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Abstract (for dissemination)	n/a	
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Document reference:	**PDB.fs.239.18_Del.D1.12**	

Contents

1 Introduction

The present deliverable report, D1.12 'Updated Communication Kit', was produced as part of work package 1 (WP1) 'Specification, Dissemination, Exploitation, Training and Communication' of the ModuLase project.

An initial communication kit was provided to the Commission within D1.11 deliverable report 'Initial Communication Kit', with the intention of updating the content in the due course of the project, while the communication and dissemination material is being produced. The overall communication material will comprise of narrative text, photographs, slides and any other suitable communication material.

It should be highlighted that the ModuLase project is funded by one of the calls under the Photonics and Factories of the Future (FoF) Public Private Partnerships (PPP). Therefore, all communication activities related to the project will acknowledge the context of the PPPs, for example by stating that the project is an initiative of the Photonics and Factories of the Future Public Private Partnerships.

Specifically, for workshops, press releases, presentations etc, the EU emblem, the Photonics21 and FoF logos will be displayed prominently together with the text "Photonics and Factories of the Future Public Private Partnerships" (Figure 1).

a)

b)

Figure 1 Logos of
a) Photonics PPP;
b) Factories of the Future PPP.

The information provided in this document comprises:

- The ModuLase project logo, which will be used in all dissemination material and activities, as well as logos of all ModuLase partners.
- Narrative text contained in the initial ModuLase project presentation, which will be used by the ModuLase Consortium and the Commission for dissemination purposes.
- A description of the ModuLase project website, which is one of the main tools for disseminating the ModuLase results among potential users and customers.
- Specific news articles and/or dedicated webpages featuring ModuLase information within the project partners' own website.
- Dissemination material, such as pen drives, flyers, posters, roll-up, used within the project for raising awareness about the ModuLase project among various target users and for attracting potential customers.
- A press release, produced at the start of the project to launch the dissemination activity of the ModuLase project.

- An overview of communication and dissemination activities that will be implemented in the course of the project.

2 ModuLase and Partner Logos

The ModuLase logo, Figure 2, will be used in all dissemination material for project events and dissemination activities (e.g presentations, publications, leaflets, brochures, project website) and in the project website.

Logos of the ModuLase partners are also shown from Figures 3 to 10.

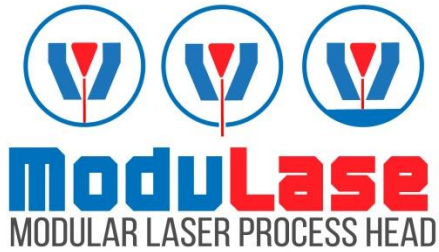


Figure 2 ModuLase Logo.

Figure 3 Logo of the partner TWI Ltd (TWI).

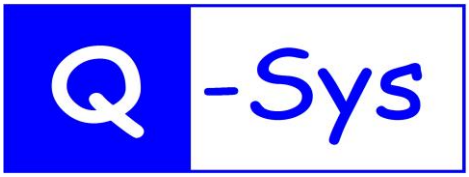


Figure 4 Logo of the partner Q-SYS BV (Q-Sys)

Figure 5 Logo of the partner ULO OPTICS LIMITED (ULO).

Figure 6 Logo of partner ASOCIACION DE INVESTIGACION METALURGICA DEL NOROESTE (AIMEN).

Figure 7 Logo of partner EUROPEAN FEDERATION FOR WELDING JOINING AND CUTTING (EWF).

Figure 8 Logo of partner CENTRO RICERCHE FIAT SCPA (CRF).

Figure 9 Logo of partner DUHLMEYER KONSTRUKTION WERKZEUG- UND FORMENBAU (SODECIA).

Figure 10 Logo of partner GRAHAM ENGINEERING LIMITED (GEL).

3 Content of Initial Project Presentation

An initial PowerPoint presentation has been produced at the beginning of the project, to be used by the ModuLase partners and the European Commission. The subsequent sub-paragraphs provide details on key information included within the presentation document.

3.1 Background to the Proposal

- Despite the unrivalled versatility of fibre-delivered laser sources to perform a wide range of processes, the potential flexibility is limited by the need to change the processing head for the different processes to be performed (eg welding, cutting and cladding).
- The majority of industrial laser systems are employed to perform low-variety and high-volume manufacturing operations.
- Current manufacturing trends (such as increased automation, individualisation and next-shoring) are driving the need to develop manufacturing systems which are capable of performing a higher variety of manufacturing operations and product mixes.
- Need to maximise equipment utilisation rates, by eliminating down-time associated with changing of laser processing heads and equipment stoppages.
- Increasing need by industry to reduce capital investment costs.

