# Window Lift Motor Durability Testing System

The window lift motor durability testing system is for the durability of a window lift motor. The system contains control system, which can control the system and collect, save, and analyze the test data, and chamber which can control temperature and humidity. Totally, six specimens can be tested at the same time by created cycle profiles.
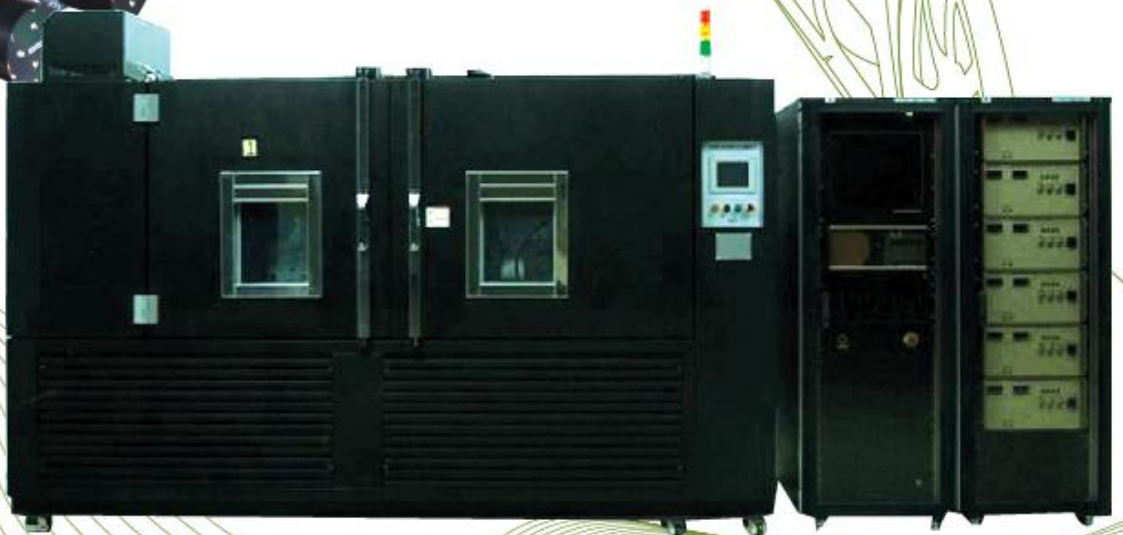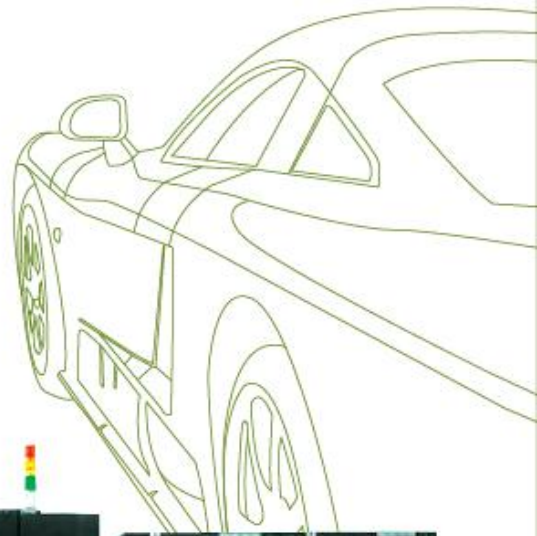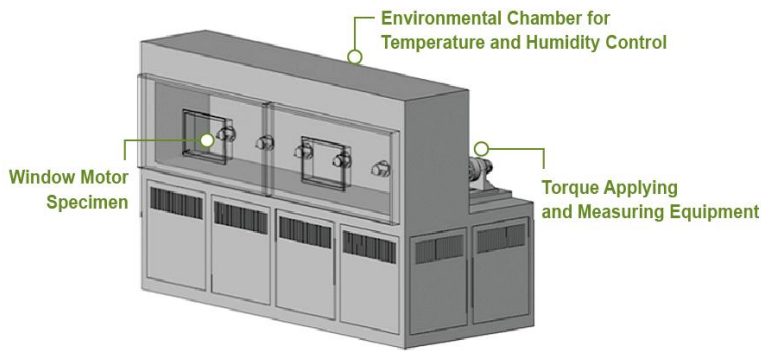
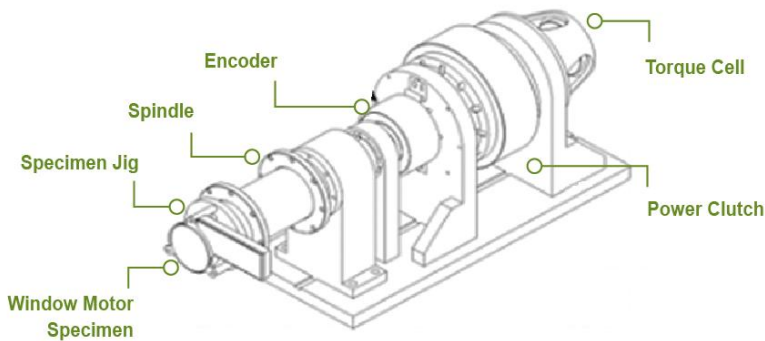Fig. 1 Window lift motor Test system Overview

