E-HYBRID KIT

A PROJECT REPORT

Submitted by

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PANIMALAR ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to Anna university, Chennai)

BONAFIDE CERTIFICATE

Certified that this project report " E HYBRID KIT " is the bonafide work of

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Who carried out the project work under my supervision

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Submitted for Anna university project viva-voce Held on ……

During the year…….

INTERNAL EXAMINER EXTERNAL EXAMINER

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TABLE OF CONTENTS

ABSTRACT

The E Hybrid Vehicle Kit is a technology that enables the conventional ICE -powered vehicles into hybrid electric vehicles. This kit includes an electric motor, batteries, controllers, and other necessary components, allowing vehicles to run on either ICE or electric power under circumstances. The hybrid technology significantly reduces fuel consumption and emissions, making it an eco-friendly and cost-effective option for vehicle owners.

This abstract provides a brief overview of the E Hybrid Vehicle Kit, highlighting its benefits, features, and potential applications in the automotive industry.

CHAPTER 1

INTRODUCTION

As developing country in 21st century, the infrastructure around us has developed tremendously. Yet we haven’t solved one major issue, pollution. In cities like Delhi the Central Pollution Control Board (CPCB), vehicular emissions account for nearly 40% of the total air pollution in Delhi. The high concentration of vehicles on the roads leads to congestion, which, in turn, leads to prolonged idling of engines, thereby increasing emissions. To tackle the issue of transportation-related pollution in Delhi, the government has implemented several measures, including the introduction of compressed natural gas (CNG) as a fuel for public transportation, the implementation of the odd-even rule for private vehicles, and the construction of dedicated bus lanes and cycle tracks.

However, despite these efforts, Delhi's air quality remains a cause for concern, and further action is needed to reduce transportation-related pollution in the city. This could include promoting the use of electric vehicles, improving public transportation infrastructure, and implementing stricter emission norms for vehicles

The best alternate solution for this problem is going with EV. But…Ev are expensive to buy and building an Ev infrastructure like charging stations are much expensive and tedious process. This may result in increased ICE vehicle of scrap.

However, it's important to note that ICE vehicles will still exist for many years to come, as not everyone will be able to afford or want to switch to an electric vehicle right away. Therefore, there will likely still be a market for ICE vehicles.

DEPLETING RESOURCES

In the recent years usage of fossil fuel is very high which causes surge in fuel prices More than 90% transportation uses fossil fuel by 2060 there will be no fossil fuel which will impact all the transportations. We need alternation.

1.WHAT WILL HAPPENS IN 10 YEARS

- Fossil fuel price spike.
- Global warming and carbon emission.
- Eu banned car manufacturing on producing ice cars by 2025.
- But the older vehicles can be purchased

2.WHY NEED EV HYBRID KIT

Increased fuel efficiency: The addition of an EV hybrid kit can increase fuel efficiency by

allowing the vehicle to operate on both electric and gasoline power. This means that the

vehicle can travel further on a single tank of gas.

Reduced emissions: EV hybrid kits can help reduce emissions and pollution by allowing the

vehicle to operate on electric power, which produces no emissions.

Improved performance: The addition of an EV hybrid kit can improve a vehicle's performance

by providing additional power when needed, such as during acceleration.

Cost savings: EV hybrid kits can help drivers save money by reducing fuel costs,

maintenance costs, and potentially reducing the need for expensive repairs.

Increased range: EV hybrid kits can increase a vehicle's range by allowing it to operate on

both electric and gasoline power, meaning the driver can go further without needing to refuel.

WORKING OF E-HYBRID SYSTEM

1.Electric motor

The electric motor provides power to the wheels stored in the battery pack.

It can also act as a generator to recharge the battery pack during regenerative braking.

2.Battery pack

The battery pack stores electricity that is used to power the electric motor.

It is typically charged by the ICE or through regenerative braking.

3.Internal combustion engine

The ICE is used to power the vehicle when the battery pack during driving.

4.Power electronics

The power electronics manage the flow of electricity.

Its battery pack, electric motor, and ICE.

They also control the speed and torque of the electric motor.

5. Regenerative Braking

When the vehicle brakes, the electric motor acts as a generator.

It converting kinetic energy into electrical energy that is stored in the battery pack.

CHAPTER 2

COMPONENTS

1.1 Brushless DC electric motor

A brushless DC electric motor (BLDC), also known as an electronically commutated motor, is a synchronous motor using a direct current (DC) electric power supply. It uses an electronic controller to switch DC currents to the motor windings producing magnetic fields which effectively rotate in space and which the permanent magnet rotor follows. The controller adjusts the phase and amplitude of the DC current pulses to control the speed and torque of the motor. This control system is an alternative to the mechanical commutator (brushes) used in many conventional electric motors.

The construction of a brushless motor system is typically similar to a permanent magnet synchronous motor (PMSM), but can also be a switched reluctance motor, or an induction (asynchronous) motor. They may also use neodymium magnets and be outrunners (the stator is surrounded by the

rotor), in runners (the rotor is surrounded by the stator), or axial (the rotor and stator are flat and parallel).[1]

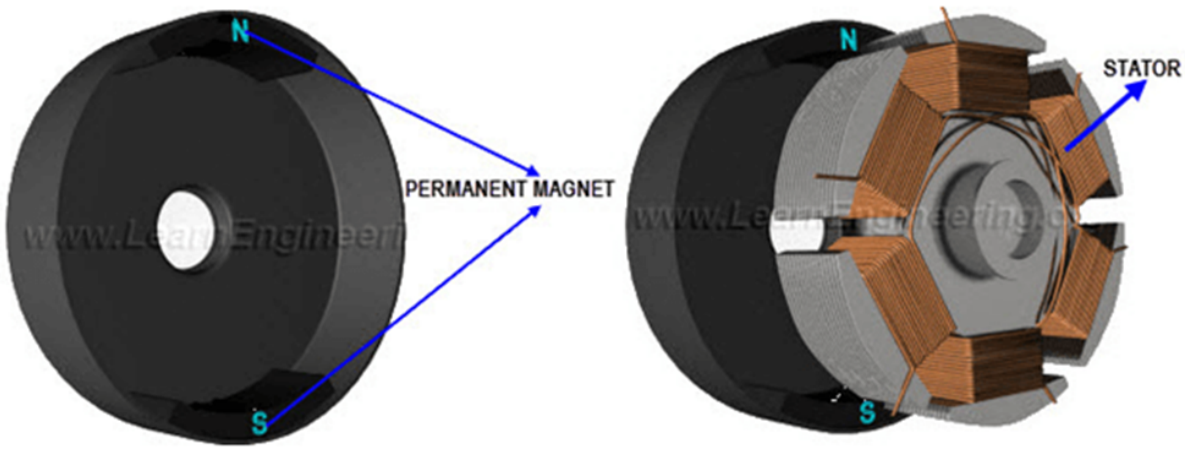
The advantages of a brushless motor over brushed motors are high power-to-weight ratio, high speed, nearly instantaneous control of speed (rpm) and torque, high efficiency, and low maintenance. Brushless motors find applications in such places as computer peripherals (disk drives, printers), hand-held power tools, and vehicles ranging from model aircraft to automobiles. In modern washing machines, brushless DC motors have allowed replacement of rubber belts and gearboxes by a direct-drive design.