3.2 ModuLase Call and Consortium

- H2020-IND-CE-2016-17- FOF-13-2016 call.
- Factories of the Future: Photonics Laser-based production.
- Start date: 1st September 2016.
- Duration: 36 months.
- Received EC funding: €2,458,465 (€2,184,565 Grant)
- Programme directly focused on “Rapid individualised laser-based production”.
- 8 participants from 4 countries.
- 50% RTO, 25%SMEs and 25%LEs.
- End users within the power, aerospace and automotive sectors.

3.3 ModuLase Overall Objectives

- The ModuLase project will develop a re-configurable highly flexible processing head system, capable of covering welding, cladding and cutting.
- The ModuLase process head system will:
  - Be capable of welding, cladding and cutting, through the use of three modular end-effectors.
  - Include intelligent sensor technologies for in-process monitoring.
  - Be linked to an intelligent system, in order to achieve adaptive process control, quality assurance, and semi-automated process parameter configuration.

3.4 ModuLase Key Features

- Reduced capital investment costs:
  - End- users will save as much as 59% when installing the ModuLase head (with three end-effectors considered in this project).
  - Higher savings possible for organisations adopting more end-effectors.
  - Further savings may be realised when replacing end-effectors due to wear or damage.

- Maximise laser equipment utilisation rates by reducing down-time:
  - Anticipated changeover time of <1 minute for the proposed ModuLase process head.
  - Improved utilisation rates.
  - The ModuLase system will allow manufacturers to adopt parallel process cell layouts, rather than sequential process cell layouts; reducing the risk of production-line stoppages.

- Reduced running costs:
  - Modular end-effectors easily and cheaply replaceable
  - Reconfiguring the BFU to match the required beam configuration will save time and cost.
  - The integrated process control and monitoring system also helps minimise, if not eliminate, defects and therefore save on re-work or scrappage.

