POWERLINK Dynamometer for Construction Machinery Transmission, Gearbox, Torque Converter and Hydraulic Transmission Test

Configuration reference
1. **Low-cost gearbox and transmission test configuration:**

- Driven by engine, eddy current dynamometer as the load

![Diagram of the test configuration](chart.png)

The purpose of using accompanied gearbox (accelerated gearbox) is mainly to increase the speed and reduce the test bench cost. After engine driving gearbox, the output speed will become very low. In case of constant power, the lower the speed, the greater the torque. Assuming that the gear ratio of the test gearbox may be high, the output torque may be large. The low speed and high torque load is expensive and also hard to find the right one. So the final speed must rise up. The accompanied gearbox can take use the test gearbox in reverse to reduce the test bench cost.
1. Low-cost gearbox and transmission test configuration:
   - Driven by engine, eddy current dynamometer as the load
1. Low-cost gearbox and transmission test configuration:

- Other projects using accompanied gearbox (accelerated gearbox) with the eddy current dynamometer as the load
2. **AC dynamometer transmission test configuration**
   (using the same gear ratio of accompanied gearbox):

   - Electric dynamometer as the drive and the load

Gearbox test equipment is a set of different speed, torque input and output gearbox test bench. The test bench uses the AC drive motor, AC load motor and through the common DC bus to feedback energy for achieving energy saving purpose.
2. AC dynamometer transmission test configuration
(using the same gear ratio of accompanied gearbox):

- Electric dynamometer as the drive and the load
2. **AC dynamometer transmission test configuration**
   (using the same gear ratio of accompanied gearbox):

- **Case study**

![Test transmission Accompanied gearbox (accelerated gearbox)](image)
3. AC dynamometer transmission test configuration  
(using different gear ratio of accompanied gearbox):

- Electric dynamometer as the drive and the load
3. AC dynamometer transmission test configuration (using different gear ratio of accompanied gearbox):

- Electric dynamometer as the drive and the load
3. AC dynamometer transmission test configuration
   (using different gear ratio of accompanied gearbox):

   • Case study
4. Using lifting platform AC dynamometer to test different gearboxes:

- AC dynamometer as the load is placed on the lifting platform.
- The high point of lifting platform is to test the input and output coaxial gearbox or transmission.
- The low point of lifting platform is to test the input and output non-coaxial gearbox, powershift transmission or hydraulic transmission.
5. Using lifting platform Eddy Current Brake to test different gearboxes:

- The eddy current dynamometer as the load is placed on the lifting platform.
- The drive section can be the engine or AC dynamometer
6. Major component – Eddy Current Dynamometer
   (Option 1 as the load, the drive can be the engine or AC dynamometer)

6.1 GW series Eddy Current Dynamometer

   The system uses the eddy current dynamometer. The torque measurement uses high-precision tension/compression force transducer. The system measurement accuracy can be up to 0.2% FS. Speed measurement uses magnetic speed sensor and the system measurement accuracy is ±1 rpm.

6.2 JC series Torque Sensor

   The torque is controlled through the torque measured by the torque sensor and compared with the torque setting by the system.
6. Major component – AC Dynamometer (Option 2 as the load and the drive)

6.3 AC Dynamometer

AC dynamometer transfers mechanical energy of engine into electrical energy. The converter controlling AC dynamometer feedbacks the electrical energy to the public power grid. The AC variable frequency speed regulation system adjusts the current to control the engine speed and torque.

6.4 High Accuracy Torque Sensor

High-precision and durable torque sensor can be used in oily and dusty test benches environment.
6. Major component – AC Dynamometer (Option 2 as the load and the drive)

6.5 Converter

The load motor is driven by the converter which is composed by the rectifier/ regenerative unit and inverter. The rectifier/ regenerative unit consists of two antiparallel units capable of flowing electrical energy in two directions, i.e. to return the electrical energy back to the grid (four-quadrant operation).

The power generation bridge is connected to the grid via an autotransformer. When the motor is in the power generation state, the power can be fed back to the grid through its feedback unit.
6. Major component

6.6 Dynamometer Calibration device

The static calibration is applied for dynamometer torque sensor.

Calibration device includes the calibration arm and standard counterweights. High accuracy of the calibration arm length, accurate weight hanging position and standard weight ensures the accuracy of the static calibration. The counterweight surface has blackening treatment and metered.
7. Foundation, Mechanical Installation Section

7.1 Shaft Protection Cover

7.2 Cast Iron Base Plate and Dampers

7.3 Drive Shaft and Coupling

7.4 Transmission Mounting Bracket
8. Gear Shift and Clutch Pedal Control

8.1 FC2320 series Gear Shift Actuator

- Speed and force are adjusted via user interface
- Interface controls gear shift
- Emergency cut-off function
- Remote control function

8.2 FC2110E Drive Unit

FC2110E Drive Unit mainly includes servo amplifier and related peripheral control circuit for controlling the servo motor in FC2320 series Gear Shift Actuator/Clutch Pedal Controller.
9. Temperature and Pressure conditioning devices

9.1 FC2430TX Transmission Oil Temperature Control Device

FC2430TX is mainly used to regulate and control the temperature of the transmission oil. It has the built-in oil pump to provide power for the oil circulation.
10. Control Units and Modules

• For fixing mounting Powerlink system components and control, monitoring and measuring equipment.
• Modular design provides extensive system expansion possibilities.
• The industrialized design of the operation ensures the best installation and service environment.
10. Control Units and Modules

8.1 FC2013 Electric Dynamometer Control Unit

FC2013 uses full digital PID control method to adjust the load speed and torque and control the output of the converter. The actual torque and speed measurement values are received from the torque sensor. The difference between those values and the actual values are compared to adjust the output of the converter until the final target values are achieved.
10. Control Units and Modules

10.2 FC2022 Data Acquisition Module

- Acquisition accuracy <0.3% FS.
- Sampling rate: 10 ms
- 16 channels: PT100, 4-20mA, etc

10.3 FC2021C Switch Module

- 8 channel switch inputs
- 8 channel switch outputs
- 2 channel frequency inputs
11. **Software** (English interface can be selected)