

From Kewet to Buddy

More than 20 years of Electric Vehicle Experience



1988 - The Kewet



1992 - Kewet Citi-Jet 1-4



1999 - Kewet Citi-Jet 5



2004 - Buddy



2006 - Buddy Classic



2010 - Buddy M9

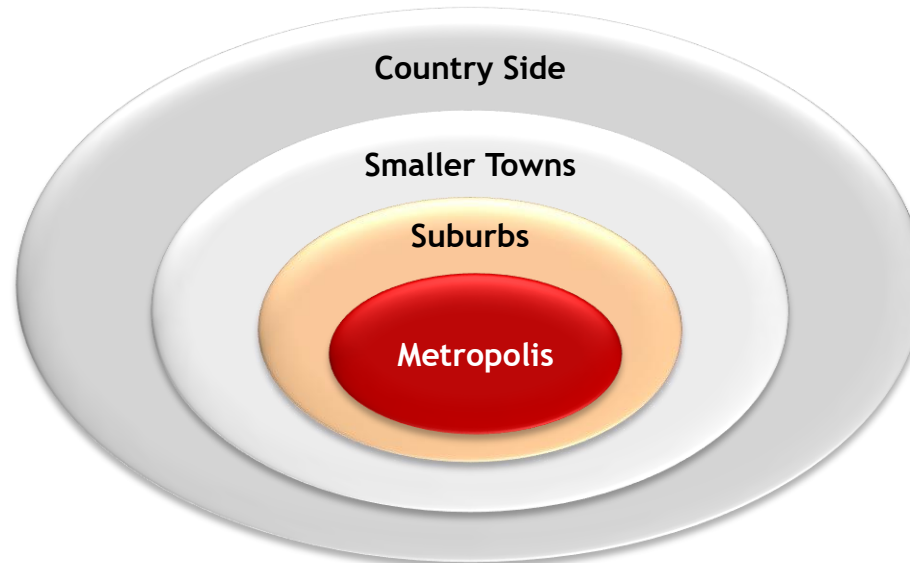
Buddy Market Target

The Main Focus



Main focus is the European City market

- Short driving distance
- Speed below 85km/h
- High density of cars



80% of all trips are below 20 km.

3 out of 10 trips are less than 10 km.

20% of all city driving is looking for parking spaces...

Scandinavian winter tested

Good weight distribution

3 seater "side-by-side"

