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European Association of the Machine Tool Industries and related Manufacturing Technologies

Guidelines of CE Marking on Laser Machines

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Objectives of the Guide

Machinery and equipment which are bound by specific European Directives cannot be placed on the single market unless they bear, among other things, the CE marking. CE marking affixed on a product indicates that the product complies with all relevant essential requirements (e.g. health and safety requirements) of the applicable Directive(s).

However, market surveillance in the EU often fails to prevent the entry of non-compliant machinery into the internal market and/or the circulation of non-compliant European machinery in Europe. Machines which do not meet essential health and safety regulations threaten health and safety in the workplace and put workers' lives in danger.

Moreover, manufacturers and suppliers who do not comply with European regulations benefit from reduced production costs and gain an unfair comparative advantage in the market. This distorts competition and undermines the competitiveness of European manufacturers who invest a significant amount of their resources in the development of products with high safety standards meeting European regulations.

Cases of non-compliance may occur due to a lack of knowledge and/or misinformation among machinery producers who fail to meet the relevant essential requirements or due to deliberate infringements by machinery producers who want to unfairly cut their development and production costs.

In this regard, CECIMO believes that effective market surveillance requires better cooperation and communication among economic operators, customs authorities and market surveillance bodies on the relevant EU regulations, standards, and conformity assessment procedures required.

In line with this view, the present document aims to contribute to the ongoing work led by the European Commission to enhance market surveillance in the internal market, under the New Legislative Framework.

This guide provides a valuable source of information for manufacturers, sellers, and users of laser machines as well as for customs authorities to detect non-compliant laser machines in the internal market, since a better functioning market surveillance is vital to create a more secure working environment for workers and a more competitive European industry.

Introduction to the Guide

The CE Guide on Laser Machines essentially consists of a checklist[1] to assist the market surveillance authorities, experts for product safety, buyers, customers or others in the safety analysis of laser processing machines for sheet metal and tubes, including their loading and unloading automation, in accordance with the provisions of the Machinery Directive (2006/42/EC). The aim of the CE Guide is to provide a simple and practical checklist, albeit not covering all of the essential health and safety requirements (EHSRs) contained in the relevant EU Directives.

For a full list of the essential health and safety requirements relating to the design and construction of machinery, outlined in the Machinery Directive, please refer to **Annex I of the legislative text.**[2]

When utilizing the checklist to assess laser machines' conformity, the user should keep in mind the following indications:

- If one or more checkpoints are answered with "NO," there is non-conformity to the Machinery Directive.
- It is necessary for the conformity of the machine that all of the checkpoints are answered with a "YES" (Or unknown or not applicable) although this in itself is not sufficient.
- Questions market with "Exp" are questions directed at technical experts that typically require measurements and quantitative evidence.

For each question a reference in Appendix I of the Essential Health and Safety Requirements from the Machinery Directive can be found in the BAuA document "**Reference List Laser Processing Machines**".[3]

Area of Application

The checklist shall be used for laser cutting machines for tubes, flat sheet and three-dimensional sheet metal, while not for ultrashort-pulse laser machines.

The checklist focuses machines that need a housing and have an average power of over 500 W (this does not mean that machines with power of less than 500 W do not need housing) and strictly considers machines with a wavelength between 0.9 µm and 1.1 µm (900 nm and 1100 nm), as these are the dominant categories in the market. The checklist can also be used for laser processing machines with a CO2 laser (Wavelength = 10.6 µm).

This checklist cannot be considered a replacement for the full conformity assessment procedure, which tests the conformity of the machine against all of the legal provisions that the machine is subject to in its respective target market – Important fields of machine safety are not covered by this checklist, including but not limited to functional safety, safety during maintenance and service. The same also applies if all the questions indicate that the machine is compliant.

[1] This Checklist is formulated on the basis of the "Safety of laser processing machines – Checklist for safety evalulation" from the Federal Institute for Occupational Safety and Health (BAuA).

[2] Annex I of the Machinery Directive (2006/42/EC).

[3] BAuA - Laserprodukte - Sicherheit von Laserbearbeitungsmaschinen - Bundesanstalt für Arbeitsschutz und Arbeitsmedizin.

