



PRILs

ITA Test Rig

Master Thesis

Optimum point determination

	$T_4$	$T_3$	$T_2$	$T_1$
$RL_1$	↑	↑	↑	↓
$RL_2$	↑	↑	↓	↓
$RL_3$	↑	×	×	×
$RL_4$	×	↑	↑	↑

## Improved Measurements of Gear Efficiency in Back-to-Back Test Rig

### Motivation

Some gear applications imply trade-offs between efficiency and other specific requirements, such as the electric vehicles' challenge relative to gear noise. A conventional method of studying gear torque efficiency using gear test samples is by means of a power-circulating test rig. This type of rig normally has two identical gearboxes, and each gear is connected by a shaft to its correspondent on the other box. The German Research Association for Drive Technology (FVA) has established for this rig concept, a method to measure gear efficiency assuming the power delivered by the motor is equal to the total loss, which is measured outside the loop and divided between the two gearboxes.

### Objective

This research aims in a more reliable power losses measurements in a power-circulating test rig. Two research question support this objective:

1. How does the power flow through a back-to-back rig?
2. What is the connection among the losses of the transmission boxes (TBs) belonging to the power loop?

### Approach

A power-circulating rig with unique features able to induce controlled power losses, PRILs, was designed for the investigation proposed by this research. A Design of Experiments (DoE) is applied where the definition of responses, variables and treatments are conducted with the purpose to identify if a box loss depends on other boxes' losses.

#### Power-circulating Rig with Induced Losses