3.5 ModuLase Technologies & Industry Focus

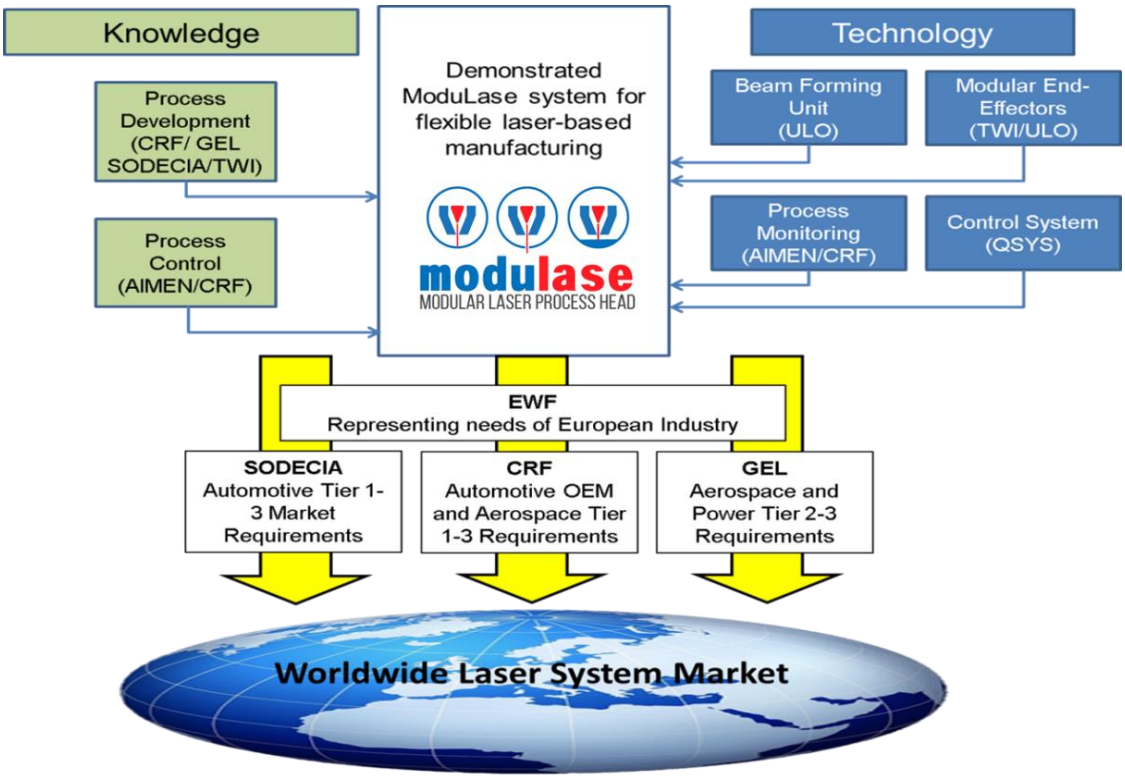


Figure 11 Diagram showing ModuLase technologies and industry focus.

3.6 ModuLase Technologies

Beam Forming Unit (BFU):

- The adaptable optical elements of the BFU will be capable of delivering a wide range of laser beam energy distributions, suitable for welding, cutting and cladding applications.
- A range of high-value goods, e.g. those made from advanced materials (advanced alloy steel, titanium, aluminium, etc.) will be covered.

End-effectors:

- Three rapidly interchangeable end-effectors will be developed to cover welding, cutting and cladding applications.
- The end-effectors will have a plug and play system to allow them to be changed on the end of the process head within a time of 1minute.

Process monitoring and quality control:

- A process monitoring system suitable for welding, cladding and cutting processes will be developed.
- It will be embedded into the ModuLase system, in order to assure process stability and enable reduction in time and costs involved in the process.

User friendly Operating/User interface:

- The ModuLase system will comprise an user friendly HMI interface, enabling to input the material grade, its thickness and the laser process required.
- Both the Quality Assurance System and BFU shall adjust vision and optical configurations and deliver the beam accordingly with minimal user contact.

Adaptability for Industrial Applications:

- The ModuLase system will be able to cover cutting, welding and cladding applications.

3.7 Summary of Key Deliverables

- Three end effectors manufactured for cutting, welding and cladding.
- BFU manufactured.
- Embedded Process Monitoring assembled.
- Laser process parameters for assembly and testing of process head (BFU + end effectors + process monitoring).
- System and software integrated with new knowledge, gained from TWI trials.
- Final system developed from its initial specification, testing of requested settings with actual beam settings and embedded monitoring system included.
- Final Demonstration of the ModuLase system in industrial environment and to an industrial audience.

4 ModuLase Project Website

The link of the ModuLase project website is http://www.modulase.eu/.

One of the main dissemination tools is the ModuLase project website. The aim of the website is to raise awareness of the project goals and results. The content is structured in six main tabs:

Home, Objectives, Impacts, Documents, Partners and Contact – as shown in Figure 12.

Its configuration has been designed to enable access via a mobile phone, as use of smartphones becomes more widely the option of choice. The “web design” approach focuses on crafting websites that provide an optimal viewing experience across a wide range of devices, from mobile phones to desktop computer monitors.

