	Front	Opening doors Opening bonnet	Studless	0	590	£50

**Loader, Backhoe, Excavator, Bulldozer, Tractor etc.**

Set #	Model	Year	Backhoe or excavator operation	Loader/Grader operation	Locomotion	Engine/Differ ential	Steering	Other	Style	Motor	Parts count	Price
8455	Backhoe	2003	Boom, jib, bucket, slew - Pneumatic	Dual Pneumatic	4 wheels	I3 engine, rear diff	Front	Rear Pneumatic Outrigger	Studless	0	703	£70
8069	Backhoe	2011	Boom - Linear actuator Bucket - Linear actuator Slew -Worm gear	Lift - Dual Linear actuator Bucket – linear actuator	4 wheels	None	Front	Opening bonnet, Rear Manual outrigger	Studless	0	609	£50
8862	Backhoe Grader	1989	Boom, jib, bucket, slew - Gear driven	Gear driven	4 wheels	None	Front	Rear, gear driven outrigger	Studded	0	664	
8265	Front end loader		N/A	Movement via linear actuators	4 wheels	V6 engine, front and rear diff	Articulat e chassis	Opening bonnet	Studless	0	1061	£75
8459 8464	Front end Loader		N/A	Pneumatic	4 wheels	V6 engine, 4WD	Articulat ed chassis	Air storage tank	Studded	0	582	\$82
8043	Excavator	2010	Fully motorized	Fully motorized (in alternate model)	Motorized tracks	None	N/A	Motor operation via remote control	Studless	4 M Remote	1123	£150
42006	Excavator	2013	Boom, jib, grab claws – linear actuators Slew – manual turntable	N/A	Tracks	None	N/A	360 rotating cab	Studless	0	720	£50
8294	Excavator	2008	Boom, jib, bucket – linear actuators Slew – manual turntable	N/A	Tracks	None	N/A	360 rotating cab	Studless	0	720	£40
8275	Bulldozer	2007	<b>Front implement</b>	<b>Rear implement</b>	Motorized tracks	V6 engine driven via track		Motor operation via remote control	Mixed	2 XL 2 M	1384	£100
			Blade, raises via motorized gear system, infrared controller	Ripper, raises via motorized worm gear system, infrared controller								
8284	Tractor	2006	<b>Power Take Off</b>	<b>Implements</b>	4 wheels	I4 engine, RWD with rear diff	Front		Studless	0	872	£40

			Can be disengaged via transmission	Lifting thresher via worm gear Rotating blades								
8063	Tractor trailer	2009	Can be disengaged via transmission	Lifting 2-point hitch	4 wheels	I4 engine, RWD with rear diff	Front	Tilting trailer bed via linear actuator Semi independent front suspension	Studless	0	1100	£65
8274	Combine Harvester	2007	<b>Head</b>	<b>Chute</b>	4 wheels		Rear	Head can be pulled as a trailer	Studless	0	1025	
			Corn head raises via crank and linkage, rotation driven by front axle through differential	Deploys via linkage								£50

### Trucks and cranes

Set #	Model	Year	Engine	Wheels	Differential	Cabin	Steering	Other	Style	Motor	Parts count	Price
8258	Crane Truck	2009	V8	4x2	1 rear differential	2-seat Tilt cab	Front and rear	Motorized rotating and luffing crane Telescopic crane Winch	Studless	1 XL	1877	£130
8868	Airtech Claw Rig	1992	V6	3x2	2 rear axles	2-seat	Front	Pneumatic loader with boom, claw and slewing of crane unit motorized air compressor	Studded	1	957	\$140
9397	Logging truck	2012	I4 engine	3x2	Rear single axle diff	2-seat	Front	Bonnet and doors open Motorized crane operation for boom and jib Turn table Motorized outriggers Motorized tilt or container and cab in alternate model	Studless	1 M	1308	£100
8285	Tow truck	2006	V6	2+4+4	RWD	2-seat	Front	Winch – rear ratcheting hoist Boom – lift and telescope via cranks Wheel lift – pneumatic Damped pivot	Studless	1	1877	£90