Fig 1 is the overview of the system and Fig 2 is the driving module which is a torque applying and measuring equipment.

Specimens are placed inside the chamber and the driving module is placed outside the chamber for protecting from environmental effect. Therefore, there is a spindle between specimen jig and driving module to transmit power.

After the operating signal from the controller, the specimen (window motor) is started, then the torque is applied to the motor spindle by the powder clutch. For applying the impact to the specimen, a pneumatic actuator holds the motor rotation.

Fig. 2 Driving module diagram

The torque can be measured and monitored by the torque meter which is placed behind the driving module. The measured signals uses as a feedback signal for the torque control loop. The encoder (inside driving module) can collect the rotation speed and angle of the specimen. There is a jig can be placed between the spindle and specimen for various specimens.

Table. 1 Window lift motor Test System Specifications

Environmental Chamber	Volume	2500X500X610 mm
	Temp. range	-45 ~ 120 ℃
	Humid range	30 ~ 98 %RH
	Heating rate	2 ℃/min
	Cooling rate	2 ℃/min
Torque generator	Torque	25 Nm
	Capacity	30 W
	Speed	800 rpm
Toque sensor	Capacity	30 Nm
Angle Sensor	Speed	1800 rpm
	Resolution	10 ~ 12 bit

External DC Power

DC 0-3OV

SUB Controller

Control Signal, Voltage, Ampere

Encoder

Clutch Control

Torque, Sensor Signal

Pneumatic Stopper

Fig 3 is the schematic diagram for the window lift motor test system. The system is controlled by a server PC which can collect, save, and analyze the data. The multi-channel A/D board is installed at the controller. The software can control and monitor the test process. The controller is mounted at a control rack which contains monitor, PC, keyboard, and mouse.

Data from each specimen are voltage, current, torque, angle, and chamber temperature. The test is processed by the user's control profile. During the durability test, the damage and failure of the specimen is judged by maximum open/close hour, and then stop the test.

Fig. 2 Window lift motor Test System schematic diagram

Each setting value can be changed by the user and the measured data can be saved by specific period.

Fig 4 is the layout of the software.
The post process software is to input the test procedure and create the test profile. Therefore, the user can test without any third party tools.
The profile is made by dnb or rsp file format and called by the control software. The control software is not only control the test, but make and record the result of the user's analysis such as power consumption and peak ampere. In this process, the file contains a raw data file of the sensor, performance changes of the motor, and data for the life analysis.