1.1 The Basic working

Thus, the brushed D.C motor should never be used for operations that demand long life and reliability. Fort this reason and the other reasons listed in the introduction, BLDC motors are used in most of the modern devices. Efficiency of a BLDC motor is typically around 85-90%, whereas the conventional brushed motors are only 75-80% efficient. BLDC motors are also suitable for high- speed applications

(10000 rpm or above). The BLDC motors are also well known for their better speed control.

Three phasis BLDC motor working principle is quite simple:

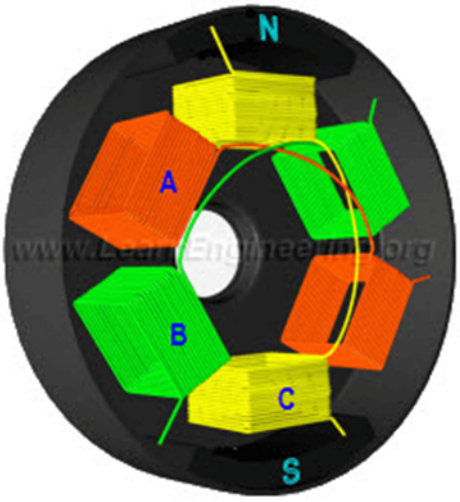


BLDC motor consists of two most important parts - stator and rotor.

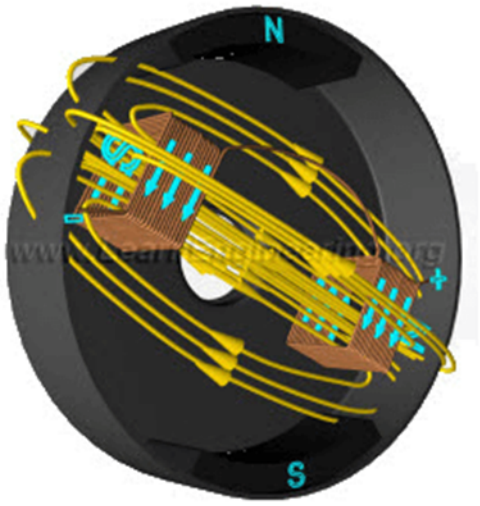
1.Rotor – is moving engine part which has permanent magnets.

2.Stator – more complex engine part which has few electromagnets groups.

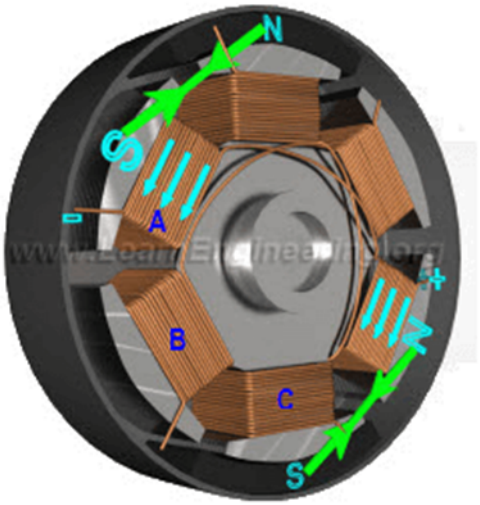
The stator has a coil arrangement, as illustrated; The internal winding of the rotor is illustrated in the picture below (core of the rotor is hidden here). The rotor has 3 coils, named A, B and C.



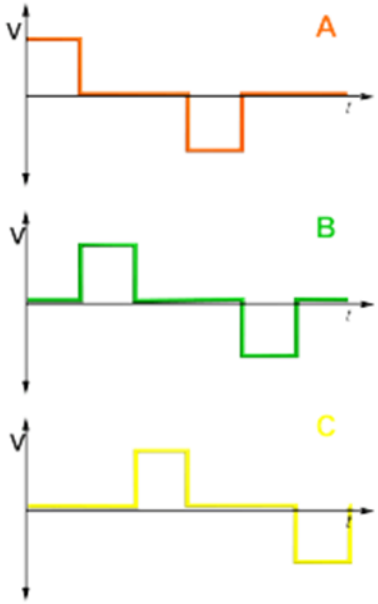
Out of these 3 coils, only one coil is illustrated for simplicity. By applying DC power to the coil, the coil will energize and become an electromagnet.



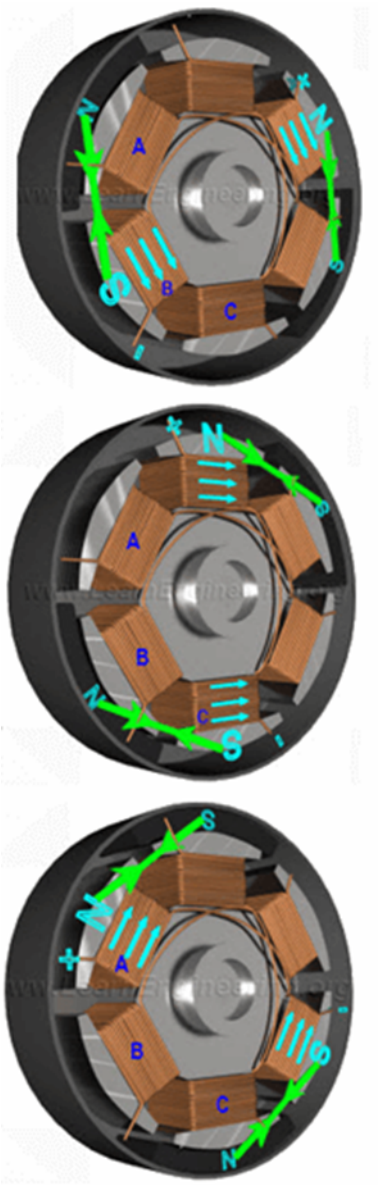
The operation of a BLDC is based on the simple force interaction between the permanent magnet and the electromagnet. In this condition, when the coil A is energized, the opposite poles of the rotor and stator are attracted to each other (The attractive force is shown in green arrow). As a result the rotor poles move near to the energized stator.



This process is repeated, and the rotor continues to rotate. The DC current required in each coil is shown in the following graph.



As the rotor nears coil A, coil B is energized. As the rotor nears coil B, coil C is energized. After that, coil A is energized with the opposite polarity.



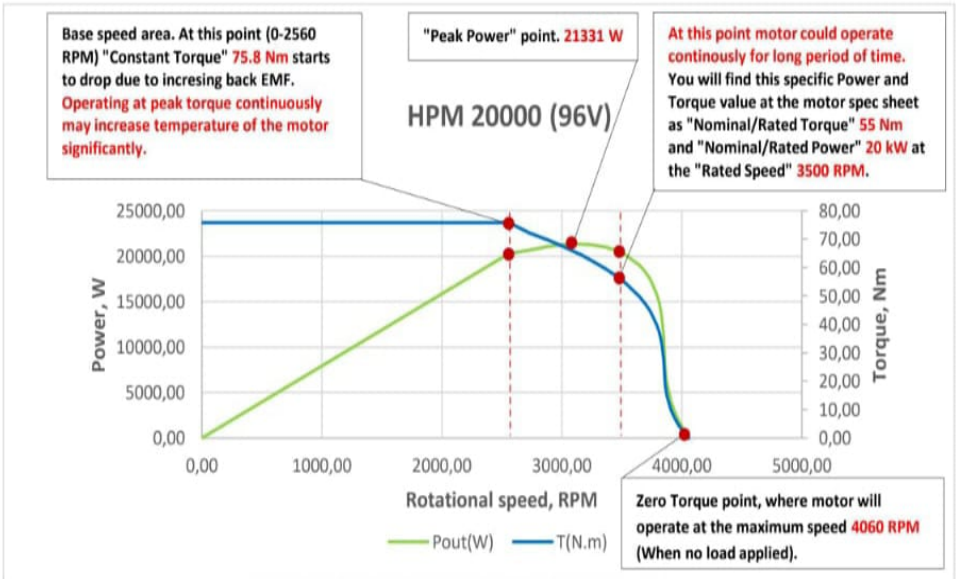
A humorous analogy help to remember it is to think of BLDC operation like the story of the donkey and the carrot, where the rabbit tries hard to reach the carrot, but the carrot keeps moving out of reach.