Powerful disc brakes

Simple & Functional

Heater + Smart Start

Simple direction change



Buddy

Technical Information

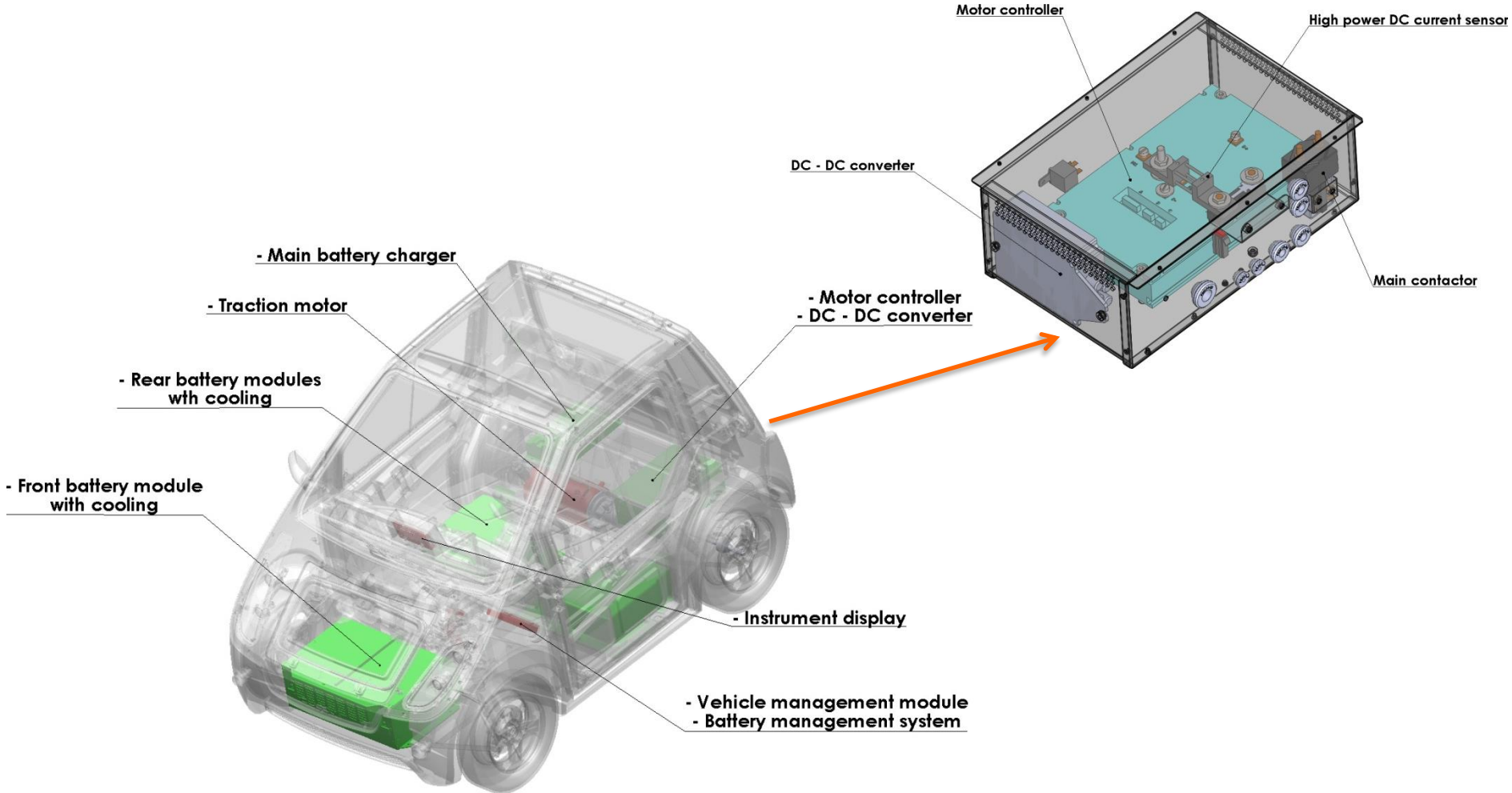


Number of seats:	3
Luggage capacity:	150 liter
Overall length:	2.44 m
Overall width:	1.43 m
Overall height:	1.44 m
Turning radius:	3.50 m
Curb weight (ALB):	872 kg
Curb weight (BAES):	750 kg
Maximum weight:	1120 kg
Acceleration:	0-50 km/h, ~7 sec
Range (ALB):	up to 60 km
Range (BAES):	up to 120 km
Charging time:	0-100% in 6-8 hours
Construction:	DCPD RIM (Telene)
Frame:	Galvanized steel tubes
Safety cabin:	Welded tubular steel space frame



Electrical Drive Train

Main components



Electrical Drive Train

Main components



Vehicle Management System:	Integrated solution of vehicle and battery management (own development)
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Display:	LED 8 segment display and LCD - under development - (own development)
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Battery cooling:	Active air cooling (own development)
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Charger:	On-board, single phase 230VAC, 10A fuse (3rd party)
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Motor:	72VDC, 13kW rating, up to 25kW peak power (3rd party)
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Motor Controller:	MOSFET technology, 4 quadrant chopper (3rd party)
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DC/DC:	72V to 12V continuous power 400W (3rd party)
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Battery Strategy

Buddy Electric strategy front different technologies



Optimize battery size and technology to different markets
(Price vs Range and Battery Life)

Nickel-metal Hydride (NiMH):

- Long range and life (10 years warranty)
- Robust proven technology
- Same technology as used by Toyota Prius

Lead Acid:

- Low cost

Lithium (future alternative?):

- Uncertain reliability / Warranty
- High cost

Others

- Monitoring market and tendencies

Buddy Service Portal

Future possibility

Product Information, service procedures, 3D Model, E-learning



Serviceportal

Home Service Support Search 3D Explorer < quick search > go!