Checklist for the Safety of Laser Machines

1 General

1.1

Person filling out this form

Name: .....

Date: .....

Authority/ Company: .....

1.2

Machine Master Data

Manufacturer: .....

Machine Type : ..... ☐ Unknown

Serial Number: ..... ☐ Unknown

1.3

Laser Master Data

Manufacturer:..... ☐ Unknown

Laser Type: ..... ☐ Unknown

Wavelenght: ..... ☐ Unknown

Power

For CW lasers: PMA_{MAX}= ..... ☐ Unknown ☐ Not Applicable

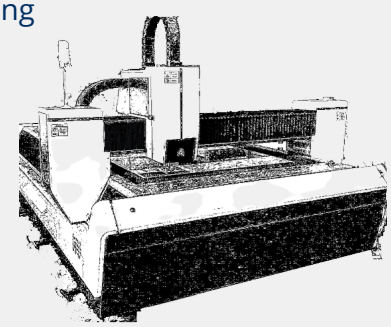
For pulsed lasers: P_{EI} =..... ☐ Unknown ☐ Not Applicable

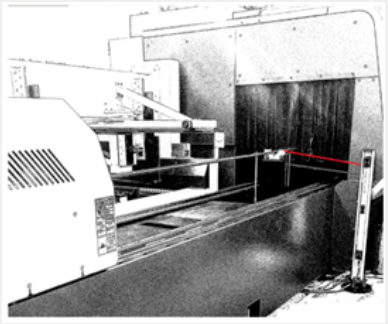
Frequency of impulse repetition: F=..... ☐ Unknown ☐ Not Applicable

[4] All the questions in this checklist, including the pictures, starting on page 3 are cited from the "Safety of laser processing machines – Checklist for safety evaluation" of the Federal Institute for Occupational Safety and Health (BAuA).

1.5	**Note**

2 Mechanical hazards

2.1	Are guards, interlocking guards, position fixing protective devices, or sensitive protective equipment available for all potentially dangerous movements of the machine? **Example**: Laser cutting machine without housing 	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
2.2	Are machine movements stopped by the doors / access flaps being opened during normal operation?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**

2.3	Where protection is provided by safety light barriers, is it possible to prevent dangerous points from being reached, such as by reaching over, and if a safety light barrier/ the light curtain is reached through, is the machine movement stopped/turned off in a timely manner? Laser tube-cutting machine example: The safety light barrier is positioned too close to the feed axis for the tubes. If the safety light barrier is penetrated, the movement cannot be stopped in time. Reaching over the safety light barrier is also possible. 	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
2.4 *Exp	Is the distance between the safety light barrier and the hazard zone large enough?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
2.5	Are guards in place to prevent objects, sparks, or fluids from falling down, spurting out, or being ejected?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**

2.6	Are all accessible machine parts free of sharp corners and edges, so that injuries can be avoided?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
2.7	Is it possible to prevent reaching hazardous movements by reaching over the guards (e.g. fence)? Is the distance between the guard and the hazard zone large enough?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**

3 Electrical hazards

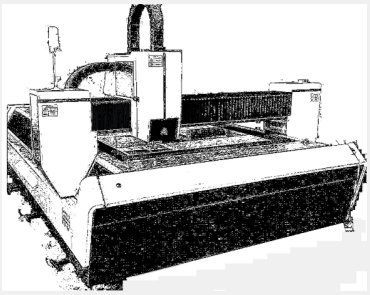
3.1	Is a special tool or an electrical cabinet key required to open the electrical cabinet?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**

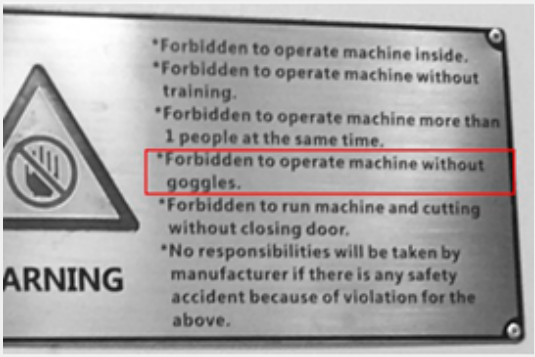
3.2	Are all parts carrying mains voltage (e.g. screw connections) in the electrical cabinet finger-safe/ safe to touch?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
3.3 *Exp	Protective earth conductor (PE): Do all housings have a PE?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
3.4	Are separate connection points used instead of fastening screws as PE connections?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**