power flow in automobile

THE MOTOR USED IN PROJECT:

HPM 20000 (96V) Test report

Power	20KW			Rated voltage		96(V)	
				Rated current		330(A)	
Test	1			Rated power		20000(W)	
Test Date	2015-7-22			Rated speed		3500(r/m)	
No.	U(V)	I(A)	Pin(W)	T(N.m)	N(r/m)	Pout(W)	η(%)
1	95.83	22.41	2147.5	0.00	4060	0.00	0.00
2	95.70	30.82	2949.9	2.25	4013	944.8	32.03
3	95.56	40.73	3892.3	4.75	3971	1973.6	50.71
4	95.43	51.14	4880.6	7.25	3937	2986.9	61.20
5	95.30	61.99	5907.5	9.74	3911	3990.5	67.55
6	95.08	84.64	8047.2	14.74	3878	5985.2	74.38
7	94.98	96.29	9145.8	17.24	3868	6981.7	76.34
8	94.89	108.06	10253.9	19.74	3861	7979.4	77.82
9	94.81	119.87	11364.8	22.24	3856	8978.1	79.00
10	94.74	131.64	12471.4	24.73	3852	9976.7	80.00
11	94.68	143.29	13566.9	27.23	3848	10972.8	80.88
12	94.64	154.74	14644.5	29.73	3843	11963.4	81.69
13	94.60	165.94	15697.3	32.23	3836	12944.1	82.46
14	94.57	176.78	16718.5	34.73	3825	13909.9	83.20
15	94.55	187.21	17701.1	37.23	3811	14854.7	83.92
16	94.54	197.15	18638.4	39.72	3792	15771.7	84.62
17	94.53	206.52	19523.4	42.22	3767	16653.0	85.30
18	94.54	215.25	20349.1	44.72	3735	17490.1	85.95
19	94.54	223.27	21108.4	47.22	3696	18273.7	86.57
20	94.55	230.50	21794.3	49.72	3648	18993.7	87.15
21	94.57	242.32	22917.0	54.71	3526	20199.3	88.14
22	94.58	246.77	23339.4	57.21	3449	20661.4	88.53
23	94.59	250.14	23659.3	59.71	3361	21012.9	88.81
24	94.58	252.36	23869.6	62.21	3261	21240.7	88.99
25	94.57	253.38	23963.0	64.71	3148	21330.8	89.02
26	94.57	253.41	23965.6	64.96	3136	21331.7	89.01
27	94.55	253.11	23932.2	67.21	3022	21269.0	88.87
28	94.52	251.49	23770.1	69.70	2883	21040.6	88.52
29	94.47	248.45	23469.7	72.20	2729	20630.2	87.90
30	94.40	243.91	23024.2	75.80	2560	20309,1	86.96



2.1 CONTROLLER

KLS-8080N – High Power Opto-Isolated Sinusoidal Brushless Permanent Magnet Motor Controller (48V-144V)

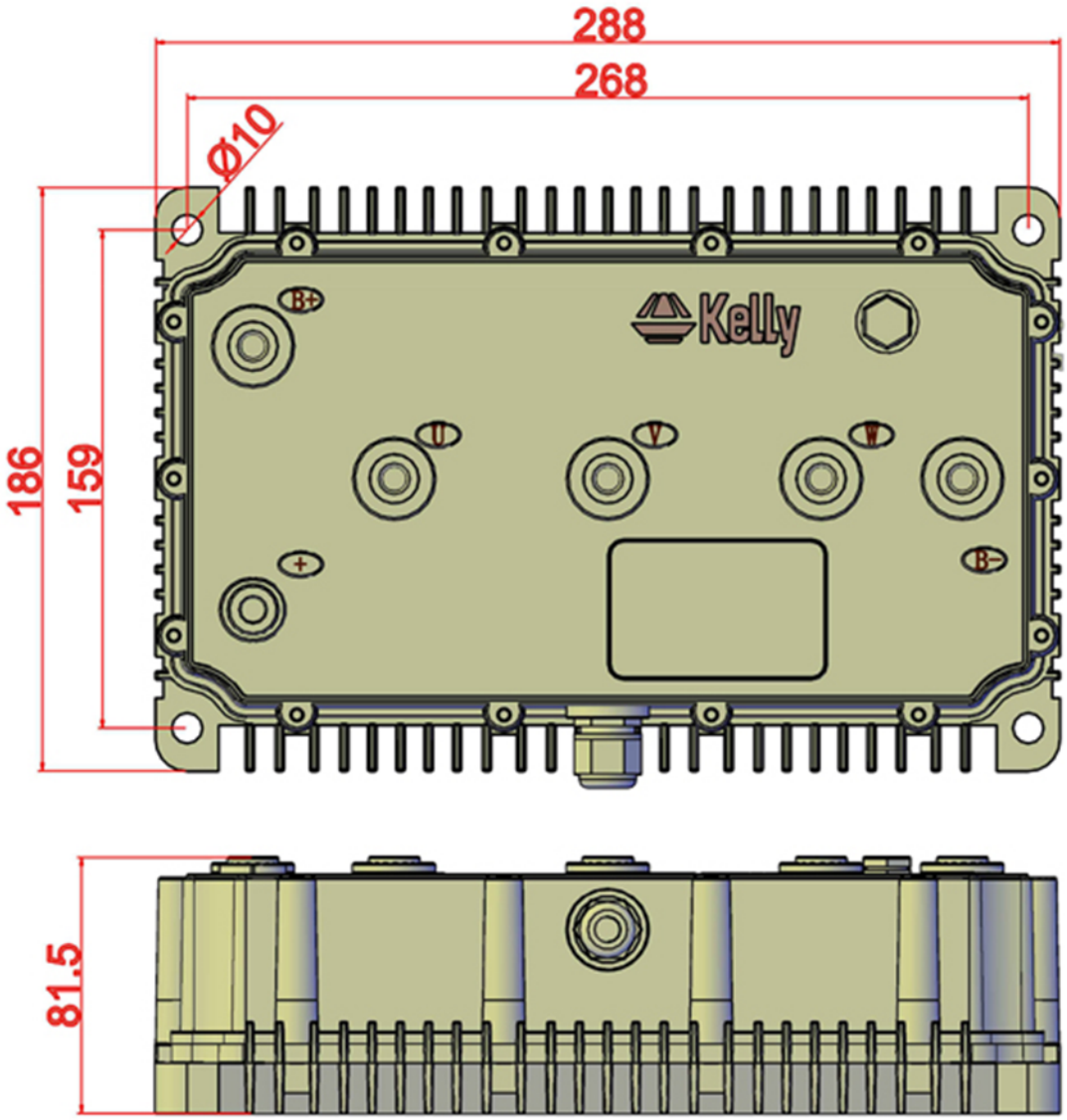


Figure 1: KLS-8080N

mounting holes' dimensions

(dimensions in millimeters)

KLS8080N/NPS is designed with opto-isolated technology. We specify 8-20V for power supply which must be isolated from main battery pack B+/B-. You may use an isolated DC/DC converter or a separate 12V battery for power supply.