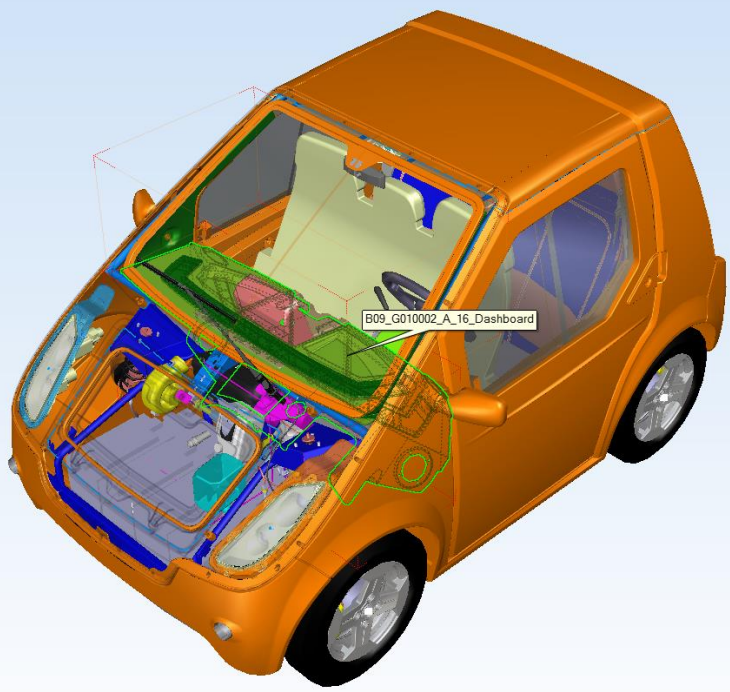
Home > 3D Explorer > B09

- Controls
- Show all
- Reset view
- Fit all
- Fit selected
- Isolate selected
- Hide selected
- Main systems
- Interior
- Wiring
- Heat system
- Light
- Battery system
- Drive gear
- Engine
- Electrical box
- Steering system
- Brake system
- Wheel position
- Chassis
- Flushing system
- Wiper system
- Body

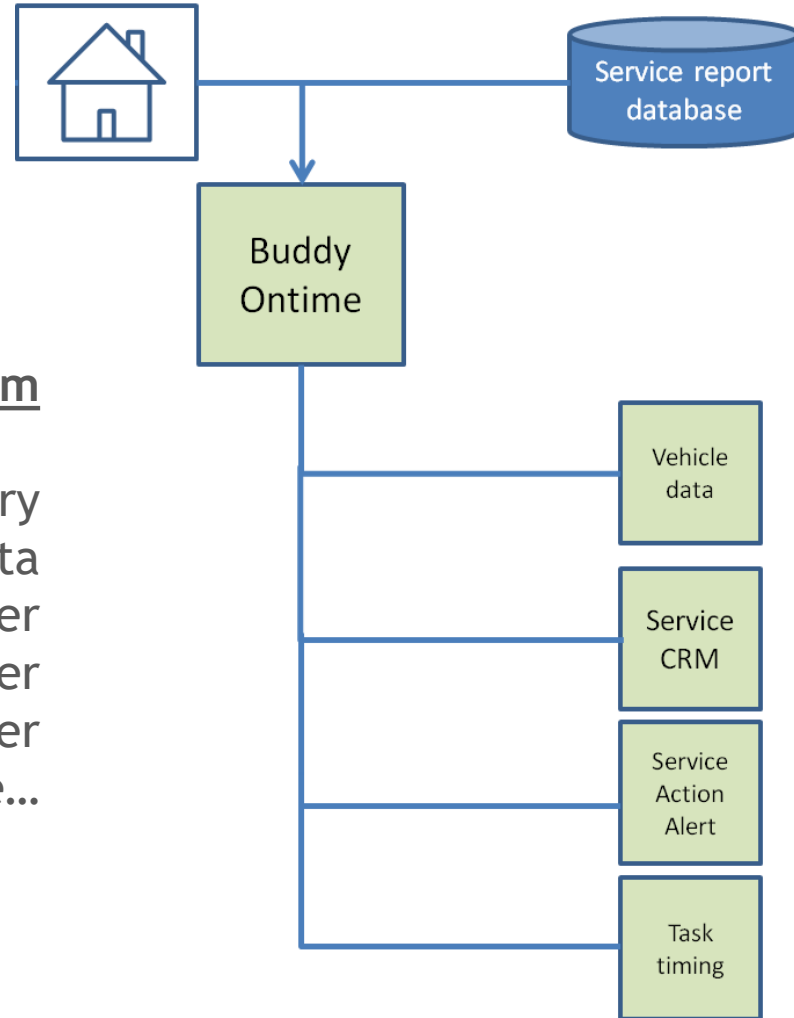
BuddyCam™

Component structure

- Body
 - Body plates
 - Bumper front
 - Front panel
 - Hood
 - Roof
 - Rear panel
 - Radiator grille
 - Door
 - Lock and door opener
 - Mirror
 - Inner fender
 - Water deflector



