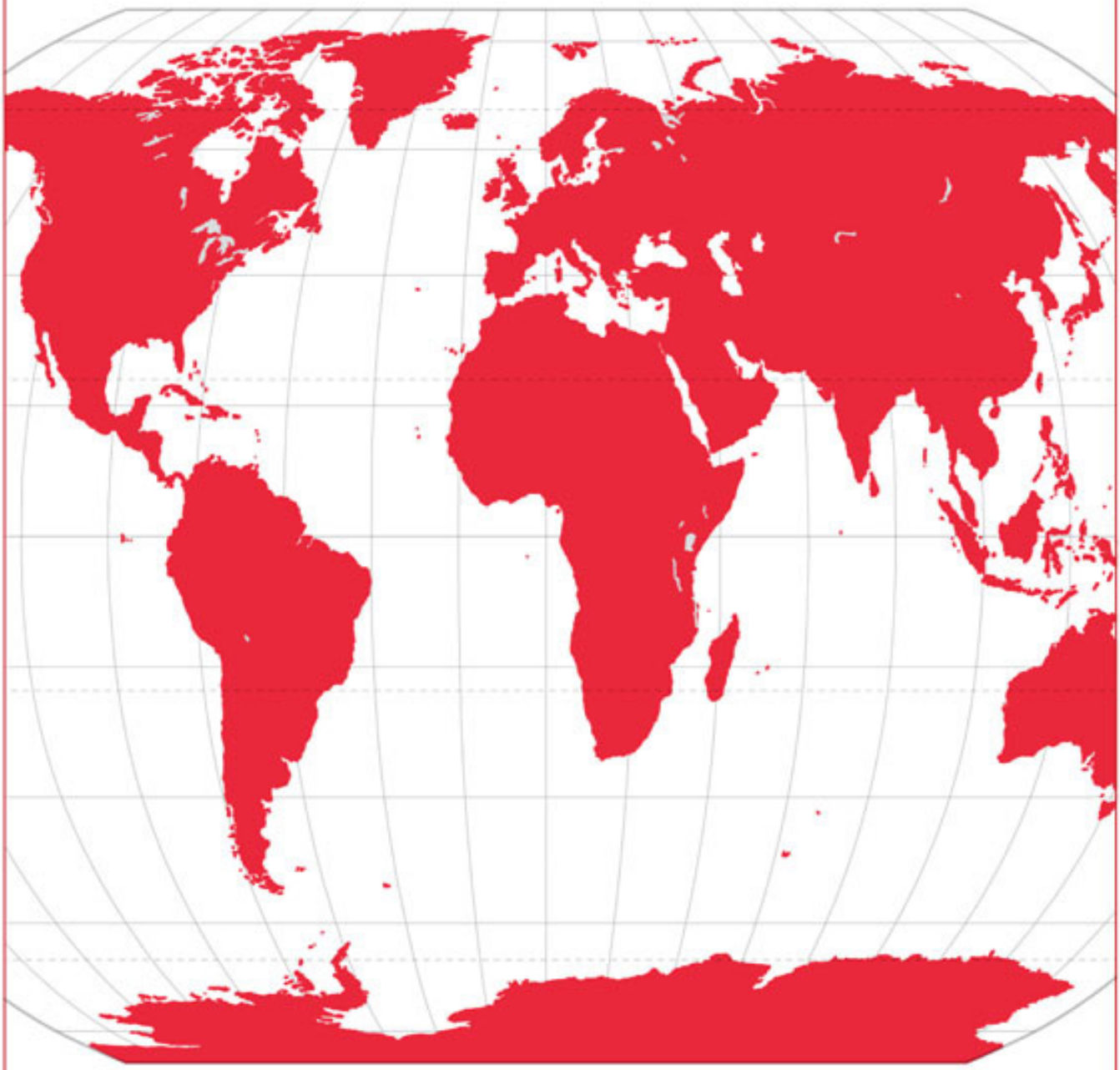
IIW Guideline for INTERNATIONAL MECHANIZED, ORBITAL AND ROBOT WELDING PERSONNEL

Minimum Requirements for the Education, Training, Examination and Qualification



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MINIMUM REQUIREMENTS FOR THE EDUCATION, TRAINING, EXAMINATION AND QUALIFICATION

INTERNATIONAL MECHANIZED, ORBITAL AND ROBOT WELDING PERSONNEL - IMORWP

This is a reduced version; it is not the full Guideline

For more information regarding the Qualification System, the IAB/EWF Combined Secretariat or the National ANB should be contacted (see in the IIW site the ANB contacts)