Deneb System Software

Preprocess Software → Control Software → Postprocess Software

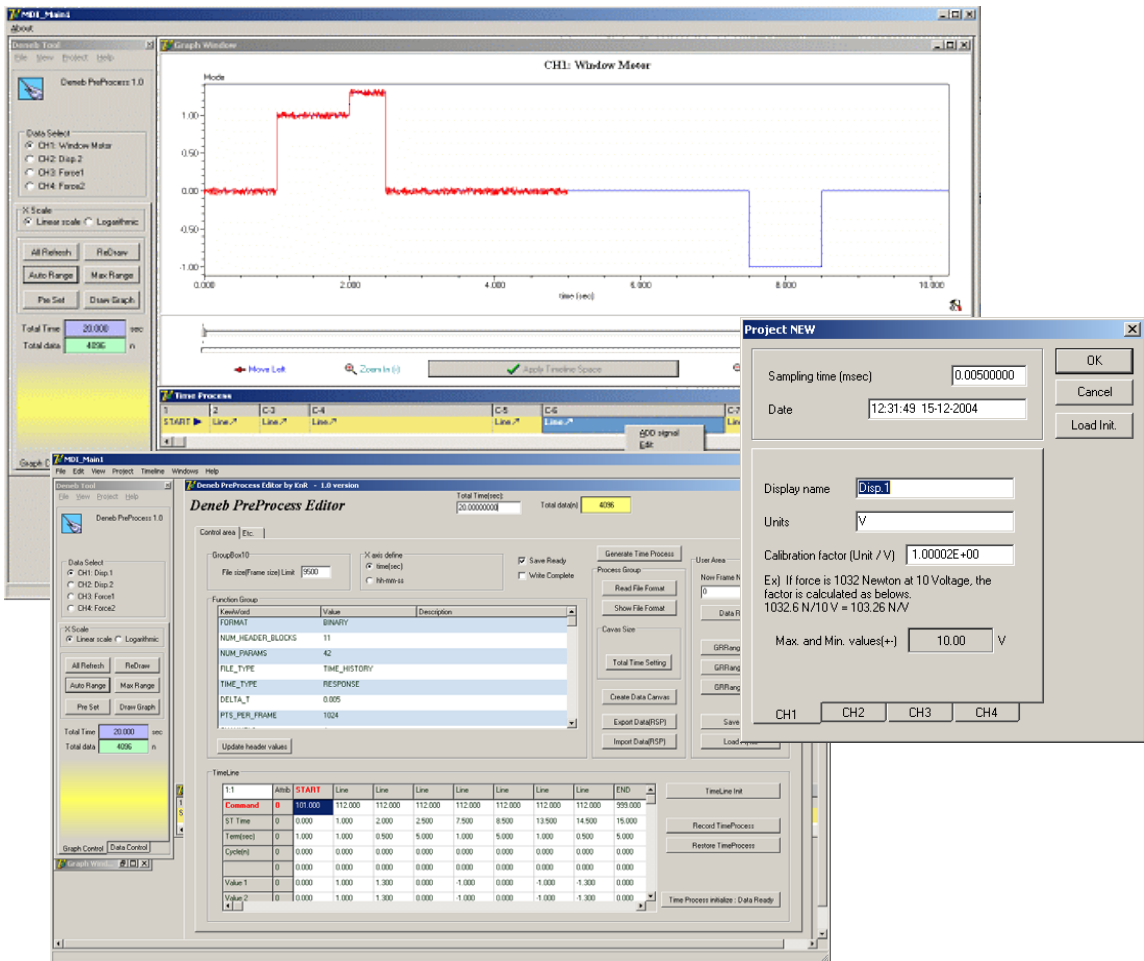Fig. 3 Window lift motor software layout

Fig. 5   Window lift motor Software (Pre-process)

The post process software is to analyze the test result such as sensor fluctuating value. In addition, the user can make a report by the purpose and save the report as a PDF file. The saved report with raw data can be loaded by the user and reanalyzed for other purpose. Therefore, the data can be used as various purposes.

Fig 5 is the main screen of the pre process software By the picture, the user can set a test profile by operating factor. Each time period can be set by maximum or minimum time. Furthermore, each measured data is saved as various file formats such as RPC3 or ASCII. The software has a function that makes and save a graph of the analyzed data from measured value of average current, peak current, and other data.