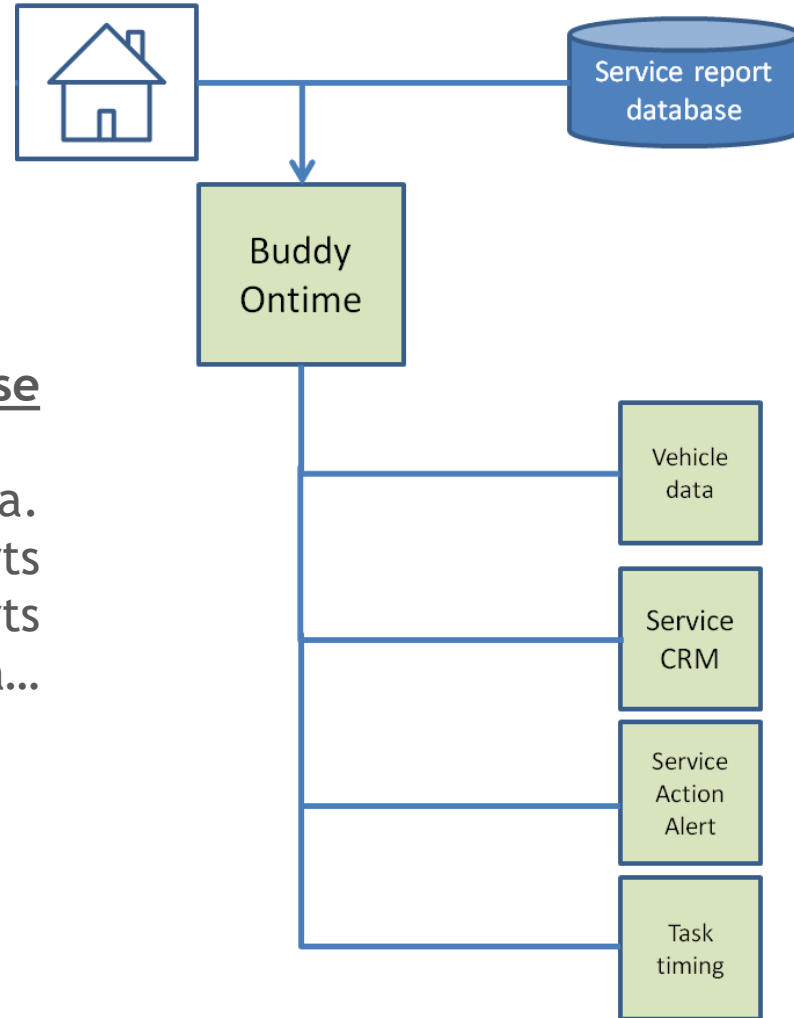
Buddy Ontime System



Buddy Ontime System

Service history
Vehicle data
Task timer
Bulletin distribution center
Electronic autoshop planner
And more...

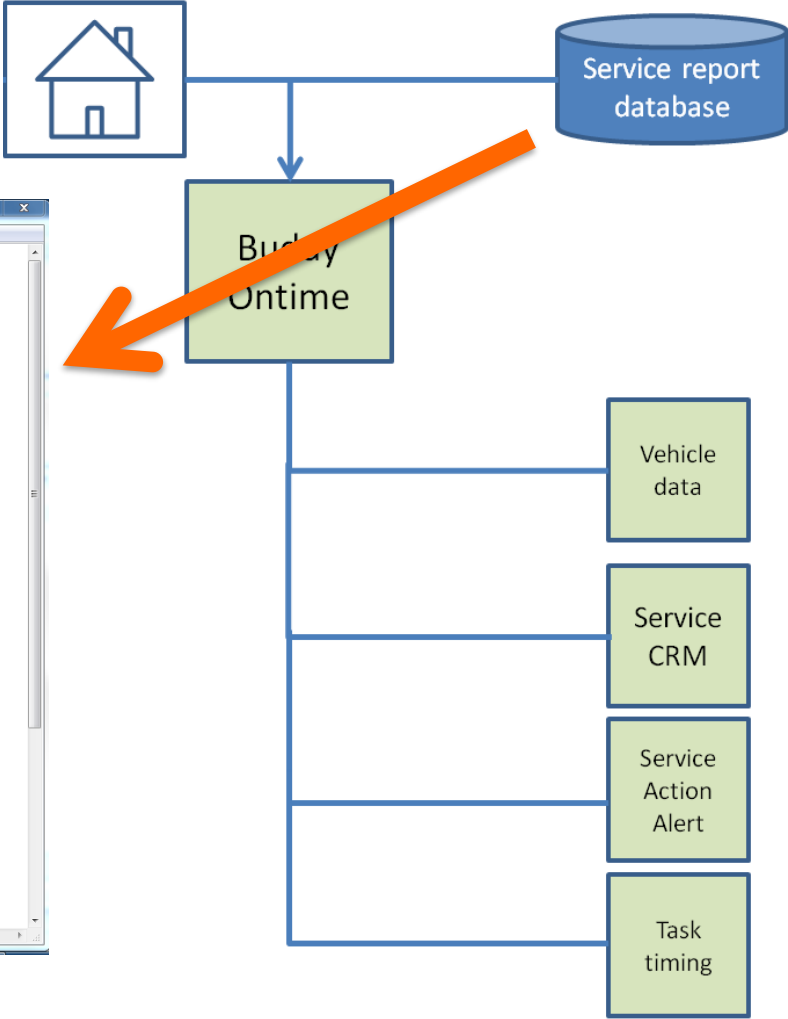
Buddy Ontime System



Service report database

Non violate battery warranty data.
Service reports
Misuse reports
Searchable criteria...