International Diploma in Mechanized Welding at the Basic Level (IMW-B)

International Diploma in Orbital Welding at the Basic Level (IOW-B)

International Diploma in Robot Welding at the Basic Level (IRW-B)

International Diploma in Robot Welding at the Comprehensive Level (IRW-C)

International Diploma in Mechanized, Orbital and Robot Welding at the Comprehensive Level (IMORW-C)

Guideline of the International Institute of Welding

INTERNATIONAL AUTHORISATION BOARD

Prepared and issued by the IAB-International Authorisation Board
based on the EWF Guideline EWF-530
Under the authority of the IIW-International Institute of Welding

Published by: **Management Team**
Av. Dr. Mário Soares, N. 35
P-2740-119 Porto Salvo
PORTUGAL

Tel: +351.21 5815200
E-mail: ewf@ewf.be
www.iiwelding.org
www.ewf.be

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Preface

This document is based upon the European Special Course Robot Welding (former Document EWF-530-01), as developed by the European Federation for Welding, Joining and Cutting (EWF), through an Agreement first signed 19 July, 1997, at the Annual Meeting of the International Institute of Welding (IIW) in San Francisco, California, USA and which has been renewed and further developed since then. It has been established in that Agreement that the International Guideline awarding the International Diploma's are equivalent to the European qualification levels and Diploma's.

The International Institute of Welding IIW has delegated the responsibility for the management of the qualification and certification systems to the International Authorisation Board (IAB).

This guideline for the international education, training, examination and qualification of welding personnel has been prepared, evaluated and formulated by Group A "Education, Training and Qualification" of the IAB.

Any EWF Authorised Nominated Body ANB is permitted to issue EWF diplomas equivalent to IIW ones that have been issued by the same ANB.

Copies of this document are available from the EWF/IAB Secretariat or the national ANB's.

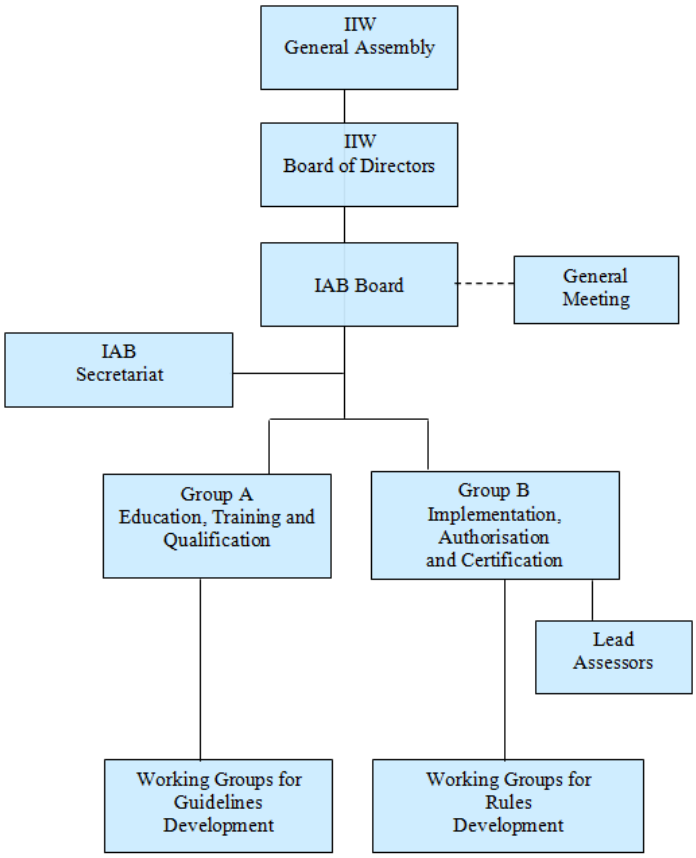


Figure 1: Organisation of the IAB

MINIMUM REQUIREMENTS FOR THE EDUCATION, TRAINING, EXAMINATION AND QUALIFICATION OF PERSONNEL

1 Introduction

Section I of the guideline covers the minimum requirements for education and training, which have been agreed upon by all IAB-ANBs, in terms of objectives, scope, expected results, and the teaching hours to be devoted to achieving them. It will be revised periodically by IAB Group A to take into account changes to reflect the "state of the art".

1.1 Guideline Structure

Chapter 2 – Section I - provides an overview of the guideline content.
Chapter 3, of this guideline covers the minimum requirements for education and training; objective, scope and expected results.
Chapter 4 – Section II - of this guideline covers the rules for examination and qualification.