2.2 General functions

Extended fault detection and protection. Customers can read the error code in PC software or Android Tablet also.

Monitoring battery voltage. It will stop driving if the battery voltage is too high and it will progressively cut back motor drive power as battery voltage drops until it cuts out altogether at the present “Low Battery Voltage” setting.

Built-in current loop and over current protection.

Configurable motor temperature protection range.

Current cutback at low temperature and high temperature to protect battery and controller. The current begins to ramp down at 90°C case temperature, shutting down at 100°C.

The controller keeps monitoring battery recharging voltage during regen braking.

Maximum reverse speed and forward speed can be configured between 20% and 100% respectively and separately.

A 4pin connector to RS232 port and a Z-TEK USB to RS232 cable allows for configuration, programming and software upgrades using the tablet which must be based on Android OS now. People can do the same things on PC software by using a standard USB to RS232 cable instead.

Provision of a +5 volt and +12-volt output to supply various kinds of hall sensors.

5 switch inputs which are activated by connection to 12V. Default to throttle switch, brake switch, reversing switch, and forward switch and Boost switch.

3 analogy 0-5V inputs that default to throttle input, Brake analogy input and motor temperature input

Copy signal of one of sensors.

Configurable boost switch. Enables the maximum output power achievable if the switch is turned on. The effect is the same as full throttle position even if you don’t turn throttle at all.

12V brake switch input used different port from motor temperature sensor. You can use both brake switch and motor temperature sensor functions at the same time on the latest version. Pin 25 is 12V brake switch input port. Pin1 is motor temperature sensor input port.

Optional joystick throttle. A bi-symmetrical 0-5V signal for both forward and reversing.

Configurable motor over-temperature detection and protection with the recommended thermistor KTY84-130/150 or KTY83-122.

3 hall position sensor inputs. Open collector, pull up provided. Sin/Cosine Speed sensors inputs.

Brake analogy regen mode. This regens mode doesn’t need brake switch to support any more. Only available from software version 0106 or advanced version.

Enhanced regen brake function. A novel ABS technique provides powerful and smooth regen. The regen can happen at any speeds until zero speed.

Cruise control. Only can be activated in forward direction.

KLS-8080I/IPS can support Broadcast type CAN bus function. It is 250Kbps. By default, KLS-8080I/IPS controller includes CAN bus function.

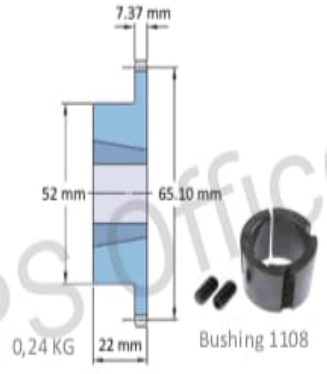
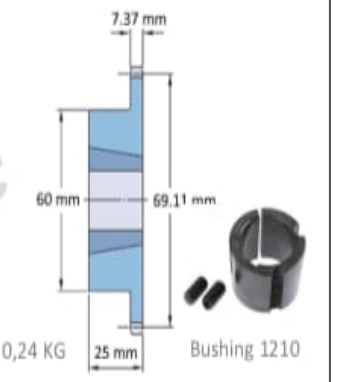
3.1 SPROCKET

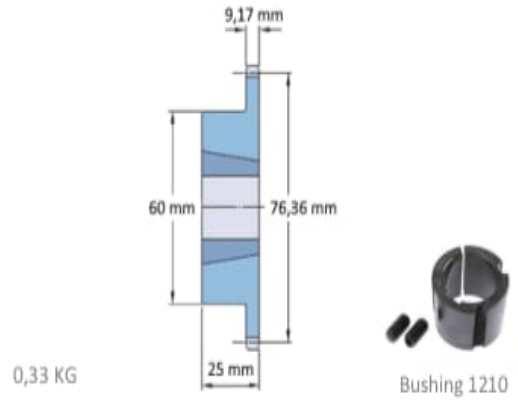
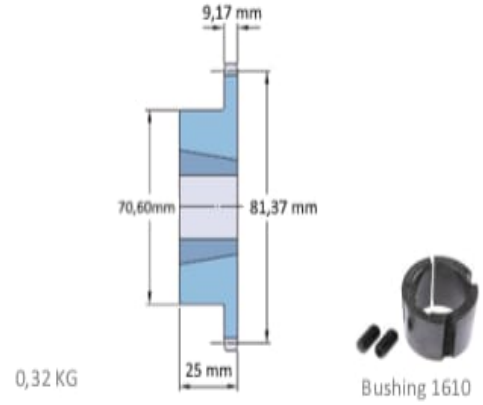
METRIC SPROCKETS, TAPER BUSHED

All specified sprockets bellow are those which has pitch of 1/2 inches, 5/8 inches or 12.7 millimeters and 15.88 millimeters. They design has tapered bore bush fitting for extra flexibility.

Following table shows technical information of Metric sprockets. All specified sprockets are suitable with following chains:
40, 41, 42, 43; 410, 415/415H, 420, 428/428H for 1/2 inches pitch and 520/520H, 520-2, 525, 530 for 5/8 inches pitch.

Please refer to the table below for more technical information about specified sprockets.

12,70 mm / 0,5-inch Pitch Sprocket		
Sprocket 15 Teeth	**Sprocket 16 Teeth**	**Sprocket 17 Teeth**
		