Buddy Ontime System



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Y29BLN0009F005036_03-02-2011_11-07-13_ServiceReport - Notepad
File Edit Format View Help
*****
*      Buddy electric vehicle      *
*      Service Report              *
*****
Vehicle Identification Number : Y29BLN0009F005036
Software version              : CC2_110127
VMS serial number             : 309
Mileage recorder              : 10668 Km
Amp hours recorder            : 17169 Amp hours
Set to charging                : 547 [Times]
Charging finished             : 224 [Times]
Misuse                        : 37 [Times]
Battery type                   : NiMH
Battery identification number  :
Date for last battery change  :
Capacity new battery          : 182.4 Amp hours (80%)
Capacity available            : 182.4 Amp hours
Capacity at display           : 78 %
Capacity discharged           : 41.3 Amp hours
Battery box temperature       : +12 Degrees Centigrade
Battery temperature front     : +13 Degrees Centigrade
Battery temperature rear      : +12 Degrees Centigrade
Current                       : -19.4 Amperes
Battery cycle count           : 88.2
Equalizing chargings         : 12
Last balancing voltages:
No data
No data
No data
No data
No data
No data
Battery no:      voltage:      Efficiency min. 70%
Battery 1-2      : +13.89 volt  100 %
Battery 3-4      : +13.88 volt  100 %
Battery 5-6      : +13.91 volt  100 %
Battery 7-8      : +13.89 volt  100 %
Battery 9-10     : +13.92 volt  100 %
Battery 11-12   : +13.91 volt  100 %
12 volt system  : +13.79 volt

Balancing charge is currently not needed
No charger faults detected
Battery temperature over 45 C, in OFF mode, in total 0:0:0 longest period 0:0:0
Battery temperature over 45 C, in CHARGE mode, in total 0:0:0 longest period 0:0:0
Battery temperature over 45 C, in DRIVE mode, in total 0:0:0 longest period 0:0:0
Battery temperature over 50 C, in OFF mode, in total 0:0:0 longest period 0:0:0
Battery temperature over 50 C, in CHARGE mode, in total 0:0:0 longest period 0:0:0
Battery temperature over 50 C, in DRIVE mode, in total 0:0:0 longest period 0:0:0
Battery temperature over 55 C, in OFF mode, in total 0:0:0 longest period 0:0:0
Battery temperature over 55 C, in CHARGE mode, in total 0:0:0 longest period 0:0:0
Battery temperature over 55 C, in DRIVE mode, in total 0:0:0 longest period 0:0:0
Battery temperature over 60 C, in OFF mode, in total 0:0:0 longest period 0:0:0
Battery temperature over 60 C, in CHARGE mode, in total 0:0:0 longest period 0:0:0
    
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VCA and QMS

Vehicle Type Approval and Quality Management System



Vehicle Type Approval (Category L7e)

VCA is the designated UK Approval Authority and Technical Service for type approval to all automotive European Community (EC) Directives and the equivalent United Nations Economic Community for Europe (ECE) Regulations. Vehicle Type Approval is the confirmation that production samples of a design will meet specified performance standards.



Quality Management System

Buddy Electric have developed a Quality Management System based on the ISO/TS16949, an ISO technical specification aiming to the development of a quality management system that provides for continual improvement, emphasizing defect prevention and the reduction of variation and waste in the supply chain.



VCA Type Approval

Directive 2002/24/EC



VCA Headquarters
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Eastgate Road
Bristol, BS5 6XX
United Kingdom

Switchboard: +44 (0) 117 951 5151
Main Fax: +44 (0) 117 952 4103
Email: enquiries@vca.gov.uk
Web: www.vca.gov.uk

THE UNITED KINGDOM VEHICLE APPROVAL AUTHORITY EC TYPE-APPROVAL CERTIFICATE

Communication concerning Type-Approval of a type of vehicle
with regard to Directive 2002/24/EC as last amended by EC Regulation 1137/2008

Type-Approval number: e11*2002/24*0983*03 Correction 01

Reason for extension: To cover: 1.) Addition of new safety belt with fabric stalk

0. GENERAL

0.1. Make(s) (trade name of the manufacturer): Pure Mobility

0.2. Type: M9

0.2.1. Commercial name(s): Buddy

0.3. Means of identification of type, if marked on the vehicle: Vehicle Identification Number Y29B

0.3.1. Location of that marking: Left hand shock-absorber tower

0.4. Category ⁽²⁾: L7e (Bodied Quadricycle)

0.5. Name and address of the vehicle manufacturer:

Pure Mobility AS
Spireaveien 6
N - 0580
Oslo
Norway

0.6. Name(s) and address(es) of assembly plant(s):

Pure Mobility AS
Spireaveien 6
N - 0580
Oslo
Norway

Job Number: VWL227611

An executive agency of the Department for Transport



The undersigned hereby certifies the accuracy of the manufacturer's description in the attached information document of the vehicle type described above, for which one or several representative samples, selected by the competent approval authorities, has (have) been submitted as prototype(s) of the vehicle type and that the attached test results are applicable to the vehicle type.