3.5	Is there a central PE connection point inside the electrical cabinet, which other PEs are guided from?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
3.6	Random test on component identification: Are electrical parts in the electrical cabinet, such as contactors, marked? Note: Source and target should be labelled	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
3.7 *Exp	Can the electrical parts' markings, e.g. of contactors, be found in the schematic?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**

3.8	Is there a lockable power isolation switch? (e.g. main switch with fixture for hanging up a padlock)	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**

4 Radiation hazards

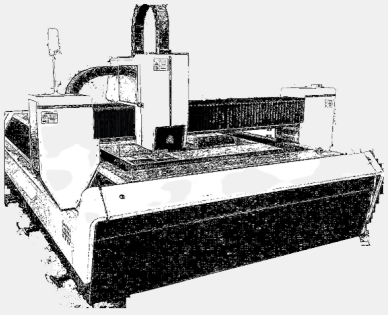
4.1	Does the machine have a housing which is mechanically stable and suitable for protecting against laser radiation? Example: Laser cutting machine without housing 	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
4.2	Is a direct view to the cutting process through gaps in the housing prevented?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**

4.3	Is a direct view to the cutting process blocked, e.g. by multilayer vertical blinds? **Example:** Direct view to the cutting process possible through single-layer vertical blind 	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
4.4	Is the machine intended to be operated in normal operation without laser safety goggles being worn? **Example**: Command to wear laser safety goggles attached to the machine in the form of a warning sign, could be an indication of missing safety equipment. 	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**

4.5 *Exp	Are windows/viewing panels which are integrated into the housing designed as suitable laser protective filters? Note: Windows/viewing panels must always have a label indicating the protection level (scale number LB in accordance with EN 207 for filters and/or equipment to protect eyes from laser radiation/scale number AB in accordance with EN 12254 for screens at laser working places/ protective exposure limit PEL in accordance with EN 60825-4). The label may be covered by the way the windows/viewing panels have been installed.	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
4.6 *Exp	If laser radiation is accessible, are the accessible emission limit values (AEL) for laser class 1 complied with? (measurement may be necessary)	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
4.7	Is the laser radiation isolated if safety-relevant sensitive protective equipment with regard to the laser is activated, e.g. safety light barrier is interrupted, safety switches on doors are opened, a feed hold or emergency stop is triggered? Note: The safety light barriers present may also „just“ secure material transport. These do not necessarily have to shut down the laser radiation.	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**

4.8 *Exp	Can adjustment and cleaning work be carried out safely? Are corresponding operating modes available? Are the actual class of accessible laser radiation and the relevant protective measures for each of these operating modes specified in the operator's manual?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
4.9 *Exp	Is a lockable operating mode selector switch present for certain operating modes which increase the risk (e.g. from an encapsulated machine (laser class 1) to service mode (laser class 4)?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**

5 Thermal hazards

5.1	Are sparks prevented from flying towards the operator? (e.g. with a guard) **Example**: Laser processing machine without housing 	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**

6 Hazards from fire, materials and substances

6.1	Does the machine have a capturing device for emissions of hazardous materials (e.g. fumes, dusts) such as a funnel?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
6.2	Does the machine have a compact dust extractor/ exhaust air cleaning system/filter device/suction system or is it connected to a central suction system which removes/filters pollutants when the laser is being operated?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**

7 **Combination of Hazards**

7.1 Emergency Stop

7.1.1	Does the machine have one or more emergency stop buttons (push-buttons)?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**

7.1.2	Are the emergency stop buttons easy to recognise?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
7.1.3	Are the emergency stop buttons (push-buttons) easy to reach?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
7.1.4	Does the emergency stop shut down the dangerous motion as fast as possible?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**

