

SPRINGER BRIEFS IN COMPUTER SCIENCE

B. R. Wienke · T. R. O'Leary

Understanding Modern Dive Computers and Operation

Protocols, Models,
Tests, Data, Risk
and Applications

B. R. Wienke • T. R. O'Leary

Understanding Modern Dive Computers and Operation

Protocols, Models, Tests, Data, Risk and Applications

SSI SCUBA SCHOOLS INT.
Instructor No. 12653
Albrecht Salm



PADI
INSTRUCTOR 33913
Albrecht Salm

A
0012019



Albrecht Salm
Master Scuba Diver Trainer
PADI MSDT # 33913

Contents

Diving and Dive Computer History	3
Early Diving	4
Modern Diving	6
References	8
Modern Dive Computers	11
Dive Computer Schematic	12
Diving Protocols	12
Commercial Units	14
References	15
Basic Computer Models	19
Dissolved Gas Model (GM)	19
Bubble Phase Model (BM)	23
Oxygen Toxicity (OT)	28
References	29
Ad Hoc Dive Computer Protocols	33
Best Diving Mixtures	33
Altitude Modifications	34
Pyle 1/2 Stops	35
Reduction Factors	36
Gradient Factors	37
Dynamical Bubble Factors	37
Isobaric Counterdiffusion (ICD) Regimens	37
Helium-Oxygen Mirroring and ICD Mitigation	38
Shallow Safety Stops	39
User Conservancy Knobs	40
References	41
Computer Profile Data	45
LANL DB	46
References	49

Wet and Dry Tests and Data	53
Haldane Deep Stops	53
Australian Pearl and Hawaiian Diving Fishermen	54
Open Ocean Deep Stop Trials	55
Recreational 1/2 Deep Stops and Reduced Doppler Scores	55
Trondheim Pig Decompression Study	56
Duke Chamber Experiments	56
ZHL and RGBM DCS Computer Statistics	57
Profile Data Banks	57
VVAL18 Evaluation	58
NEDU Deep Stop Tests	59
French Navy Deep Stop Tests	60
Computer Vendor and Training Agency DCS Poll	60
Training Agency Testing and Standards	61
References	63
Risk Estimators	67
End of Dive Risk Estimator (EOD)	67
Test Profiles and EOD Risk	68
On the Fly Risk Estimator (OTF)	71
Test Profiles and OTF Risk	74
Equal Risk Deep and Shallow Stop Profiles	78
References	79
Computer Diveware	83
Packages	83
Examples	85
Rebreather and Open Circuit Profiles	86
Diveware Model Characteristics Comparison	91
Comparative GM and BM Risk Estimates for Wet Pod Trials	92
References	93
Bubble Issues and Dive Computer Implementations	95
Bubble Dynamics	95
Bubble Regeneration	99
Bubble Broadening	100
References	101
Recap	105
Applications and Exercises	115

List of Tables

Basic Computer Models	19
Table 1 Workman USN M-Values	21
Table 2 Buhlmann swiss Z-values	22
Ad Hoc Dive Computer Protocols	33
Table 1 Relative decrease in critical parameters after safety stop	39
Computer Profile Data	45
Table 1 Profile gas-DCS summary	47
Table 2 Profile gas-depth summary	48
Table 3 Profile gas-depth DCS summary	48
Risk Estimators	67
Table 1 Comparative helium and nitrogen gas switches and risk	70
Table 2 Extreme RB dive and risk	71
Table 3 Nonstop air limits and risk	75
Table 4 Deep trimix OC dive and risk	76
Table 5 Shallow nitrox OC dive and risk	77
Table 6 Heliox RB dive and risk	77
Table 7 Equal surfacing risk deep and shallow stop air dives	78
Computer Diveware	83
Table 1 Comparative rebreather and open circuit profiles	91
Table 2 Comparative NEDU deep stop air schedules and risk	92

List of Figures

Modern Dive Computers	11
Fig. 1 Dive computer schematic	13
Ad Hoc Dive Computer Protocols	33
Fig. 1 Isobaric counterdiffusion and supersaturation	38
Wet and Dry Tests and Data	53
Fig. 1 Thermodynamic staging versus USN and RN staging	55
Fig. 2 NEDU deep stop test profile and model comparisons	59
Fig. 3 French navy deep stop test profiles and model comparisons	60
Fig. 4 Dual phase staging options	62

SPRINGER BRIEFS IN COMPUTER SCIENCE

B. R. Wienke · T. R. O'Leary

Understanding Modern Dive Computers and Operation
Protocols, Models, Tests, Data, Risk and Applications

Professional Computing

ISBN 978-3-319-94053-3



► springer.com