Suitable with chains		
40, 41, 42, 43, 410, 415/415H, 420, 428/428H		

15,88 mm / 0,625-inch Pitch Sprocket	
Sprocket 15 Teeth	**Sprocket 16 Teeth**
	
Suitable with chains	
520/520H, 520-2, 525, 530	

EXTENDED DATA SHEET OF TAPER BUSHED METRIC SPROCKETS

Pitch	Number of teeth	Pitch diameter	Type	Bushing number	Dimensions Bore		L	H	Plate thickness	Mass Rim	Bushing	Designation
		PD			Min.	Max.			t_1			
mm	–	mm	–	–	mm					kg		–
12,70	14	57,07	B	1008	9	25,4	22,0	46,0*	7,37	0,12	0,14	PHS 08B-1TBH14
	15	61,09	B	1008	9	25,4	22,0	45,0	7,37	0,18	0,14	PHS 08B-1TBH15
	16	65,10	B	1108	9	28,0	22,0	52,0	7,37	0,24	0,16	PHS 08B-1TBH16
	17	69,11	B	1210	11	31,8	25,0	60,0*	7,37	0,24	0,27	PHS 08B-1TBH17
	18	73,14	B	1210	11	31,8	25,0	60,0*	7,37	0,30	0,27	PHS 08B-1TBH18
	19	77,16	B	1210	11	31,8	25,0	63,0	7,37	0,33	0,27	PHS 08B-1TBH19
	20	81,19	B	1610	11	31,8	25,0	71,0	7,37	0,32	0,41	PHS 08B-1TBH20
	21	85,22	B	1610	14	41,3	25,0	71,0	7,37	0,37	0,41	PHS 08B-1TBH21
	22	89,24	B	1610	14	41,3	25,0	76,0	7,37	0,50	0,41	PHS 08B-1TBH22
	23	93,27	B	1610	14	41,3	25,0	76,0	7,37	0,53	0,41	PHS 08B-1TBH23
	24	97,29	B	1610	14	41,3	25,0	76,0	7,37	0,54	0,41	PHS 08B-1TBH24
	25	101,33	B	1610	14	41,3	25,0	76,0	7,37	0,59	0,41	PHS 08B-1TBH25
	26	105,36	B	1610	14	41,3	25,0	76,0	7,37	0,61	0,41	PHS 08B-1TB26
	27	109,40	B	1610	14	41,3	25,0	76,0	7,37	0,94	0,41	PHS 08B-1TB27
	28	113,42	B	2012	14	50,8	25,0	90,0	7,37	0,86	0,77	PHS 08B-1TB28
	29	117,46	B	2012	14	50,8	25,0	90,0	7,37	0,90	0,77	PHS 08B-1TB29
	30	121,50	B	2012	14	50,8	32,0	90,0	7,37	0,94	0,59	PHS 08B-1TB30
	32	129,57	B	2012	14	50,8	32,0	90,0	7,37	1,12	0,59	PHS 08B-1TB32
	35	141,68	B	2012	14	50,8	32,0	90,0	7,37	1,30	0,59	PHS 08B-1TB35
	36	145,72	B	2012	14	50,8	32,0	90,0	7,37	1,48	0,59	PHS 08B-1TB36
	38	153,80	B	2012	14	50,8	32,0	90,0	7,37	1,67	0,59	PHS 08B-1TB38
	40	161,87	B	2012	14	50,8	32,0	90,0	7,37	1,80	0,59	PHS 08B-1TB40
	42	169,94	B	2012	14	50,8	32,0	100,0	7,37	1,93	0,59	PHS 08B-1TB42
	45	182,07	B	2012	14	50,8	32,0	100,0	7,37	2,06	0,59	PHS 08B-1TB45
	48	194,18	B	2012	14	50,8	32,0	100,0	7,37	2,36	0,59	PHS 08B-1TB48
12,70	54	218,42	B	2012	14	50,8	32,0	100,0	7,37	2,66	0,59	PHS 08B-1TB54
	57	230,53	B	2012	14	50,8	32,0	100,0	7,37	3,07	0,59	PHS 08B-1TB57
	60	242,66	B	2012	14	50,8	32,0	100,0	7,37	3,23	0,59	PHS 08B-1TB60
	70	283,07	B	2012	14	50,8	32,0	100,0	7,37	3,39	0,59	PHS 08B-1TB70
	72	291,15	B	2012	14	50,8	32,0	100,0	7,37	3,55	0,59	PHS 08B-1TB72
	76	307,31	B	2012	14	50,8	32,0	100,0	7,37	3,71	0,59	PHS 08B-1TB76
	80	323,49	B	2012	14	50,8	32,0	100,0	7,37	4,55	0,59	PHS 08B-1TB80
	84	339,65	B	2012	14	50,8	32,0	100,0	7,37	5,39	0,59	PHS 08B-1TB84
	95	384,10	B	2012	14	50,8	32,0	100,0	7,37	6,23	0,59	PHS 08B-1TB95
	96	388,15	B	2012	14	50,8	32,0	100,0	7,37	7,00	0,59	PHS 08B-1TB96
	114	460,90	B	2517	16	63,5	45,0	110,0	7,37	8,10	1,30	PHS 08B-1TB114
15,88	12	61,34	B	1008	9	25,4	22,0	49,2*	9,17	0,21	0,09	PHS 10B-1TBH12
	13	66,32	B	1008	9	25,4	22,0	47,0	9,17	0,25	0,09	PHS 10B-1TBH13
	14	71,34	B	1108	9	25,4	22,0	52,0	9,17	0,27	0,12	PHS 10B-1TBH14
	15	76,36	B	1210	11	31,8	25,0	60,0	9,17	0,33	0,21	PHS 10B-1TBH15
	16	81,37	B	1610	14	41,3	25,0	70,6*	9,17	0,32	0,31	PHS 10B-1TBH16
	17	86,39	B	1610	14	41,3	25,0	71,0*	9,17	0,40	0,31	PHS 10B-1TBH17
	18	91,42	B	1610	14	41,3	25,0	75,0	9,17	0,50	0,31	PHS 10B-1TBH18
	19	96,45	B	1610	14	41,3	25,0	75,0	9,17	0,56	0,31	PHS 10B-1TBH19
	20	101,49	B	1610	14	41,3	25,0	76,0	9,17	0,64	0,31	PHS 10B-1TBH20
	21	106,52	B	1610	14	41,3	25,0	76,0	9,17	0,69	0,31	PHS 10B-1TBH21
	22	111,55	B	1610	14	41,3	25,0	76,0	9,17	0,75	0,31	PHS 10B-1TBH22
	23	116,58	B	1610	14	41,3	25,0	76,0	9,17	0,81	0,31	PHS 10B-1TBH23
	24	121,62	B	2012	14	50,8	32,0	90,0	9,17	1,00	0,59	PHS 10B-1TBH24
	25	126,66	B	2012	14	50,8	32,0	90,0	9,17	1,06	0,59	PHS 10B-1TBH25
	26	131,70	B	2012	14	50,8	32,0	90,0	9,17	1,14	0,59	PHS 10B-1TB26
	27	136,75	B	2012	14	50,8	32,0	90,0	9,17	1,19	0,59	PHS 10B-1TB27
	28	141,78	B	2012	14	50,8	32,0	90,0	9,17	1,28	0,59	PHS 10B-1TB28
	29	146,83	B	2012	14	50,8	32,0	90,0	9,17	1,37	0,59	PHS 10B-1TB29
	30	151,87	B	2012	14	50,8	32,0	90,0	9,17	1,65	0,59	PHS 10B-1TB30
	32	161,96	B	2012	14	50,8	32,0	98,0	9,17	2,21	0,59	PHS 10B-1TB32
	35	177,10	B	2012	14	50,8	32,0	98,0	9,17	3,05	0,59	PHS 10B-1TB35
	36	182,15	B	2012	14	50,8	32,0	98,0	9,17	3,33	0,59	PHS 10B-1TB36
	38	192,24	B	2012	14	50,8	32,0	100,0	9,17	3,89	0,59	PHS 10B-1TB38
	40	202,33	B	2012	14	50,8	32,0	100,0	9,17	4,45	0,59	PHS 10B-1TB40
	42	212,43	B	2012	14	50,8	32,0	100,0	9,17	5,01	0,59	PHS 10B-1TB42
	45	227,58	B	2012	14	50,8	32,0	100,0	9,17	3,97	0,59	PHS 10B-1TB45
	48	242,73	B	2012	14	50,8	32,0	100,0	9,17	6,69	0,59	PHS 10B-1TB48
	54	273,03	B	2012	14	50,8	32,0	100,0	9,17	8,37	0,59	PHS 10B-1TB54
	57	288,19	B	2012	14	50,8	32,0	100,0	9,17	5,45	0,59	PHS 10B-1TB57
	60	303,33	B	2012	14	50,8	32,0	100,0	9,17	10,05	0,59	PHS 10B-1TB60
	70	353,84	B	2012	16	63,5	45,0	100,0	9,17	12,85	1,30	PHS 10B-1TB70
	72	363,95	B	2012	16	63,5	45,0	100,0	9,17	13,41	1,30	PHS 10B-1TB72
	76	384,15	B	2012	14	50,8	45,0	100,0	9,17	7,43	0,59	PHS 10B-1TB76
	80	404,35	B	2012	16	63,5	45,0	110,0	9,17	15,65	1,30	PHS 10B-1TB80
	84	424,70	B	2012	16	63,5	45,0	110,0	9,17	16,77	1,30	PHS 10B-1TB84
	95	480,14	B	2517	14	50,8	45,0	110,0	9,17	19,85	0,59	PHS 10B-1TB95
	96	485,30	B	2517	16	63,5	45,0	110,0	9,17	20,13	1,30	PHS 10B-1TB96
	114	576,13	B	2517	16	63,5	45,0	110,0	9,17	25,17	1,30	PHS 10B-1TB114