7.1.5	After the emergency stop has been triggered, is it possible to restart the machine only after the emergency stop device has been released?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
7.1.6	Is a workpiece held by a vacuum prevented from falling down when the machine goes into feed hold or emergency stop or when the power supply is switched off?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
7.1.7	Do all dangerous axes remain in place or go into a safe stop when feed hold or emergency stop is triggered?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**

7.2 *Exp	Are the emergency stop buttons designed in accordance with EN ISO 13850 and EN/IEC 60204-1?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
7.3	Is the main switch of the machine lockable in the 0- or/ OFF-position?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
7.4	Can the danger zone be seen from the acknowledgment points? Persons must not be overlooked nor injured by machine movements after acknowledgment.	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**

7.5	Is the acknowledgement of safety equipment from inside the hazard zone prevented?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
7.6 *Exp	Are the components used, e.g. door switches, safety light barriers, etc. suitable for safety functions?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
7.7	Are dangerous situations precluded in the event of a power failure?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**

7.8 Transport

7.8.1	Is a transport instruction available? (may be in the operator's manual)	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
7.8.2	Is it possible to transport the machine safely in compliance with the transport instruction? **Example**: Machine may tip over/ roll away when transported 	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**

7.9 *Exp	Are the setting and maintenance points outside of the danger zones or can setting and maintenance tasks be carried out safely?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**

8	**Formal Requirements**	
8.1	Nameplate	
8.1.1	Is there a nameplate on the machine?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
8.1.2	Does the nameplate contain the business name and complete address of the manufacturer and, where applicable, his authorized representative?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
8.1.3	Does the nameplate contain a designation of the machine?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**

8.1.4	Does the nameplate have a CE marking? Alternatively, at a trade fair: Is there a visible sign on the machine which indicates that the machine does not comply with the requirements of the Machinery Directive and can only be made available after the machine has been brought to conformity? Is the protection of persons guaranteed by suitable safety measures when such a non-conforming machine or partially completed machine is demonstrated?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
8.1.5	Does the nameplate have a designation of series or type?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
8.1.6	Does the nameplate indicate the year of construction?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**

8.2	Operator's Manual	
8.2.1	Is an understandable operator‘s manual available in the national language?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
8.2.2	Is the operator‘s manual supplied in paper form?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
8.2.3	Is the intended use detailed in the operator‘s manual?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**

8.2.4	Is information on residual risks included in the operator's manual?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**

8.3 EC/EU declaration of conformity

8.3.1	Is there an EC/EU declaration of conformity in paper form and in the national language?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
8.3.2	Is the content of the EC/EU declaration of conformity repeated in the operator's manual?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**

8.3.3	Does the EC/EU declaration of conformity contain the business name and complete address of the manufacturer and, where applicable, their authorized representative?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
8.3.4	Does the EC/EU declaration of conformity contain the name and address of the person authorized to compile the technical file (this person must be established in the Community/Union)?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
8.3.5	Does the EC/EU declaration of conformity contain a description and identification of the machine, including a generic denomination, function, model, type, serial number, and commercial name?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**

8.3.6	Does the EC/EU declaration of conformity contain a sentence expressly declaring that the machine fulfills all relevant provisions of the Machinery Directive, and where applicable, a similar formulation which explains the conformity with other applicable legal harmonisation regulations and/or pertinent provisions that the machine complies with? (References are to be given as published in the official journal of the European Union)	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
8.3.7 *Exp	Are harmonised standards named which the EC/EU declaration of conformity refers to?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
8.3.8	Are the place and date of the declaration given in the EC/EU declaration of conformity?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**

8.3.9	Does the EC/EU declaration of conformity contain the identity and signature of the person who is empowered to issue the declaration on behalf of the manufacturer or his authorized representative?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
8.4	Do the sales brochure and operator's manual demonstrate a safety concept which is equivalent in terms of laser classes (e.g. sales brochure laser class 1 ↔ operator's manual laser class 3R or higher)?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**
8.5	Are information and warnings available in the national language or language-neutral (pictograms)?	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**

8.6 *Exp	Is the machine labelled in accordance with EN 60825-1? (in particular, the laser class labelling)	☐ Yes ☐ No ☐ Unknown ☐ Not applicable **Note**

Results of the checklist

The machine was assessed as being non-compliant to the Machinery Directive 2006/42/EC according to the check list if at least one check point was answered with "NO":

☐ Laser machine is **not** compliant to the Machinery Directive 2006/42/EC.

