



Thesis submitted in fulfilment of the requirements for the award of the degree of
Doctor of ... (Doctor in de ...)

TITLE OF PHD

Your Name

July 30, 2021

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Faculty of ...
Department of ...

Acknowledgement

I would like to thank ...

Your Name

Abstract

Give here a short summary of your work

List of abbreviations

Below, the list of abbreviations that has been used throughout this thesis, can be found. This list is made per chapter to show where each abbreviation appears first. No new entry will be made if a certain abbreviation returns in a later chapter.

Chapter 1

<i>SPECTA</i>	Series Parallel Constant Torque Elastic Actuation
<i>SEA</i>	Series Elastic Actuation
<i>PEA</i>	Parallel Elastic Actuation
<i>VSA</i>	Variable Stiffness Actuation
<i>SPEA</i>	Series Parallel Elastic Actuation
<i>+SPEA</i>	Series Parallel Elastic Actuation with multiple parallel branches
<i>iSPEA</i>	intermittent Series Parallel Elastic Actuation
<i>DMA</i>	Dual Motor Actuation
<i>DOF</i>	Degrees Of Freedom
<i>SMES</i>	Superconducting Magnetic Energy Storage
<i>CAES</i>	Compressed Air Energy Storage
<i>pHRI</i>	Physical Human-Robot Interaction
<i>NBM</i>	Non Backdrivable Mechanism
<i>CT</i>	Constant Torque

Chapter 2

<i>CTM</i>	Constant Torque Mechanism
<i>ZTS</i>	Zero Torque Shift
<i>CFM</i>	Constant Force Mechanism

Chapter 4

<i>HRI</i>	Human-Robot Interaction
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Chapter 5

<i>BLDC</i>	Brushless Direct Current
<i>PMSM</i>	Permanent Magnet Synchronous Machine
<i>PMAC</i>	Permanent Magnet Alternating Current
<i>PSGT</i>	Parallel Shaft Gear Train
<i>PGT</i>	Planetary Gear Train
<i>HD</i>	Harmonic Drive
<i>CD</i>	Cycloid Drive
<i>BS</i>	Ball Screw
<i>WG</i>	Wave Generator
<i>FS</i>	Flexspline
<i>CS</i>	Circular Spline
<i>EC</i>	Eccentricity Cam
<i>CD</i>	Cycloid Disc
<i>RR</i>	Ring rollers with ring gear
<i>OD</i>	Output Disc

List of symbols

Below, the list of symbols that has been used throughout this thesis, can be found. This list is made per chapter to easily find the meaning for each symbol.

Standard Symbols

T	Torque
θ	Angle
K	Spring Stiffness
F	Force
m	Mass
V	Volume
J	Mass moment of inertia
I	Area moment of inertia
d	Diameter
L	Length
t	Thickness
σ	Stress
E	Module of elasticity
b	Width
I	Motor Current
R	Armature Resistance

Standard Subscripts

i	Input
o,out	Output
$spring,spr$	Spring
$mech$	Mechanical
min	Minimum
max	Maximum

Chapter 2

Q	
L_0	Initial length
ΔL	Axial compression
θ_L	Left inclination angle
θ_R	Right inclination angle

Chapter 3

A_{spring}	The torque level of a constant torque spring
R_1	
R_2	
r_0	
c	Minimal required distance between the axes of the drums of a constant torque spring

Chapter 4

r_{gap}	Gap radius
k_t	Motor torque constant
n	Number of wires in the cross-section
H	Magnetic field strength
m_m	Motor mass
J_m	Motor inertia
r_a	Armature radius
l_a	Rotor length
r_m	Motor radius
l_m	Motor length
ρ_a	Armature density
N	Reduction ratio
C	Utilization factor of the machine
B_e	Air gap flux density
α	Pole coverage factor
A	Linear current density
w_a	Number of armature windings
T_{stall}	Stall torque
ρ_w	Specific winding resistance
l_w	Total length of the winding
r_w	Winding radius
A_w	Winding cross-section
t_s	Stator thickness
t_r	Rotor thickness
d_m	Motor diameter

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A List of publications

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Chapter *1*

Introduction

Give here the introduction...

1.1 Research questions

The goal of this dissertation is to ...

This is divided into several separate research questions:

- Question 1?
- Question 2?
- Question 3?
- Question 4?
- Question 5?

1.2 Outline of the thesis

The doctoral thesis is divided into... (give here overview of the thesis)

Part I

First Part

Chapter 2

First real chapter

2.1 Introduction

Put here the introduction

2.2 Conclusion

Give here the conclusion of the first chapter

Part II
Part two

Chapter **3**

Second chapter

Part III

Conclusion

Chapter 4

Conclusion and future work

4.1 General conclusions

4.1.1 Question 1?

4.1.2 Question 2?

4.1.3 Question 3?

4.1.4 Question 4?

4.1.5 Question 5?

4.2 Future work

Appendix *A*

List of publications

Publications which are submitted for review, or which are not listed in Scopus (such as poster presentations or publications in journals not listed in Scopus), are listed in grey.

Articles in scientific journals with an international referee system

1. ...
2. ...
3. **Last Name, A.**, Co-author, B., ..., & Last author, C. (2019). Name of paper. Name of Journal, edition number.

Review articles in scientific journals with an international referee system

1. ...

International conference papers

1. ...
2. ...

International conference and symposium abstracts and/or posters

1. ...
2. ...

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