Students having successfully completed modules 1, 2, 3 and 7 of this course and passed the relevant examination (minimum in mechanized, orbital or robot welding or all together) will be expected to be capable of applying the technology required at the “Basic” level in mechanized, orbital or robot welding as covered by this guideline. Students having successfully completed each module of this course of education and passed the appropriate examinations (minimum in mechanized, orbital or robot welding or all together) will be expected to be capable of applying the technology required at the “Comprehensive” level in mechanized, orbital and/or robot welding as covered by this guideline.

The contents are given in the following structure, three routes and two levels and finally five different diplomas. M means mechanized, O means orbital and R means robot welding.

Module	Teaching hours of B/C-level				Required for qualification at the level:	
	IMW	IOW	IRW	IMORW	B	C
1: Basics of mechanized, orbital and robot welding	8/8	8/8	8/8	8/8	X	X
2: The quality assurance in mechanized, orbital and robot welding	3/8	3/8	3/8	3/8	X	X
3: Different welding systems and them programming	12/12	8/8	21/23	41/43	X	X
4: Design and economy of mechanized, orbital and robot welding systems	-	-	-/16	-/16	-	X
5: Design of welded structures for mechanized, orbital and robot welding	-	-	-/24	-/24	-	X
6: Practical cases from industry	-	-	-/16	-/16	-	X
7: Practical education	32/4	32/4	56/32	-/40	X	X
TOTAL FOR THE BASIC AND COMPREHENSIVE LEVEL	55/32	51/28	88/127	52/155		

Table 1 – Overview of the Structure of the Training Courses

A “teaching hour” shall contain at least 50 minutes of direct teaching. It is not obligatory to follow exactly the order of the topics given in this guideline and choice in the arrangement of the syllabus is permitted. The depth to which each topic is dealt with is indicated by the number of hours allocated to it in the guideline.

It is to be noted that the overall structure of the syllabus for comprehensive and basic levels is similar, but some items are not considered appropriate in the education of the basic level candidate. This will be reflected in the scope and depth of the examination.

1.2 General Access Conditions

In a separate document (Directory of Access Conditions, latest edition) the national definitions are given in detail.

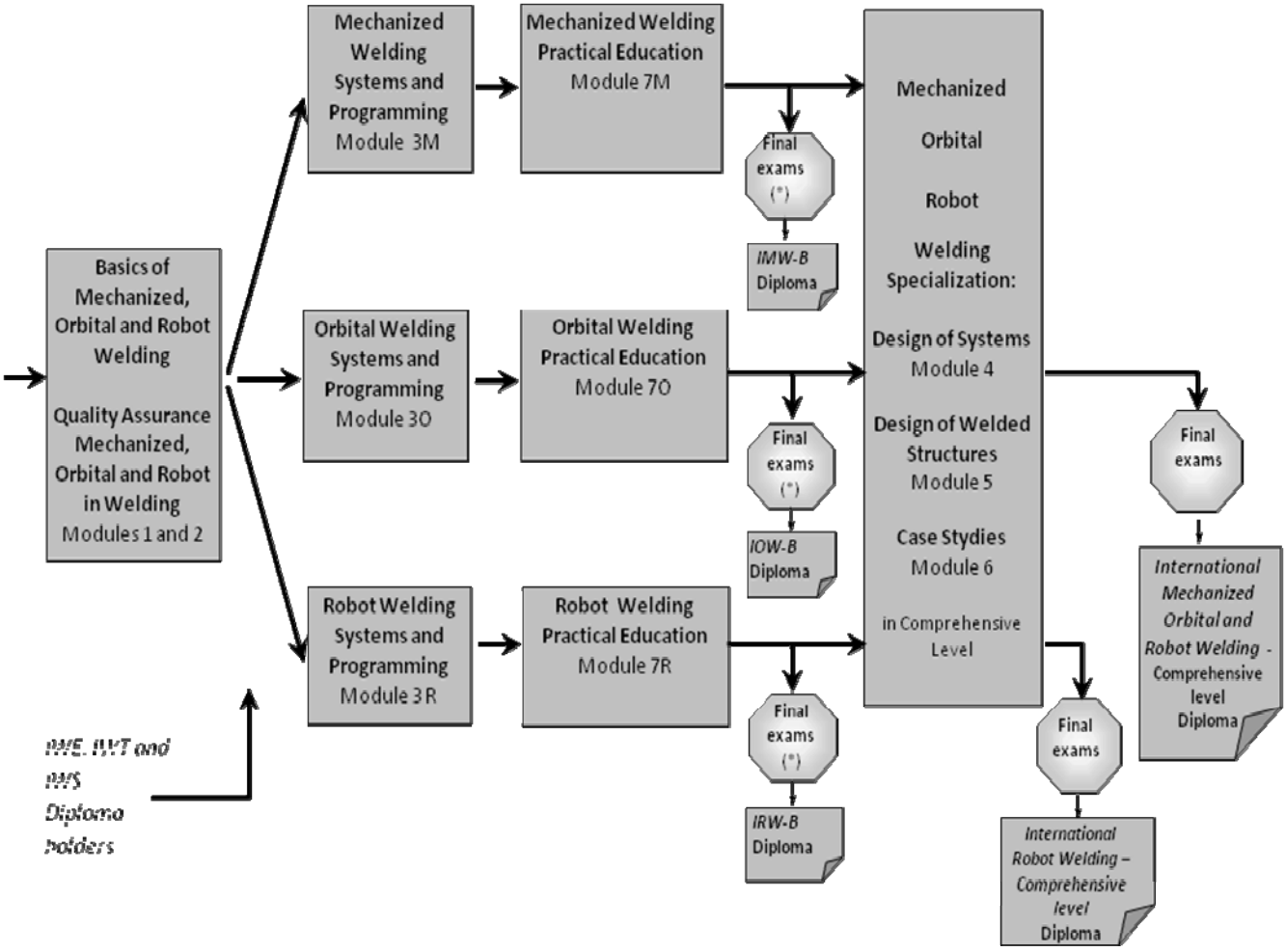
Applicants entering at Comprehensive level shall fulfil at least the National Access Conditions at the IWS level. The purpose of this education concentrates on mechanized, orbital and robot welding technology, with a secondary focus on certain welding processes.

