POWERLINK AC Dynamometer for Powertrain and Transmission Test

Configuration reference

www.powerlinkpt.com
info@powerlinkpt.com
1. Powertrain Test Layout

The system configures with one input dynamometer (Permanent magnet synchronous motor) and two output dynamometers (Asynchronous motor).
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The dynamometer system layout can be varied to fit with different types of MT, AT, DCT, CVT transmissions using with the layouts as Front engine Front drive (FF), Front engine Rear drive (FR), Middle engine Front drive (MF), etc.
2. Major part of AC dynamometer

The input dynamometer considers permanent magnet synchronous motor but not asynchronous motor because of the limited length distance between input shaft and output shaft of transmission.

Traditionally asynchronous motor, usually has bigger size, was applied for input motor in the past. An extra gearbox needs to apply for the position of transmission input drive shaft.

By applying PM synchronous motor, smaller input dynamometer can be achieved. Besides, higher maximum speed can be reached.
2. **Major part of AC dynamometer**

2.1 **AC Dynamometer (1 input, 2 outputs)**

AC dynamometer transfers mechanical energy of motor 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 motor speed and torque.

2.2 **High Accuracy Torque Sensor (x3)**

High-precision and durable torque sensor can be used in tough test bench environment.
2. Major part of AC dynamometer

2.3 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.
2. Major part of AC dynamometer

2.4 Dynamometer Calibration device

The static calibration is applied for dynamometer torque sensor.

Calibration device includes the calibration arm, balance arm, weight disc and 4 standard weight composition. 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.
3. Foundation, Mechanical Installation Section

3.1 Shaft Protection Cover

3.2 Cast Iron Base Plate and Dampers

3.3 Drive Shaft and Coupling

3.4 Transmission Mounting Bracket
4. Gear Shift and Clutch Pedal Control

4.1 FC2320 series Gear Shift Actuator / Clutch Pedal Controller

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

4.2 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.
5. Temperature and Pressure conditioning devices

5.1 FC2420TD Test Motor Coolant Temperature Control Device

FC2420TD is a dedicated temperature control device for cooling dynamometer motor, vehicle motor and its controller. It is an essential auxiliary equipment to ensure the smooth testing of the motor test stand.

5.2 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.
6. Electrical parameter measurement system

The electrical parameters of the tested motor and its controller need to be measured during the system test. The power meter chosen for this purpose is used as an electrical parameter measurement and acquisition instrument. Power analyzer can accurately test all the electrical parameters of the system and its transformation, acquisition, calculation and so on. System is equipped with a power analyzer host, current transformer and test data cables.

Power measurement technology provides the highest level of accuracy and stability. Basic power accuracy: 0.01% of reading, measurement bandwidth: 0.1Hz-1MHz, up to four input units can be installed. The power analyzer can achieve high precision measurement of the motor controller input/output efficiency.
7. Battery Simulator or DC Power Supply (Optional)

The power converters for battery simulation & battery testing and DC-power supply applications have special features: Battery operated installations can be simulated and tested with nearly any type and characteristic of batteries. The power converters can be modified to any type of battery the customers wants to be tested.

Application range:

- Testing of the battery in current control mode
- Simulation of the battery in voltage control mode
- Simulation of the battery with internal battery model
- Simulation of the battery at low battery resistance value
- DC power supply applications
- Test of electric motor drives and inverters
8. 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.
8. 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.
8. Control Units and Modules

8.2 FC2022 Data Acquisition Module
- Acquisition accuracy <0.3% FS.
- Sampling rate: 10 ms
- 16 channels: PT100, 4-20mA, etc

8.3 FC2021C Switch Module
- 8 channel switch inputs
- 8 channel switch outputs
- 2 channel frequency inputs

8.4 FC2025 D/A Conversion Module
- Digital/ Analog conversion precision: 12 digit
- 8 channel digital/ analog outputs
- 4 channel frequency inputs
9. **Software** (English interface can be selected)