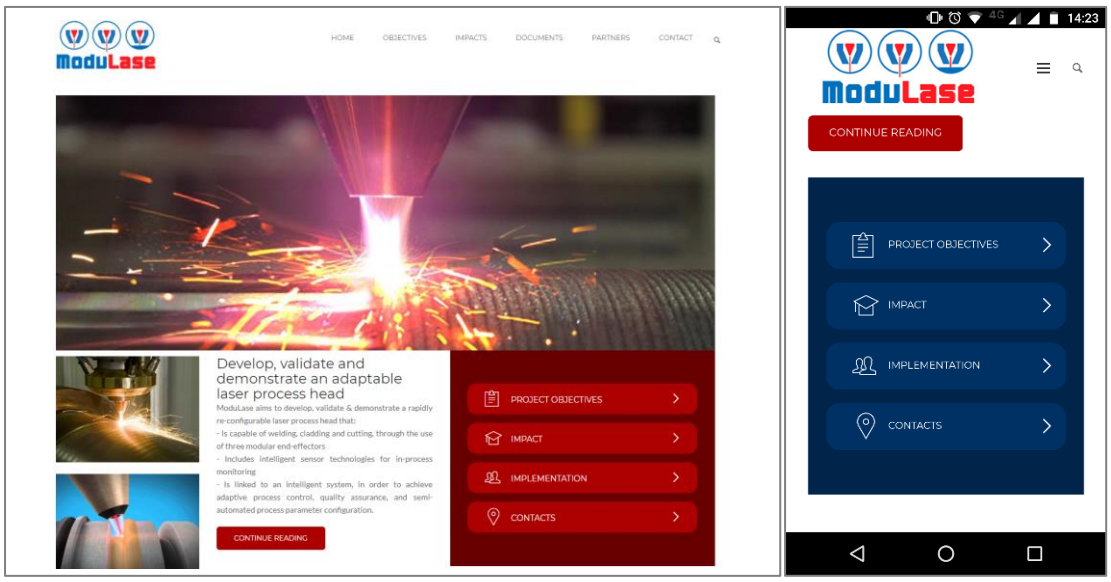


Figure 12 Screenshot of the ModuLase website.

5 Partner's Websites

Specific news articles and/or dedicated webpages featuring ModuLase information within the project partners organisation's website have been implemented. Some examples are shown in Figures 13 to 16 below.

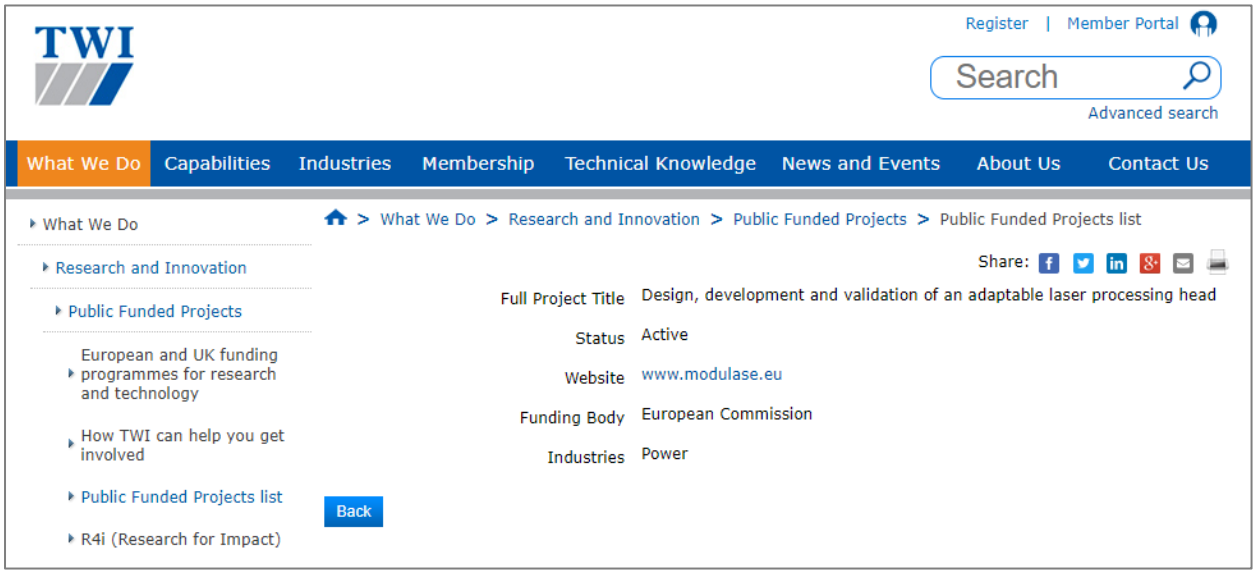


Figure 13 ModuLase Reference at TWI's website.

Figure 24 ModuLase Reference at Graham's Website.