☐ Compliance to the Machinery Directive 2006/42/EC is possible.

Comments to checklist results

Annex: Relevant Directives and Standards for Laser Machines

Here below you can find a non-exhaustive list of all the Directives and Standards for which laser processing machines for sheet metal and tubes are covered:

- 2006/42/EC OF THE EUROPEAN PARLIAMENT AND COUNCIL of 17 May 2006 on machinery products (Machinery Directive)
- 2014/30/EU DIRECTIVE OF THE EUROPEAN PARLIAMENT AND COUNCIL of 26 February 2014 on the harmonization of the legal regulations of the member states regarding electromagnetic compatibility (Electromagnetic Compatibility Directive)
- EN ISO 12100: 2010 Safety of machinery – General principles for design – Risk assessment and risk reduction
- EN ISO 11553-1: 2008 Safety of machinery – Laser processing machines – Part 1: General safety requirements (ISO 11553-1: 2005)
- EN ISO 11553-1: 2020 + A11:2020 Safety of machinery – Laser processing machines – Part 1: Laser safety requirements (ISO 11553-1: 2020)
- EN 60825-1: 2014 Safety of laser products – Part 1: Equipment classification and requirements
- EN 60825-4: 2006 EN 60825-4:2006/A1:2008, EN 60825-4:2006/A2:2011 Safety of laser products – Part 4: Laser guards
- EN 60204-1: 2006, EN 60204-1:2006/A1:2009, EN 60204-1:2006/AC:2010 Safety of machinery – Electrical equipment of machines – Part 1: General requirements
- EN 60204-1: 2018 Safety of machinery – Electrical equipment of machines – Part 1: General requirements
- EN 13849-1: 2015 Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design

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CREDITS

Publisher: CECIMO
Authors: David Heisenberg , Sonja Pfenninger, Stefano Ramundo Orlando
Copyediting & graphic design: Diana Anichitoaei

CECIMO is the European Association of the Machine Tool Industries and related Manufacturing Technologies. We bring together **15** national associations of machine tool builders, which represent approximately **1500** industrial enterprises in Europe (EU + UK+ EFTA + Turkey), over **80%** of which are SMEs. CECIMO covers **98%** of the total machine tool production in Europe and about **1/3** worldwide. It accounts for approximately **150,000** employees and a turnover of around **22.6 billion** euros in 2021. More than **three quarters** of CECIMO production is shipped abroad, whereas **half** of it is exported outside Europe.

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www.metalltechnischeindustrie.at

Belgium: AGORIA,Federatie van de Technologische Industrie
www.agoria.be

Czech Republic: SST, Svazu Strojírenské Technologie
www.sst.cz

Denmark: Danish Manufacturing Industries Cooperation
A part of the Confederation of Danish Industry
www.isa.di.dk

Finland: Technology Industries of Finland
www.teknologiateollisuus.fi

France: Evolis, Organisation Professionnelle des Biens d'Equipement
www.evolis.org

Germany: VDW, Verein Deutscher Werkzeugmaschinenfabriken e.v.
www.vdw.de

Italy: UCIMU, Associazione dei costruttori Italiani di macchine utensili robot e automazione
www.ucimu.it

Netherlands: FPT-VIMAG, Federatie Productie Technologie / Sectie VIMAG
www.ftp-vimag.nl

Portugal: AIMMAP , Associacâo dos Industriais Metalúrgicos, Metalomecânicos e Afins de Portugal
www.aimmap.pt

Spain: AFM, Advanced Manufacturing Technologies Asociación española de fabricantes de máquinas-herramienta, accesorios, componentes y herramientas
www.afm.es

Sweden: SVMF, Machine and Tool Association of Sweden
www.svmf.se

Switzerland: SWISSMEM, Die Schweizer Maschinen-, Elektro- und Metall-Industrie
www.swissmem.ch

Turkey: MIB, Makina Imalatcilari Birligi
www.mib.org.tr

United Kingdom: MTA, The Manufacturing Technologies Association
www.mta.org.uk