The vehicle type meets the technical requirements of all the relevant separate Directives (as last amended) listed in the table of Annex I to Directive 2002/24/EC.

The approval is: GRANTED

Place: BRISTOL

Signature:

A.W. STENNING
Head of Technical and Quality Group

Date: 25 FEBRUARY 2011

Attachments: Information document, Parts 1 and 2 (Annex II).

~~Test results (Annex VII).~~

Name(s) and specimen(s) of the signature of the persons authorised to sign the certificates of conformity and a statement of their position in the company.
A model certificate of conformity.

⁽¹⁾ Delete where not applicable.

⁽²⁾ According to the classification introduced in Article 1.

Job Number: VWL227611

An executive agency of the Department for Transport



Quality Management System

Based on ISO/TS16949



PURE MOBILITY

**OPERATIONAL PROCEDURE
ENGINEERING CHANGE REQUEST / ORDER**

Doc.no. BPD001 Ver. 02
Date 01.06.11 Page/Pages 1 / 3

Ver.	Date	Issued	Approved	Last updates
01	01.06.11	Milost T.	Edoardo E.	Updated Responsibility and Flow
01	18.02.11	Robson R.	Edoardo E.	Introduction of BPD002 – Drawing / Specification control
00	18.10.10	Robson R.	Edoardo E.	Initial submission

1. Purpose
This instruction describe the Engineering Change process at Pure Mobility AS.

2. Scope
All Engineering Change at Pure Mobility AS must be created, evaluated, approved, controlled, archived and distributed following this instruction.

3. Responsibility
All departments at Pure Mobility AS and Pure Mobility suppliers can request changes.
Engineering Changes must be managed by the Change Manager and the Change Responsible.
Issuer can be anyone that requests for a change
Change Manager is responsible to update the total overview of all ECR/ECO and status of each.
Change Responsible is responsible that the unique ECR/ECO follows this routine, each function/department is informed and that there is progress.
Multi-functional team, formed by R&D, Production and Purchase, is responsible to approve or reject for further progress in defined gates.
Issuer and Change Responsible are very often the same person.

4. Definitions
ECR: Engineering Change Request.
ECO: Engineering Change Order.
PER: Part Evaluation Report.
Product Changes: Changes that have influence on Form, Fit and Function (eg.: New specification, drawing or design).
Process Changes: Changes that have NO influence on Form, Fit and Function (eg.: New supplier, tool or process).

5. Description
An ECR/ECO can be proceeded by a project. The project can result in an ECR/ECO. The project can already include some answers/information as requested in BD701. On these, it is enough to give a reference to the project number.

5.1 Engineering Change Request
All change process start after the definition of the change needed with the fulfillment of the request from release B or higher, accordingly BPD002.
The ECR form must be fulfilled, by issuer, with:

Part number: Part number of the component / system subject to change;
Drawing/Release: Drawing number and release of the component / system subject to change;
Description: Description of the component / system subject to change,
Issued date: Date of the ECR,
Issued by: Name of the person requesting the change;
Area or Supplier: Department at Pure Mobility AS or Pure Mobility supplier requesting the change;
Change Description: Detailed description of the change to be evaluated;
Impact/Benefits: Expected results of the change (cost reduction, quality/productivity improvement);
Other affected parts: Other components that will or potentially can be affected with the change;
Attachments: Other documents attached to the ECR like drawings, sketches, pictures, reports, etc....


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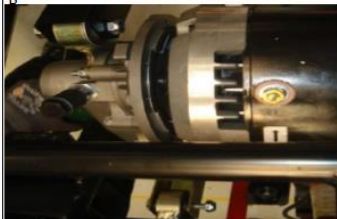
WORK INSTRUCTION


Assembly Line
Operation: **L00130**
TIME: **12 min.**

Ver.	Date	Issues	Approved	Last Updates
02	12.06.2011	Magnus J.	Robson R.	New form and torque meter nr
01	27.05.2011	Magnus J.	Robson R.	Updated part numbers and changed torque in pic c and length of screw
00	26.05.2010	Victor L.	Robson R.	Initial submission-preliminary

Description: Assemble the Engine/Gearbox unit

A

Lubricate the splines of the gearbox

B

Assemble the engine to the gearbox
Attention: Enter the bolts manually first

C

Tighten and mark the bolts

D

Step	Part Number	Description	Qt.	Tool	Control
A	BD0_C010010	Motor72VDCSepExt13kW	1		
A	BD0_T020003	Black Grease	10g	Brush	
B				Crane	
B	BD0_S010006	Bolt 6KT M6 x 35 8.8 ZN DIN913	3	Manual wrench + extension + 10mm socket	
B	BD0_S030003	Plain Washer 6.4 x 16 x 1.6 ZN DIN6021	3		
B	BD0_S030010	Serrated Washer 6.4 ZN DIN678A	3		
C				Torque meter 2009/2387764 + 10mm socket	12 Nm