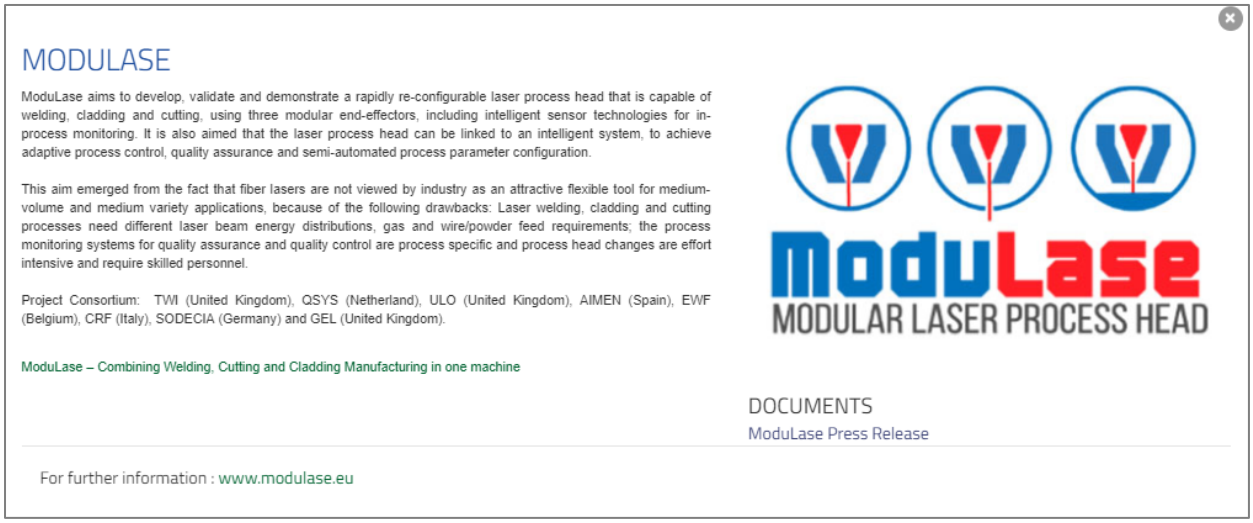


Figure 15 ModuLase Reference at EWF's website.

