ENGINEERING TOMORROW

Reference : ADC Test facility rates 2025
Location : Gorinchem, The Netherlands
Date : 20-03-2025

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1. ADC-test facility rates

Terms and conditions for each test are separately agreed between the customer and Danfoss. Danfoss Drives permits the customer to utilize the ADC test facilities on weekdays between 08:00 – 16:30, excluding Dutch public holidays. Table 1 outlines the rates for each service/activity.
For standard tests, an hourly rate is charged, based on the testbench which is used. In addition to the testbench rate, an hourly rate "Danfoss test engineer" will be applied.
If a custom test setup is needed or when external Equipment Under Test (hereinafter referred to as EUT) is connected, a daily rate will be charged and test plan validation is necessary. There are separate rates for assembly and disassembly, and actual testing. Additionally, an hourly rate for assistance/supervision will be applied.

Service / activity	Rate	Units	Remarks
Safety Briefing	€ 185	€ once	Group briefing including access approval
Danfoss test engineer	€ 150	€/hour	Supervision / assistance of 1 Danfoss engineer
Standard test 200kW NXP hybrid test setup	€ 185	€/hour	All standard tests without modification to setup
Standard test 2200kW NXP test setup	€ 185	€/hour	All standard tests without modification to setup
Standard test iC7 hybrid test setup	€ 185	€/hour	All standard tests without modification to setup
Testplan validation	€ 150	€/hour	Validation and approval of test plan by Danfoss
Custom test setup assembly & disassembly	€ 1.250	€/day	Assembly of test setup done by customer
Custom test setup testing	€ 2.950	€/day	Tests which require modifications or external EUT

Table 1.

Equipment	Rate	Units	Remarks
4 channel oscilloscope	€ 95	€/piece/ day	1x Tektronix 2 series 100MHz
8 channel oscillscope	€ 95	€/piece/ day	1x Picoscope 4824A 20MHz
Diff. Voltage probe	€ 65	€/piece/ day	4x 700V-7000V DC-70MHz
Rogowski Current probe	€ 65	€/piece/ day	2x PEMUK CWT1500, 300kA, 0,03Hz – 16MHz
Rogowski Current probe	€ 65	€/piece/ day	3x PEMUK CWT60, 12kA, 0,4Hz -16MHz
Rogowski Current probe	€ 65	€/piece/ day	1x PEMUK CWT3, 0,6kA, 3,5Hz – 10MHz
Rogowski Current probe	€ 65	€/piece/ day	1x PEMUK CMC06, 0,15kA, 1,9kHz – 16MHz
Clamp on current probe	€ 65	€/piece/ day	3x tektronix A621 0,02kA – 2kA, 5Hz – 50kHz
Clamp on current probe	€ 65	€/piece/ day	1x Hioki CT6846-05 1kA, DC-20kHz
Power Quality Analyzer	€ 125	€/piece/ day	1x Fluke 430-II

Table 2. *Note: equipment can only be rented in combination with using the test facility.*

2. Calculation example

See below example of a custom test that has 2 (dis) assembly days, 3 testing days and rental of equipment.

Service	Tariff	Units	Usage	Total
Test plan validation	€ 150	€/hour	4	€ 600
Safety briefing	€ 185	Once	1	€ 185
Assembly / disassembly	€ 1 250	€/day	2	€ 2.500
Danfoss test engineer	€ 150	€/hour	24	€ 3.600
4 channel oscilloscope	€ 95	€/piece/day	3	€ 285
Diff. Voltage probe	€ 65	€/piece/day	9	€ 585
Test days	€ 2 950	€/day	3	€ 8.850
			Total	**€ 16.605**

Table 3.