ORDER EXAMPLE

Please provide us following information:

A. Motor type to be used with	- HPM 10K
1. Number of teeth	- 15 Teeth
2. Pitch of the sprocket or chain model	- 12,70 mm (0,5 inch) or 410 chain
Or	
B. Size of the axle	- 22 mm
1. Number of teeth	- 15 Teeth
2. Pitch of the sprocket or chain model	- 12,70 mm (0,5 inch) or 410 chain

Sprocket set consist of:

1. Sprocket
2. Tapered bush
3. Chain

Bore diameter of the taper locks will be respective to your order.

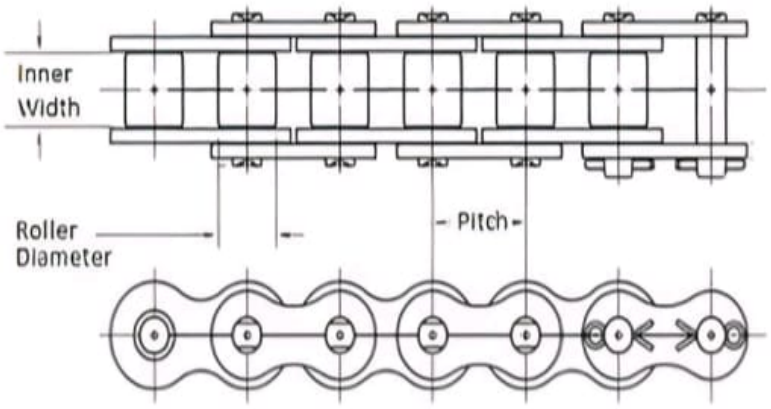
As an option as well you can order separately additional Taper bushing with required diameter.

If you would like to order Taper bushing additionally as separate part – please let us know.

Necessary provide:

1. Required Bore diameter of taper bushing.
2. Sprocket model for that you plan to use Taper lock bushing for example.

CHAIN TYPE ACCORDING TO THE SPROCKET MODEL



Chain Number	Pitch	Roller Diameter	Betwwen Inner Plates	Pin Diameter	Average Tensile Strength	Lbs. per foot
#40 (#425)	1/2	.312	5/16	.156	3,700	.41
#41	1/2	.306	1/4	.141	2,000	.27
#410 (#43)	1/2	.306	1/8	.141	1,600	.19
#415 (#42)	1/2	.306	3/16	.141	1,600	.26
#415H (#42H)	1/2	.306	3/16	.141	1,600	.26
#420	1/2	.306	1/4	.156	3,700	.38
#425 (#40)	1/2	.312	5/16	.156	3,700	.41
#428	1/2	.335	5/16	.177	4,200	.44
#428H	1/2	.335	5/16	.177	4,200	.44
__#520	5/8	.400	1/4	.200	6,100	.64
__#520H	5/8	.400	1/4	.200	6,100	.68
__#520-2	5/8	.400	1/4	.200	12,200	1.26
__#525	5/8	.400	5/16	.200	6,100	.65
__#530 (50)	5/8	.400	3/8	.200	6,100	.66

Chain types are identified by number; ie. a number 40 chain. The rightmost digit is 0 for chain of the standard dimensions; 1 for lightweight chain; and 5 for rollerless bushing chain. The digits to the left indicate the *pitch of the chain in eighths of an inch*. For example, a number 40 chain would have a pitch of four-eighths of an inch, or 1/2", and would be of the standard dimensions in width, roller diameter, etc.

The roller diameter is "nearest binary fraction" (32nd of an inch) to 5/8ths of the pitch; pin diameter is half of roller diameter. The width of the chain, for "standard" (0 series) chain, is the nearest binary fraction to 5/8ths of the pitch; for narrow chains (1 series) width is 41% of the pitch. Sprocket thickness is approximately 85-90% of the roller width.

Plate thickness is 1/8th of the pitch, except "extra-heavy" chain, which is designated by the suffix H, and is 1/32" thicker.

4.1 BATTERY

CA100FI BATTERY

4.2.DESCRIPTION:

CA100FI model in the new design with reduced weight and high energy density.

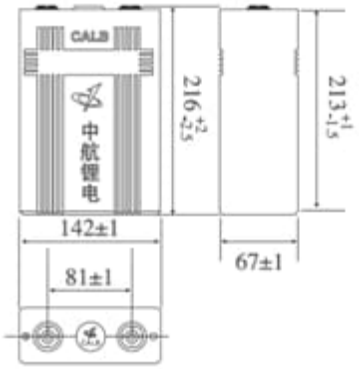
Nominal voltage of the cell is 3,2 V and the operational voltage is 2,5 - 3,65 V.

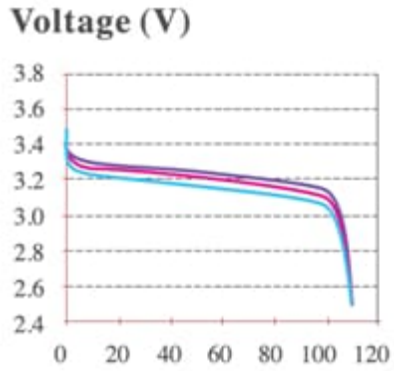
The maximum charging voltage for initial charge is 3,8 V.

Recommended subsequent charging is to 3.65 V.

The minimum voltage is 2.5 V.

Maximum discharge current is 2C continuously.





