## **Contents**

1	Introduction							
2	Mer	Membrane Interface Probe						
	2.1	Systen	natic description of the Membrane Interface Probe	8				
	2.2	Applic	ation of the MIP under field conditions	12				
	2.3	Proble	m identification and current "state of the art" of the MIP system $\ldots \ldots$	15				
3	Met	Methodical approach - systematic analysis of direct-push sensor systems						
	3.1	3.1 Systematic description of direct-push sensor systems						
	3.2	Analys	sis of direct-push sensor systems	24				
		3.2.1	Experimental analysis stage	26				
3.2.2 Modeling analysis stage				27				
		Application Examples	28					
			3.2.3.1 EC as an example for deduction of system identification	29				
			3.2.3.2 CPT as an example for expertise deduction	30				
			3.2.3.3 Automated probing process as an example of optimization					
			deduction	31				
4	Systematic analysis of the Membrane Interface Probe							
	4.1	System	n under measurement	35				
		4.1.1	Experimental analysis stage	35				
		4.1.2	Modeling analysis stage	36				
		4.1.3	Results	39				
	4.2 Sensor interface							
		4.2.1	Experimental analysis stage	44				
		4.2.2	Modeling analysis stage	46				

xix



## Contents

		4.2.3 Results							
	4.3	Transi	mission s	ystem	52				
	4.3.1 Laboratory-scale investigation								
			4.3.1.1	Experimental analysis stage	53				
			4.3.1.2	Modeling analysis stage	55				
			4.3.1.3	Results	58				
		4.3.2	Field-sc	ale investigation	60				
			4.3.2.1	Experimental analysis stage	62				
			4.3.2.2	Transformation from time-dependent to depth-dependent					
				signals	62				
			4.3.2.3	Results	64				
5	Opti	imizati	on of the	Membrane Interface Probe	71				
	5.1 Combination with a mobile mass spectrometer								
	5.2	Multi	-direction	al probing	72				
	5.3	Conti	nuous de	pth profiling and triggered sampling with two transfer lines $\ldots$	74				
	5.4	Funda	amental in	mprovement concept	75				
6	Sum	mary	and outlo	ok	79				
Bi	Bibliography								
Li	List of Figures								
List of Tables									
A	Con	Control program of the MIP system							
B Modeling of the system under measurement									
С	C Modeling of the sensor interface								

2