42008	Service Truck	2013	None	4x2		2-seat Doors open	Front 2 axles	Motorized rear stabiliser extend/retract Motorized hook extend/retract Motorized lift arm raise/lower Pneumatic under lift raise/lower Pneumatic lift arm extend/retract	Studless	1 M	1276	£100
9395	Pick up tow truck	2011	V6	2x2	Rear axle single diff	2-seat Doors open	Front	Folding tow lift via cogs Winch	Studless	0	954	£50
8462	Tow Truck	1998									773	\$122
8436	Truck chassis	2003	V6								1027	£60
42009	Mobile crane	2013	V8	5x2		2-seat Doors open	Front and rear 4 axles	Boom – motorized extend/retract Slew – 360 manual turntable Hoist – motorized Outriggers – motorized	Studless	1 L	2606	£150
8421	Mobile crane	2005		4x2			3 axles	Boom – pneumatic luffing, motorized double telescoping Slew – 360 manual turntable Hoist – motorized Outriggers – gear driven manual	Mixed	1	1884	£90
8053	Mobile crane	2010		4x2		2-seat cab	All wheels	Worm driven outriggers Pneumatic crane boom with ratcheting hoist 360 turning of crane unit	Mixed	0	1289	£80
8460 8431 8438	Crane Truck	1995 2002 2003	None	3x2	None	2+1 seat cabs	4 wheels	Worm driven 4 outriggers Telescopic crane via racks Turntable with 360 turning of crane unit	Studded	0	839	£40
8110	Unimog	2011	V6	3x2	3 with 4WD	2-seat	Front	All wheel suspension Motorized pneumatic operation of crane Motorized winch Motor does not drive whole truck	Studless	1 M	2048	£150
8479	Barcode Truck	1997	None	3x2	1 rear differential	2-seat	Front	Programmable Barcode scanner/code pilot Motorized tilting of container Claw lift Motorized movement of truck	Studded	1	1263	£100
8109	Flatbed truck	2011		3x2		2-seat	Front	Motorized lowering and retraction of flatbed	Studless	1 M	1115	£60
8052	Container truck	2010		3x2		2-seat	Front	Motorized tilting of container	Studless	1 M	686	£50
42024	Container truck	2014		3x2		2-seat	Front	Motorized loading/unloading of container (motor not supplied with set)	Studless	0		
8273	Off road Truck	2007	None			2-seat		Rotating crane loader with lifting boom and		0	805	£35

						tilt cab		jib				
8292	Cherry Picker	2008	None	3x2		2 seat Door opens	Front	Motorized turning and crane operation Tilt truck as alternate model	Studless	1 M	726	£50

### Other vehicles





Set #	Model	Year	What	Other	Style	Motor	Parts count	Price
8480	Space Shuttle	1996	Space shuttle	Fiber optics Multi-speed transmission	Studded	2	1366	\$160
8051	Motorbike	2010	Motor cycle	3 cylinder engine Chain drive Suspension	Studless	0	467	£35
8422	Bike	1995	Motor cycle	V2 engine Chain driven rear wheel Suspension on both wheels	Studded	0	315	£20
42025	Cargo Plane	2014	Plane	Twin propellers Landing gears Cargo door opening	Studless		1308	
8855	Sea Plane	1988	Plane	V2 engine Big propeller Retractable landing gear Rudder, aileron movement from cab via gears	Studded	0	574	
8425	Black Hawk plane	1995	Plane	retractable landing gear, rudder, aileron, propellers movements through gears	Studded	0	470	£35
9394	Jet plane	2011	Plane	Opening canopy Sweeping wings Retractable landing gear Moving of flaps Propeller movement in alternate model	Studless	0	499	£30
8068	Rescue Helicopter	2011	Helicopter	Moving rotor and propeller Functioning winch Opening side doors	Studless	0	408	£35
9396	Helicopter	2012	Helicopter	Moving rotor and propeller Functioning winch Opening side doors	Studless	0	1056	£70

852	Helicopter	1977	Helicopter	Collective control for varying pitch of propeller	Studded	0	364	
10220	VW Camper	2011	Camper van	Detailed interior as of a camper van	Studded	0	1332	£80
10188	Death Star	2008	Star Wars object	A detailed object to replicate the Star Wars Death Star	Studded	0	3803	£275

## Lego motors' characteristics

Only the Technic motors of recent times are shown here.

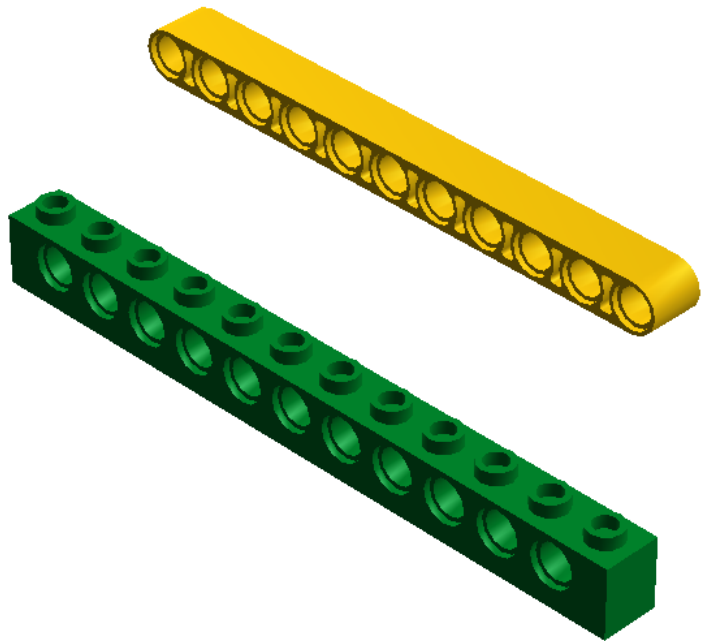
For details of all motors please see <http://www.philohome.com/motors/motorcomp.htm>