Design

The E-hyb kit consists of 3 major components:

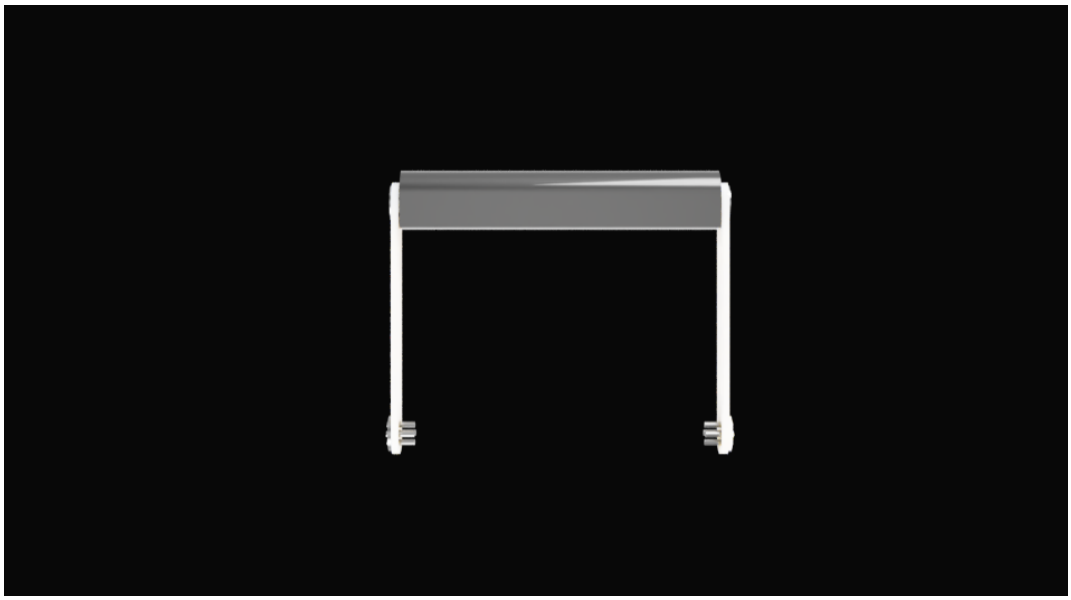
- Electric motor

- Battery
- Controller

The kit is made of recycled aluminium and scrap metals form older cars which makes the build rigid and importantly carbon neutral.

E-HYB prototype model-1

Top view:


top view

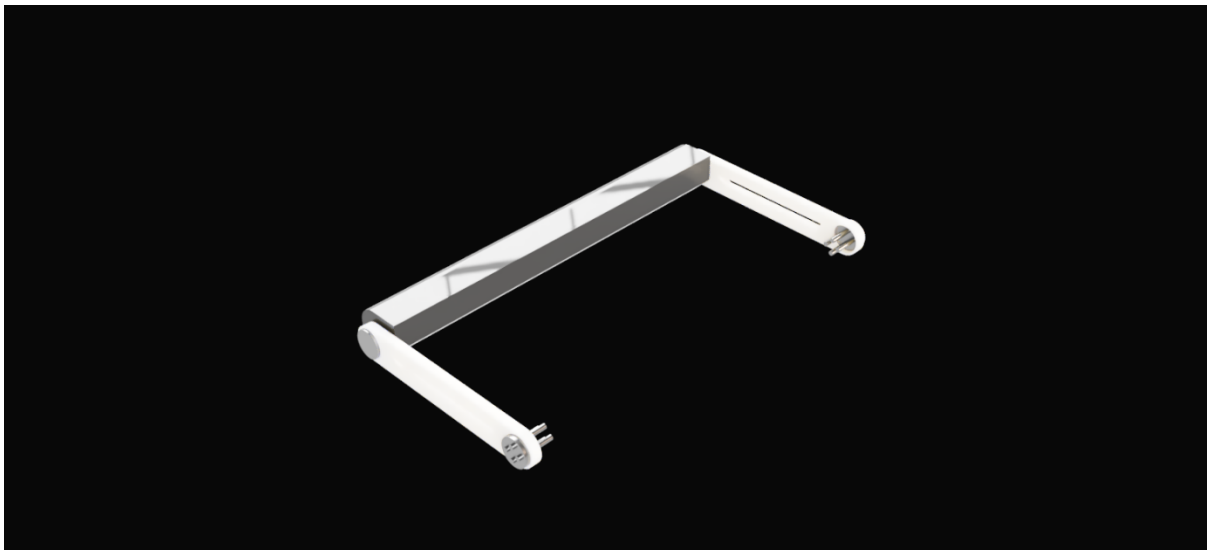
It is the outer shell of the kit. The sides are connected with the help of **thrust bearings** .

A **thrust bearing** is a particular type of rotary bearing. Like other bearings they permanently rotate between parts, but they are designed to support a predominantly axial load.

Thrust bearings come in several varieties.

- *Thrust ball bearings*, composed of bearing balls supported in a ring, can be used in low thrust applications where there is little axial load.
- *Cylindrical thrust roller bearing*s consist of small cylindrical rollers arranged flat with their axes pointing to the axis of the bearing. They give very good carrying capacity and are cheap, but tend to wear due to the differences in radial speed and friction which is higher than with ball bearings.

Side view



Internal components overview:

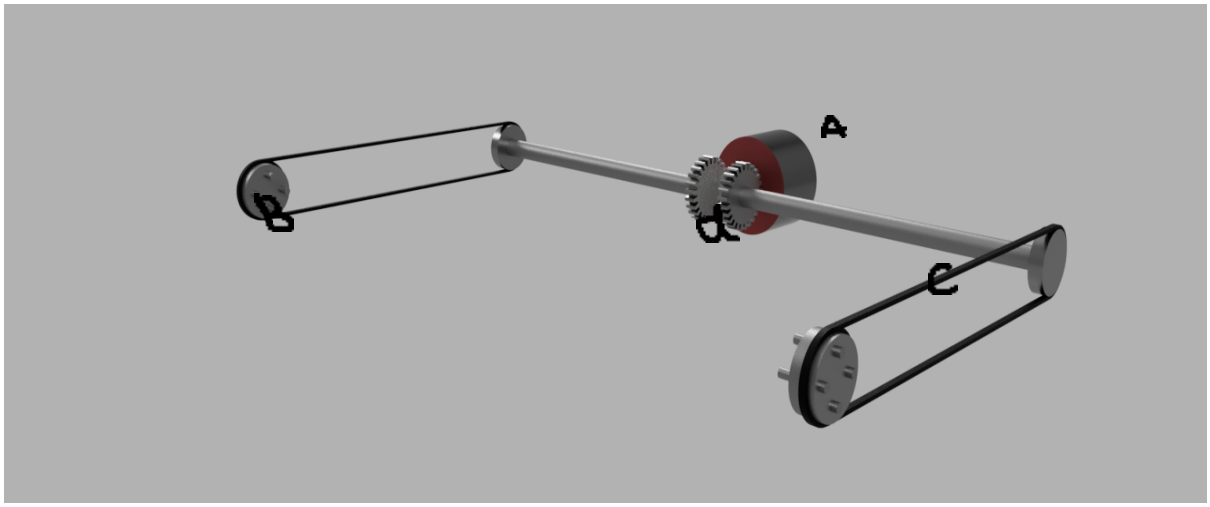
A. ELECTRIC MOTOR coupled with the differential

B. Custom made part

C. V-belt

D. Differential

All the parts are combined and integrated together to create the ehyb kit



The skeleton of the design remains same.

