DIN EN 18110:2025-11 (E)

Water quality - Assessment of damage to fish passing through pumping stations and hydropower plants - Methods based on live fish passage survival test and blade strike model

Contents

Page

European foreword 4

Introduction 5

1 Scope 9

2 Normative references 9

3 Terms and definitions 10

4 Drawings of the installations 14

5 Equipment and tools 20
5.1 Collection net 20
5.2 Fish introduction device 21
5.3 Transport tank 23
5.4 Storage tank 23
5.5 Keepnet 23
5.6 Small transport tank 23
5.7 Measuring board 23
5.8 Anaesthetics 23
5.9 Fish welfare journal 24

6 Fish survival test 24
6.1 General 24
6.2 Authorization and safety 24
6.3 Legislation and directives 24
6.4 Flow charts 25
6.5 Operating conditions 30
6.6 Choice and origin of fish 30
6.7 Preparation of a fish survival test 32
6.8 Execution of a fish survival test 34
6.9 Calculation of passage survival 37
6.10 Report 38

7 Computational method to assess fish survival 41
7.1 General 41
7.2 Blade strike mortality 41
7.3 Probability of collision 42
7.4 Velocity in the meridional plane 43
7.5 Relative velocity of the fish 44
7.6 Effective fish length 44
7.7 Mutilation ratio 45
7.8 Strike velocity 46
7.9 Blade thickness 47
7.10 Total mortality 47
7.11 Integral mortality 48

8 Scaling of results of fish survival tests 48

8.1 General 48
8.2 Geometric similarity 48
8.3 Kinematic equality 49
8.4 Scaling in case of true similarity 49
8.5 Scaling under practical conditions 50

Annex A (informative) Fish species 52

Annex B (informative) Causes of damage and mortality to fish passing through pumping stations and hydropower plants 53

Annex C (informative) Fish survival assessment for open-water turbines 59

Annex D (informative) Survival estimates, statistical precision, power, and sample size 67

Annex E (normative) Parameters to be described in a fish welfare journal 76

Annex F (informative) Legislation on the protection of test animals used for scientific purposes 78

Bibliography 79