3. Details of test setups

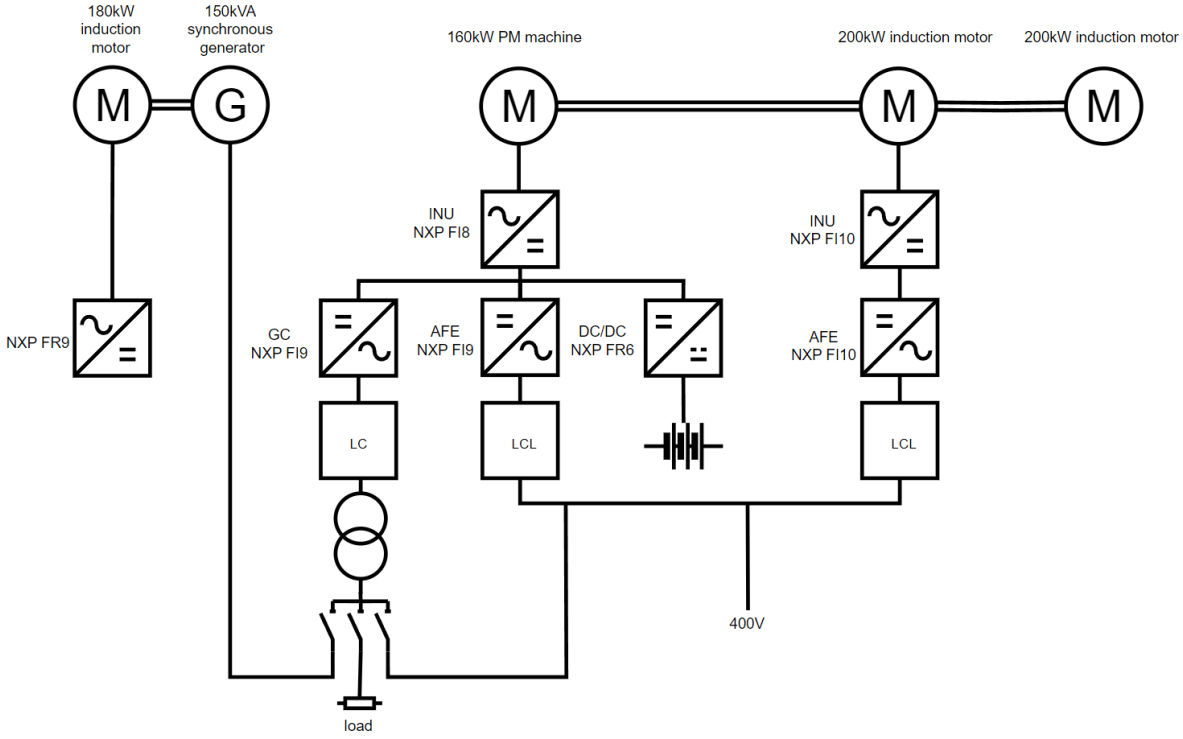
200kW NXP hybrid test setup

The 200kW hybrid test setup is designed to be the perfect tool for validating drive systems, control functionalities, strategies and related features.
The test setup supports a wide range of fieldbus configurations, allowing seamless integration with customer PLCs and control systems.
A glimpse of the applications that can be validated:

- AFE
- Grid converter
- Generator application PTI/PTO
- Marine application
- DC/DC converter
- Etc.

Picture 1. 200kW hybrid test setup

The setup offers flexibility and real power testing capabilities in a controlled environment. It's compact and lean design ensures quick and efficient overviews, enabling fast insight in system behaviour en performance.



Schematic 1. Single line of 200kW NXP hybrid test setup

2200kW test setup

The 2200kW setup is equipped with a Vacon 3000 MV drive, and liquid Cooled NXP 690V AFE+INU and 400V AFE+INU. This setup can be used for testing with power up to 2,2MW. The 690V and 400V motors and drives can be connected to external devices. This means a customer's drive panel or motor can be connected to the system relatively easy. The system is equipped with water cooling connections, making sure liquid cooled components can be used with ease.

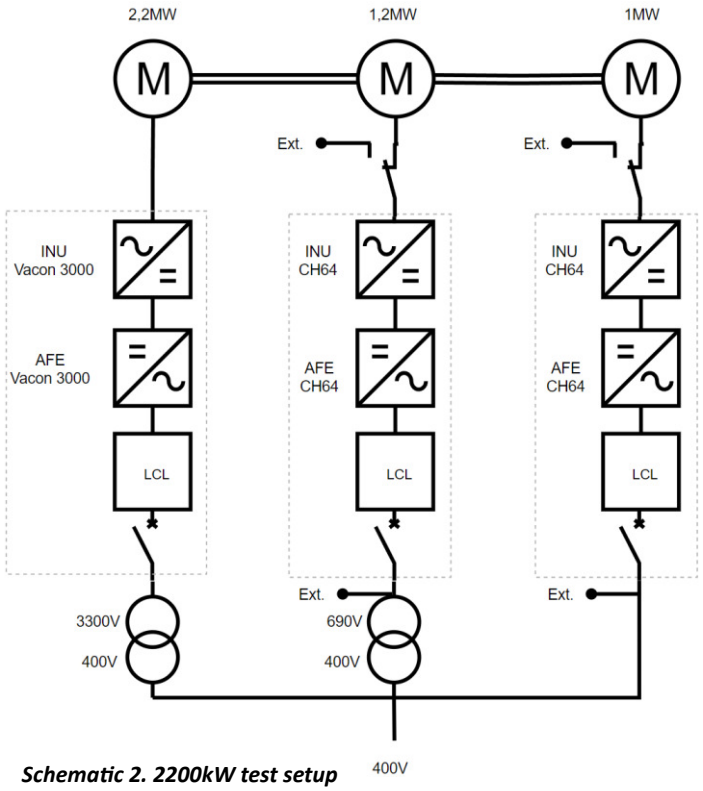
Picture 2. 2200kW motor setup

Utilizing our 2200kW test setup allows customers to save time and reduce project risks effectively. For instance, it is ideal for pre-delivery testing of drive cabinets and conducting heat run tests. Performing these validations in our controlled environment not only reduces costs but also minimizes potential risks.