Exprementaion:

Idling of vehicle refers to a situation in which a vehicles engine is running while the vehicle is stopped. The measurement of vehicle fuel consumption at idling is essential to estimate the total loss of fuel due to idling at signalised intersection. There are various categories of motorised vehicles which are plying in different cities of India. The fuel used to power these vehicles is predominantly petrol and diesel. Though use of CNG and LPG is gaining popularity due to government regulatory policy on public transport vehicles in some of the cities and use of CNG fuel by private vehicle owners due to economic benefits. The equipment available with us has limited the study to petrol and diesel powered vehicles. Efforts were made to cover all vehicle types. The study of fuel consumption at idling was done at laboratory level by use of on-line fuel flow data acquisition system. Idling is considered as one of the dominant operating mode in development of driving cycle (Zheng et al., 2012). Driving cycle is a representation of a typical driving pattern of a city/ region/area. Motor vehicle idling though perceived as a

trivial amount of fuel use in the overall fuel consumption by transport sector requires the least effect by policy makers in order to get the fuel conservation benefits (Carrico et al., 2009). Various methods for fuel consumption measurement in laboratory have been indicated (Pirs et al., 2008). Fuel consumption measurements on vehicles are carried out indirectly by measuring exhaust emissions and using carbon balance method to calculate fuel consumption. Use of portable emission measurement system other than chassis dynamometer tests are used extensively for vehicle certification using established test cycle are costly proposition for conducting few tests for idling emission measurement. Critical evaluation of the various test methods for measuring fuel consumption on engines has been elaborated and it is reported that volumetric or gravimetric measurements are more accurate than the carbon balance method (Burke et al., 2011). Alternatively use of OBD test based on getting data from Engine ECU is gaining ground as an additional test method (Posada et al., 2013). The method adopted for idling fuel consumption measurement in the present

study is by volumetric measurement and is limited to petrol and diesel powered vehicles. The volumetric measurement is also the method of measurement adopted in retail selling of fuel for vehicle use at fuel filling station. The main objective of this study is measurement of idling fuel consumption of vehicles.

EQUIPMENT USED

Three types of detector are used for testing various types of petrol and diesel powered vehicles. They are (a) MF-2200 fuel flow detector (b) FP-214OH fuel flow detector and (iii) FP-213S. All the three detectors (Fig. 1) are of ONO SOKKI make and have measurement capability up to 0.1 ml (ONO SOKKI, Owner's Manual). In addition Engine RPM sensors (Fig. 2) were used to measure Engine RPM, three types of sensors were used for measurement of engine RPM. They are (a) Vibratory sensor (b) Induction pick up on secondary circuit (c) induction pick up on primary circuit. They have measurement capability up to 1 RPM. For diesel vehicle, the vibration sensor is the method of measurement of Engine RPM adopted. Both the fuel flow detector and Engine RPM sensors are connected to the respective digital output meters which facilitates recording of measurement second by second (Fig. 3).Besides the fuel flow meter and digital engine meter, the voltage and pulse signal are captured through the V-Box, a GPs based data acquisition system which integrates the fuel flow and engine RPM data (Fig. 4).

(a). MF-2200 flow detector

(b). FP-214OH flow detector

(c). FP-213S flow detector

Fig 1Fuel flow Detector used for fuel consumption measurement in vehicles

Fig 2 RPM Sensor mounted on engine and RPM meter

(a). Engine RPM Meter

(b). Fuel flow Meter

Fig 3 Engine RPM meter and Fuel flow Meter with communication port

(a). Fuel flow Meter

(b). Engine RPM Meter

Fig 4: Fuel flow data acquisition system integrated with Fuel flow meter and Engine RPM meter

TEST SET UP

The test vehicle is examined for identification of fuel flow in the vehicle. Care is taken to ensure that necessary spare fuel pipes and connectors are available for use of fuel flow detector on line with the test vehicle. Depending on the engine technology adopted for a given vehicle, the appropriate fuel flow detector is selected for fuel flow measurement. On ensuring availability of connectors, fuel pipes and necessary tools for opening of the concerned joint in the fuel line. The test vehicle is considered for fuel consumption measurement. The necessary fuel connections for the existing vehicle are removed and the fuel flow detector is connected on-line. The basic logic in proper fitment of fuel flow detector in the test vehicle is that fuel once sensed by the fuel flow detector before being consumed by the engine is once again not measured. It is to be ensured that there is no leakage of fuel in the fuel line/connections of the engine after installation of the fuel flow detector in test vehicle. No adjustments or tampering is done in the engine setting for the vehicle in normal circumstances. Under extreme circumstances some minor adjustments/ setting are carried out on two wheeler and three wheelers to ensure that the test vehicle does not stop during the test period.

DATA COLLECTION METHOD

The vehicle after connecting the fuel flow detector and the data acquisition system is ensured that there is no leakage of fuel in the fuel line of the test vehicle during idling of the vehicle. The fuel consumption measurement is carried for duration of 40 minutes. With the first 10 minutes considered for cold start and warm up period for engine to hot stabilize. The reading of fuel consumption for the first ten minutes is not considered for analysis. The successive readings of 10 minutes are considered as run 1, run 2 and run 3 respectively. The stop watch is initialized for measurement of time duration and simultaneously the fuel flow meter is initialized for measuring the total flow, the event trigger is also pressed to ensure initialization of fuel flow in data logger. The information related to the vehicle as indicated in the registration certificate as well as the odometer reading as well as the information shared by the vehicle owner are also recorded. The vehicle is operated in idling mode continuously for the entire duration of the test

CALUCATION OF FUEL CONSUMPTION IN PETROL ENGINE CARS

FORMULA

FUEL CONSUMPTION = (LITRE USED X 100)/KM TRAVELLED = LITRE PER 100KM

CAR= MAHINDRA XUV 500(PETROL ENGINE CAR)

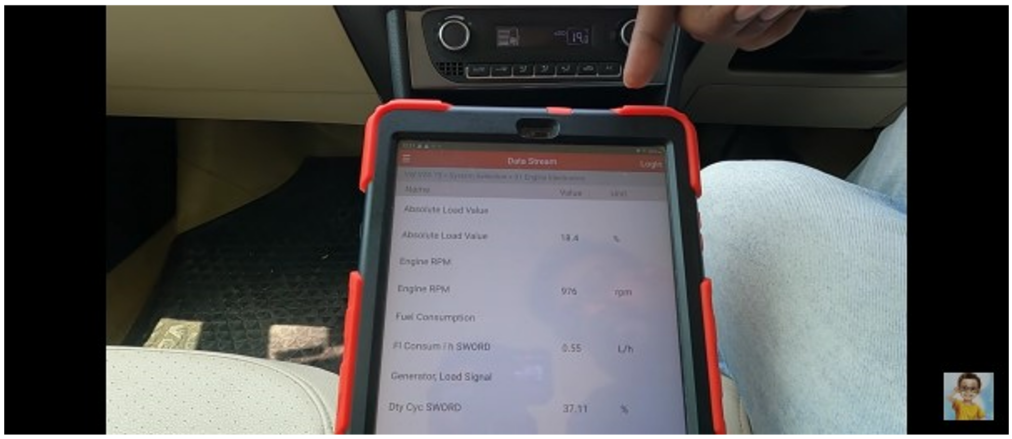
IT DRIVES 100KM

IT 35.2KM/L

FUEL CONSUMPTION =100/35.2L/100KM=2.8409L/KM

IT ANSWER OF FUEL CONSUMPTION WITH AC TURNING ON/OFF = 2.8409L/KM

TEST SAMPLE



FUEL COMSUMPTION OF AVERAGE COMBUSTION ENGINE CAR ON IDLING TEST FOR WITHOUT AC AND FAN BY OBD SCANNER

STEP 2:

FUEL COMSUMPTION OF AVERAGE COMBUSTION ENGINE CAR ON IDLING TEST FOR FAN (HIGH SPEED) WITHOUT AC BY OBD SCANNER

FUEL COMSUMPTION OF AVERAGE COMBUSTION ENGINE CAR ON IDLING TEST BOTH FAN AND AC ON HIGH SPEED) BY OBD SCANNER