Applicants not fulfilling the access conditions for Comprehensive level may follow the course as a guest but are not allowed entry to the IIW examination at Comprehensive level.

Applicants entering at the Basic level shall fulfil at least the National Access Conditions at the IW Basic level. Applicants should have adequate knowledge of the welding before entering to certain education [this sentence does not have any meaning – ‘adequate’ and ‘certain education’ must be defined]. The purpose of this education concentrates on mechanized, orbital and robot welding technology, with a secondary focus on certain welding processes.

Applicants not fulfilling the entry access conditions at Basic level may follow the course as a guest, but are not allowed entry to the IIW examination at Basic level.

In the case that a participant has an IWE, IWT or IWS diploma, the participant may be exempt from attending the taught modules 1 and 2 but she/he must still take the Module 1 and 2 examinations.



*It includes approval testing of welding operators according to ISO 14732

Diagram 1 - Training modules and levels in education. See also different routes and hours in appendix 1

2 Section I - Course Content Overview:

Theoretical and Practical Education

	Hours
THEORETICAL EDUCATION	
Module 1: BASICS OF MECHANIZED, ORBITAL AND ROBOT WELDING	**8**
(common module for all levels and routes)	
M 1.1 Basics of education for mechanized, orbital and robot welding personnel	2
M 1.2 Mechanization and automation levels in welding	2
M 1.3 Basics of mechanized welding	1
M 1.4 Basics of orbital welding	1
M 1.5 Basics of robot welding	2
Module 2: THE QUALITY ASSURANCE IN MECHANIZED, ORBITAL AND ROBOT WELDING	**8**
(common module for all levels and routes)	
M 2.1 Introduction to quality assurance in welding	1
M 2.2 Quality assurance and quality standards in welding	
2.2.1 Quality standards in welding: EN ISO 3834, ISO 9001, etc	1
2.2.2 Quality control during manufacturing	1
2.2.3 Quality control in mechanized, orbital and robot welding	1
M 2.3 Basics of productivity, quality and economy in welding	2
M 2.4 Qualification of mechanized, orbital and robot welding personnel	2
Specific modules for mechanized (M), orbital (O) and robot (R) welding	
Module 3M: MECHANIZED WELDING SYSTEMS AND PROGRAMMING	**12**
MM 3.1 Structures of mechanized welding equipment and systems	3
MM 3.2 Welding processes for mechanized welding (MIG, MAG, PAW, SAW, TIG)	3
MM 3.3 Joint preparation in mechanised welding procedures	1
MM 3.4 Setting up, welding parameters and programming of mechanized welding systems	2
MM 3.5 Quality assurance in mechanized welding, NDT of welds	2
MM 3.6 Health and safety consideration in mechanized welding	1
Module 3O: ORBITAL WELDING SYSTEMS AND PROGRAMMING	**8**
MO 3.1 Structures of orbital welding equipments and systems	1
MO 3.2 Arc welding processes for orbital welding, TIG cold and hot wire welding and other processes (MIG, MAG, FCAW)	1
MO 3.3 Joint preparation in orbital welding	1
MO 3.4 Material technology and welding metallurgy in orbital welding	1
MO 3.5 Setting up, welding parameters and programming of orbital welding systems	2
MO 3.6 Quality assurance in orbital welding, NDT of welds	1
MO 3.7 Health and safety consideration in orbital welding	1