Reaction Plan
In case of problems on this operation, stop the production and inform the team leader immediately

PureMobility Production System - Operation: L00130_EN.xlsx

BD101 V02

Assembly Line

General View



Assembly Line

Stations #1 to #6



Assembly Line

Stations #4 to #9



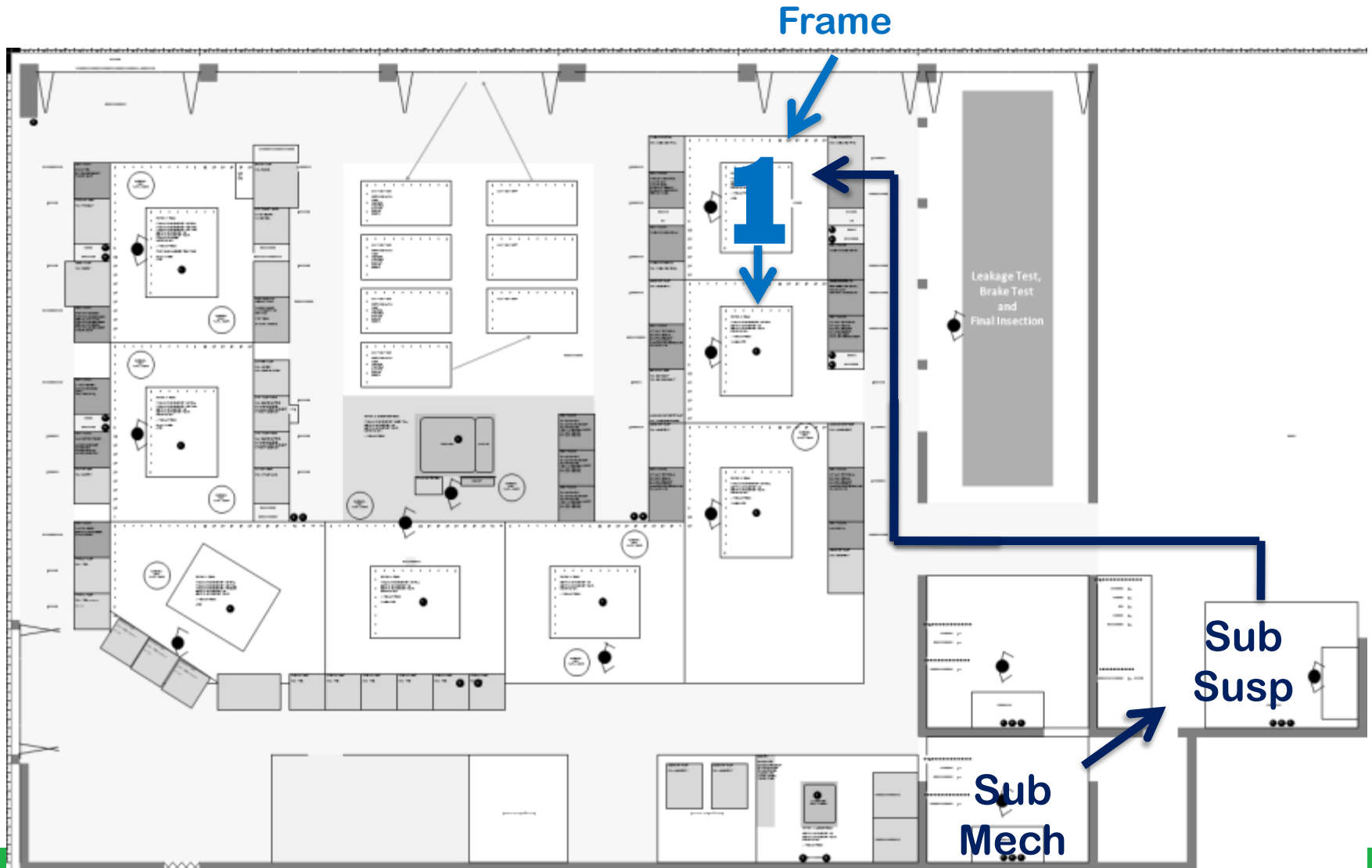
Assembly Line

Stations, Sub-Assemblies and Flow



Assembly Line #1 - Suspensions

Stations, Sub-Assemblies and Flow



Assembly Line #2 - Dashboard

Stations, Sub-Assemblies and Flow



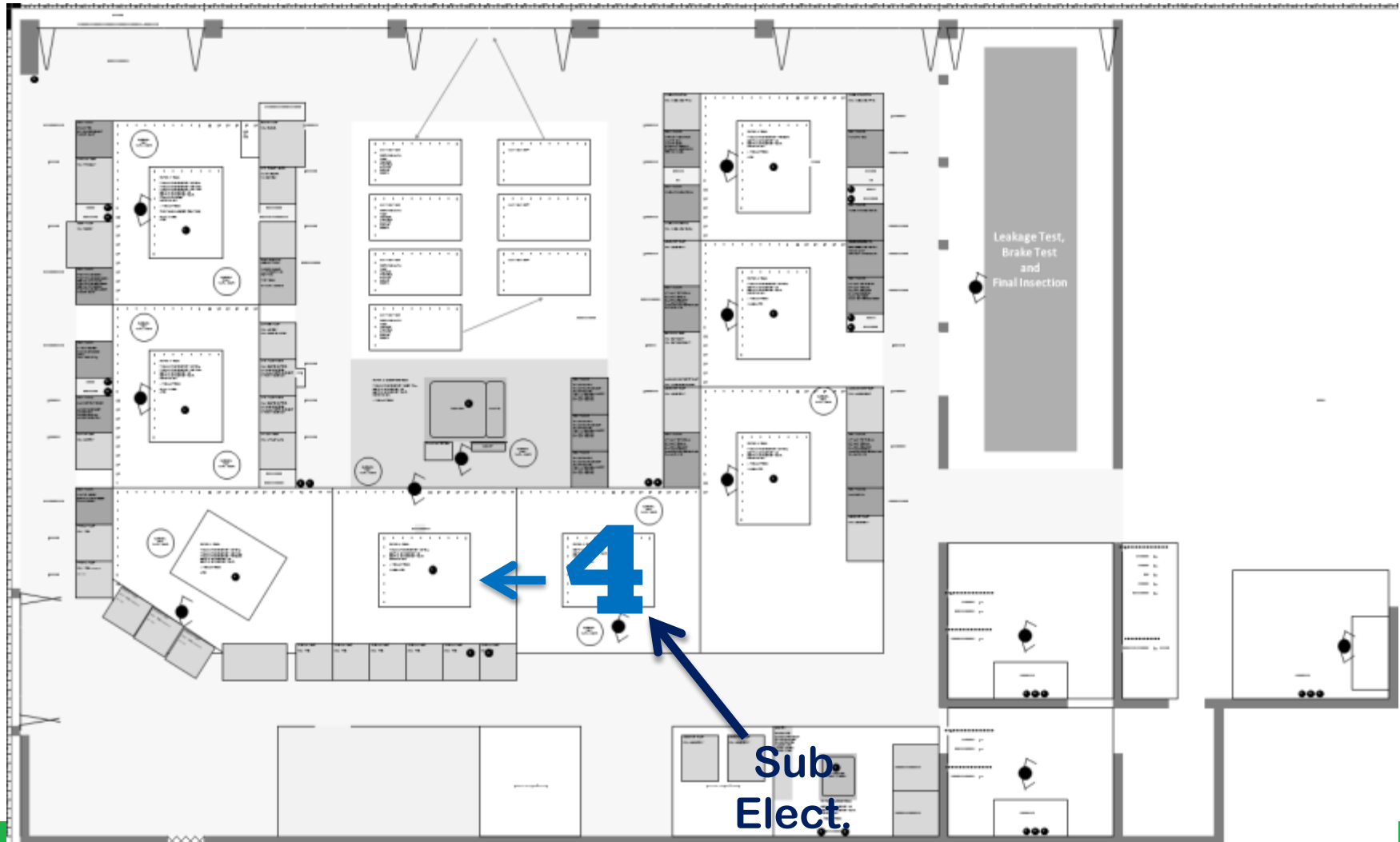
Assembly Line #3 - Elbox

Stations, Sub-Assemblies and Flow



Assembly Line #4 - Batteries

Stations, Sub-Assemblies and Flow



Assembly Line #5 – Body Work

Stations, Sub-Assemblies and Flow



Assembly Line #6 – Interior 1

Stations, Sub-Assemblies and Flow



Assembly Line #7 – Interior 2

Stations, Sub-Assemblies and Flow



Assembly Line #8 – Doors

Stations, Sub-Assemblies and Flow



Assembly Line #9 – Test / F. Insp.

Stations, Sub-Assemblies and Flow



Charge



9



Current Supplier Base

Worldwide Supply Chain



Americas:

ALB batteries
Motor

Europe:

Frame	Sealers	Interior
Body work	Mirrors	Windows
Std fixings	Brake parts	Gearbox
Steering	Charger	HAVAC
Motor controller		

China / Taiwan / HK:

Metal parts
Suspension parts
Brake parts
Drive shafts
DC converter
Car electronics
NiMh batteries

South East Asia:

Tires, Rims, Switches