Picture 3. Connection boxes and drive setup

Some examples of validations that can be performed using the 2200kW setup:

- Load testing and heat run testing of drive cabinets
- Load testing of drives
- Active harmonic filter validation
- ID run for external motors
- Functional testing of complex drive systems



Schematic 2. 2200kW test setup

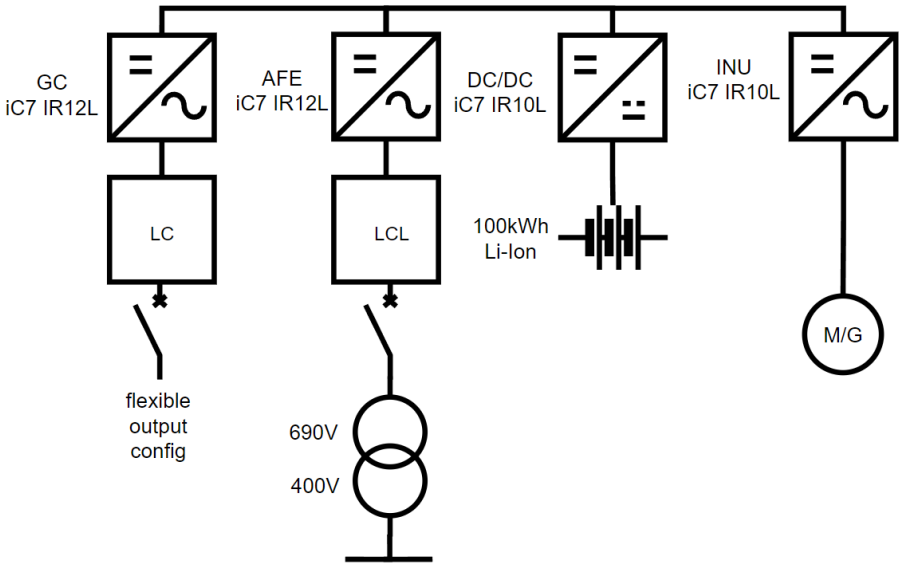
iC7 hybrid test setup

The iC7 hybrid test setup is our latest addition, designed to Demonstrate the performance of the iC7 hybrid platform. Connecting the setup to a customer's control system is made easy due to its flexible interface possibilities. The test setup is connected to our 100kWh battery pack and can be linked to our induction or PM motor setup, creating a real-life hybrid drivetrain in a controlled environment.

Picture 4. iC7 hybrid drive setup

An example of applications that can be validated:

- AFE
- Grid converter
- Generator application PTI/PTO
- Propulsion application
- DC/DC converter



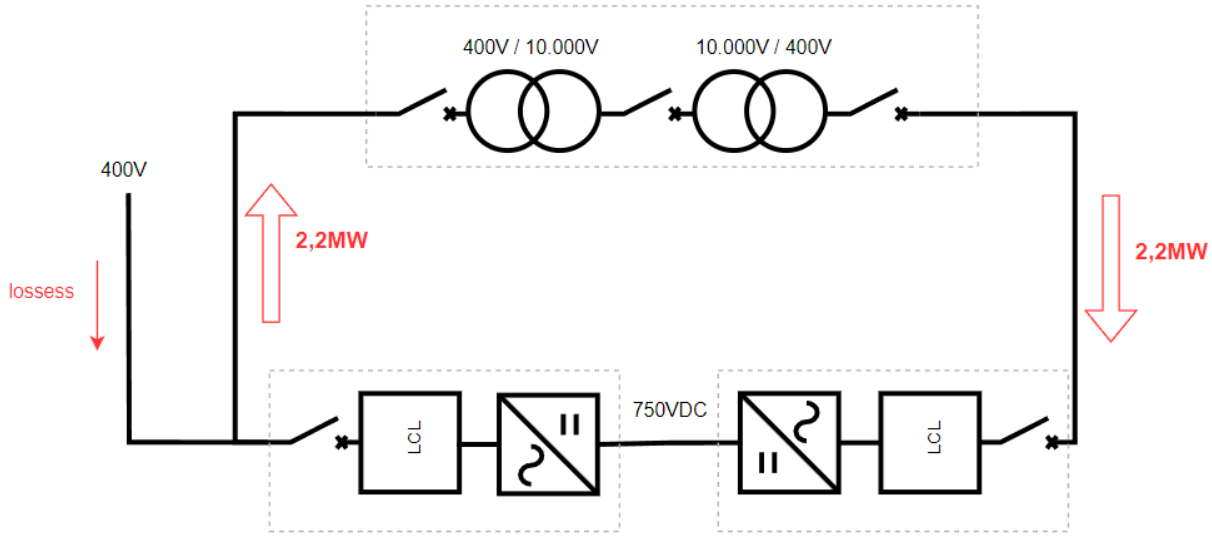
Schematic 3. iC7 hybrid setup.

Example of custom test

In this custom setup, 2 cabinets equipped with Active Front Ends (AFE) were subjected to a full load test.
The goal of the test was to validate following parameters at different loads:

- Power quality in AC and DC side
- Overall system behavior
- Temperatures inside the cabinet, cooling water, etc.

The principle of the setup is that both cabinets are pushing 2,2MW through the transformers.
The losses of this process are taken from the grid, as shown in the single line diagram below.



Schematic 4. Single Line Diagram of custom test setup