Module 3R: ROBOT WELDING SYSTEMS AND PROGRAMMING 24

MR 3.1 Basics of robotics and robot welding systems
- MR 3.1.1 Basics of robotics (basics of joint axes robots for welding) 2
- MR 3.1.2 Robot systems 2
- MR 3.1.3 Structures of robot welding systems 2
- MR 3.1.4 Health and safety considerations in robot systems 1

MR 3.2 Robot programming in welding and efficient use
- MR 3.2.1 Arc welding processes for robot welding 2
- MR 3.2.2 Other welding processes for robot welding (resistance, laser) 2
- MR 3.2.3 Programming of robot 2
- MR 3.2.4 Programming of welding robot 2
- MR 3.2.5 Seam tracking systems and sensors in robot welding 1
- MR 3.2.6 Multi robot welding systems 2
- MR 3.2.7 Offline programming and graphic simulation in robot welding 2

MR 3.3 Joint preparation for robot welding 2
MR 3.4 Maintenance 2

For Comprehensive level only

Module 4: DESIGN AND ECONOMY OF MECHANIZED ORBITAL AND ROBOT WELDING SYSTEMS 16

M 4.1 Optimizing of intelligence levels in welding 3
M 4.2 Investment planning of welding systems 3
M 4.3 Design of robot welding systems 3
M 4.4 Lay-out in workshop 2
M 4.5 Efficient implementation of welding systems 3
M 4.6 Economy and productivity in welding systems 2

Module 5: DESIGN OF WELDED STRUCTURES FOR MECHANIZED, ORBITAL AND ROBOT WELDING 24

M 5.1 Design of welded structures for mechanized and orbital welding 4
M 5.2 Design of welded structures for robot welding 8
M 5.3 Preparation for mechanized and orbital welding 2
M 5.4 Preparation for robot welding 3
M 5.5 Design in robot welding jigs and fixtures 4
M 5.6 Best practises of design of welded structures for robot welding 3

Module 6: CASE STUDIES 16

M 6.1 Best practises in welding fabrication and automation 4
M 6.2 Practical cases from industry
- 6.2.1 Practical cases from industry in mechanized welding 3
- 6.2.2 Practical cases from industry in orbital welding 3
- 6.2.3 Practical cases from industry in robot welding 6

Specific modules for mechanized, orbital and robot welding and different contents for Comprehensive and Basic levels

Module 7M MECHANIZED WELDING PRACTICAL EDUCATION

for Comprehensive level	**4**
MM 7.1 Welding demonstrations in mechanized welding	2
MM 7.2 Parameters in welding	1
MM 7.3 Visual examination of welds	1
for Basic level	**32**
MM 7.4 Functional knowledge appropriate to the mechanized welding unit	2
MM 7.5 Knowledge on welding technology	2
MM 7.6 Programming exercises in mechanized welding	8
MM 7.7 Welding exercises in mechanized welding	10
MM 7.8 Qualification tests of the operator	2

Module 7O: ORBITAL WELDING PRACTICAL EDUCATION

for Comprehensive level	**4**
MO 7.1 Welding demonstrations	2
MO 7.2 Parameters in welding	1
MO 7.3 Visual examination of welds	1
for Basic level	**32**
MO 7.4 Functional knowledge appropriate to the mechanized welding unit	2
MO 7.5 Knowledge on welding technology	2
MO 7.6 Programming exercises	8
MO 7.7 Welding exercises	10
MO 7.8 Qualification tests of the operator	2

Module 7R: ROBOT WELDING PRACTICAL EDUCATION

for Comprehensive level	**32**
MR 7.1 Programming exercises of the robots	8
MR 7.2 Programming exercises of welding robots	8
MR 7.3 Off-line programming exercises	16
for Basic level	**46**
MO 7.4 Functional knowledge appropriate to the mechanized welding unit	2
MO 7.5 Knowledge on welding technology	2
MR 7.6 Programming exercises of the robots	8
MR 7.7 Programming exercises of welding robots	16
MR 7.8 Off-line programming exercises	16
MR 7.9 Qualification tests of the operator	2