Motor	Characteristics
	~ 350 RPM 9 V, 360 mA 6 N.cm torque
	M motor 405 RPM 9 V, 850 mA 11 N.cm torque
	XL motor 220 RPM 9 V, 1.8 A 40 N.cm torque
	L motor 390 RPM 9 V, 1.3 A 18 N.cm torque

## Studded vs studless

In the past all Lego parts were studded. Since 2000, most of Lego Technic parts are now studless. It is to be noted that studless parts are available only in Technic themed sets. Other Lego sets still use traditional studded parts.

Whether studded or studless construction is better in MOCs, depends on your goal.



In the image above, the green beam is studded beam and the yellow beam is a studless beam.

The characteristics of studded beams are:

- Stronger
- Height is more than width
- Somewhat more intuitive for beginners (subjective)

The characteristics of studless beams are:

- Height is same as width – which makes it easier to construct in all directions
- Aesthetic ally better looking (subjective)
- Cheaper for TLG to produce

It is expected that all new Technic sets will consist of only studless parts. Please note that studded and studless constructions are compatible and it is possible to mix both types in same model.

## Houses and buildings (*not Technic*)

Most houses are on minifig scale

Set #	Model	Year	Floor	Interior	Other	Parts count	Theme	Price
10185	Green Grocer	2008	G+3	windows, stairs, fireplace and furniture		2352	Town – modular building	£100
10224	Town Hall	2012	G+2	Detailed interior with many objects, elevator, minifigs		2766	Town – modular building	£150
10182	Café Corner	2007	G+3	Detailed interior		2056	Town – modular building	£90
10211	Grand Emporium	2010	G+2	3-storied departmental store with flooring, figures, interior furniture, revolving door and several other details		2182	Town – modular building	£135

10218	Pet shop	2011	G+2	Detailed interior		2032	Town – modular building	£120
10197	Fire brigade	2009	G+1		Replica of fire brigade building	2231	Town – modular building	£100
10190	Market Street	2007	G+2		a somewhat narrower version of 10185 with good detail	1248	Town – modular building	£60
4954	Town House	2007	G+1	No floor or interior	Garage	1174	Creator	£45
5891	Apple Tree House	2010	G+1	Ladder to upstairs	garage	539	Creator	£35
5771	Hillside House	2011			Similar to 5891		Creator	£50
6754	Family Home		G+1	Some interior detail		976	Creator	£60
10189	Taj Mahal	2008	N/A		Giant replica of Taj Mahal	5922	Large scale model - building	£200
10214	London Tower Bridge	2010	N/A			4287	Large scale model - building	£210
10181	Eiffel Tower	2007	N/A		Replica of Eiffel Tower	3428	Large scale model – building	£150

## Drawbacks of Lego

Unfortunately, Lego as a hobby is not without its problems!

- Lego sets are expensive! Unless you budget yourself, you can soon carried away and end of buying lots of sets spending considerable amount of money. Although you can recover some of your money by selling used sets later, not all sets appreciate in price.
- Lego building is time consuming – especially if you make MOCs. This may not make you popular in your family circle!
- Lego sets require lots of space for storage and display. You really need a spare room if your sets start to grow.
- If you are not careful, you may lose Lego pieces. Some pieces are difficult to replace.
- If you want to create MOC, you often need to mix parts from multiple sets. This makes it very difficult to maintain an inventory of sets if you ever want to sell (or donate) those sets later. Checking inventory of large Lego sets is painstaking. For this reason, some hobbyists buy duplicate sets – one for display and another one for just parts.

- Lego electronics are not long lasting as its plastic components.
- Lego has too many themes nowadays and you may not find most of them as interesting. Only Technic and modular buildings are somewhat aimed at adults.

## Abbreviations used in Lego world

AFOL = Adult Fan of Lego (roughly 5% of all Lego sales are from adults who are buying for themselves)

LDD = Lego Digital Designer

LUG = Lego User Group

MBA = Master Builder Academy

MOC = My Own Creation

S@H = Shop at Home or official Lego online store

TLG = The Lego Group

*This article was written by Saikat Basak on Jan 2005 and last updated as shown in header © [www.enselsoftware.com](http://www.enselsoftware.com)*

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