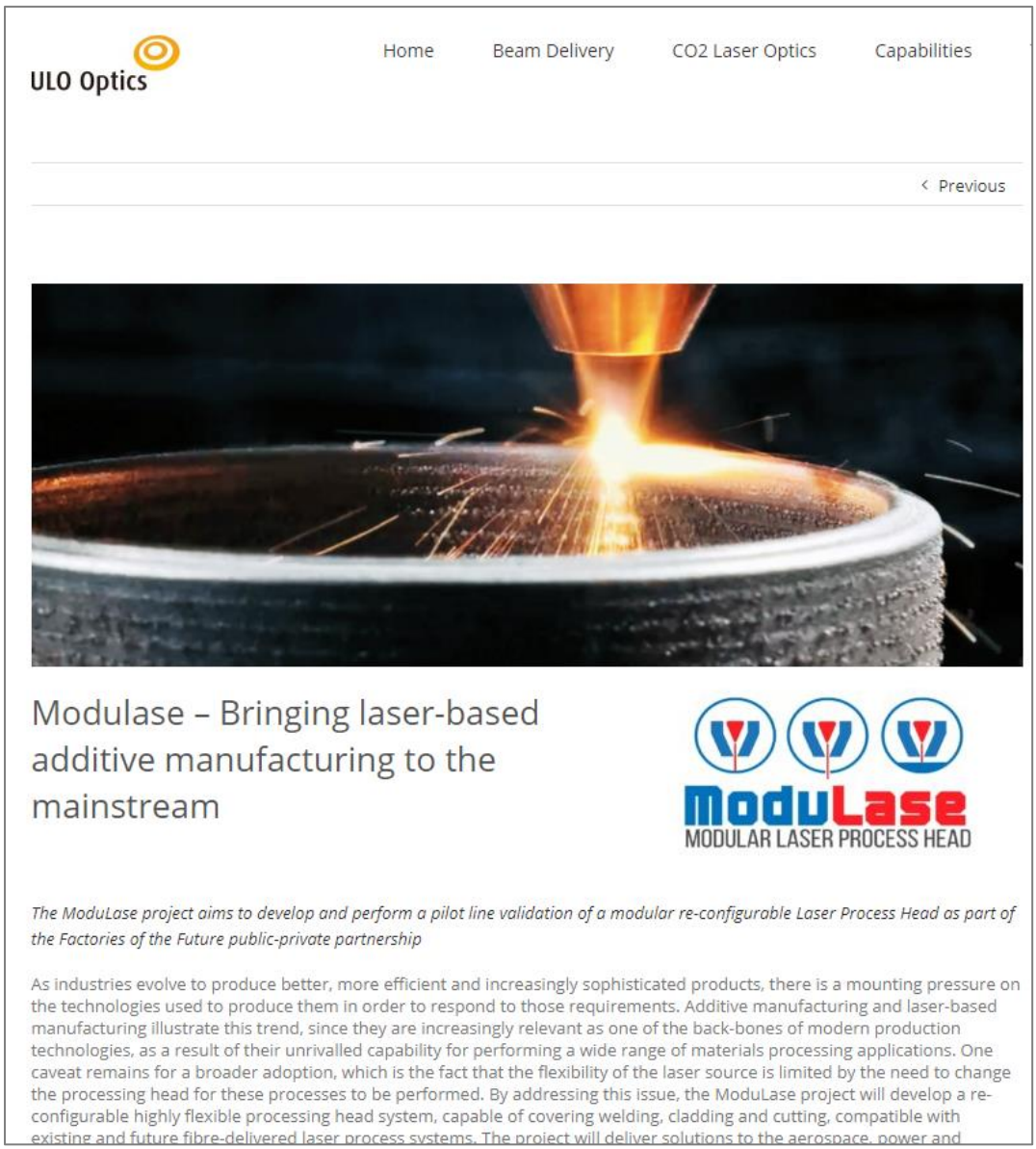


Figure 16 ModuLase Reference at ULO's website.

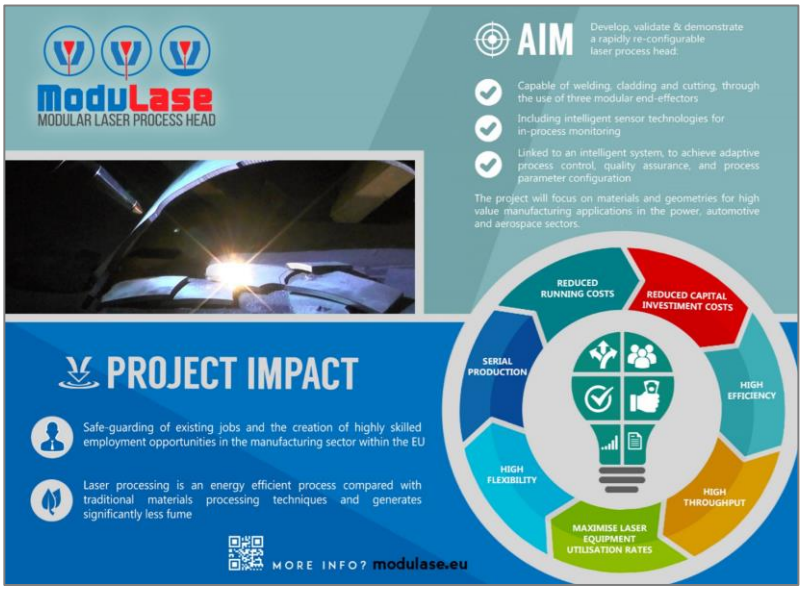
6 ModuLase Dissemination Materials

The following dissemination tools have been produced within the ModuLase project:

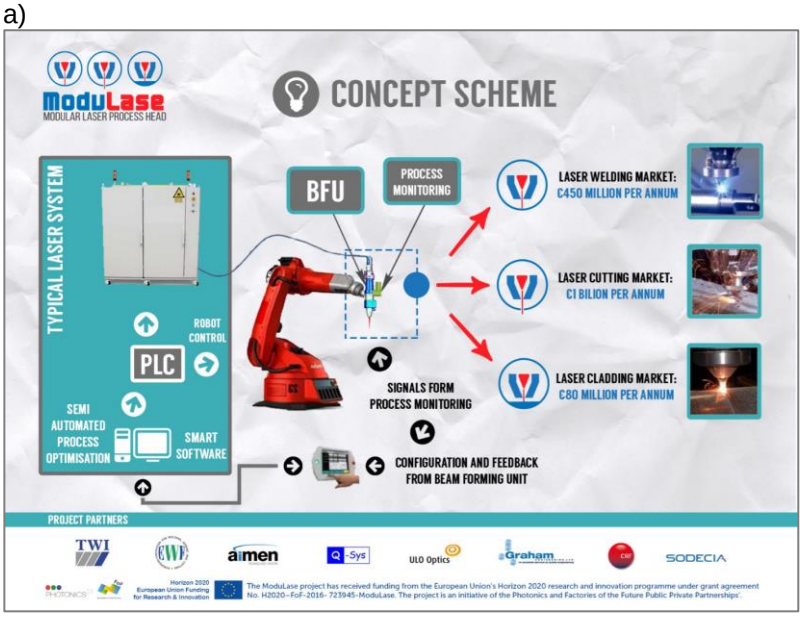
- Pen Drive
- Flyer
- Poster
- Roll-up

Images of the generated dissemination material are shown from Figure 17 to Figure 20 below.

Figure 17 ModuLase Pen Drive.



a)



b)

Figure 183 ModuLase Flyer: a) front page; back page b).

Figure19 ModuLase Poster.

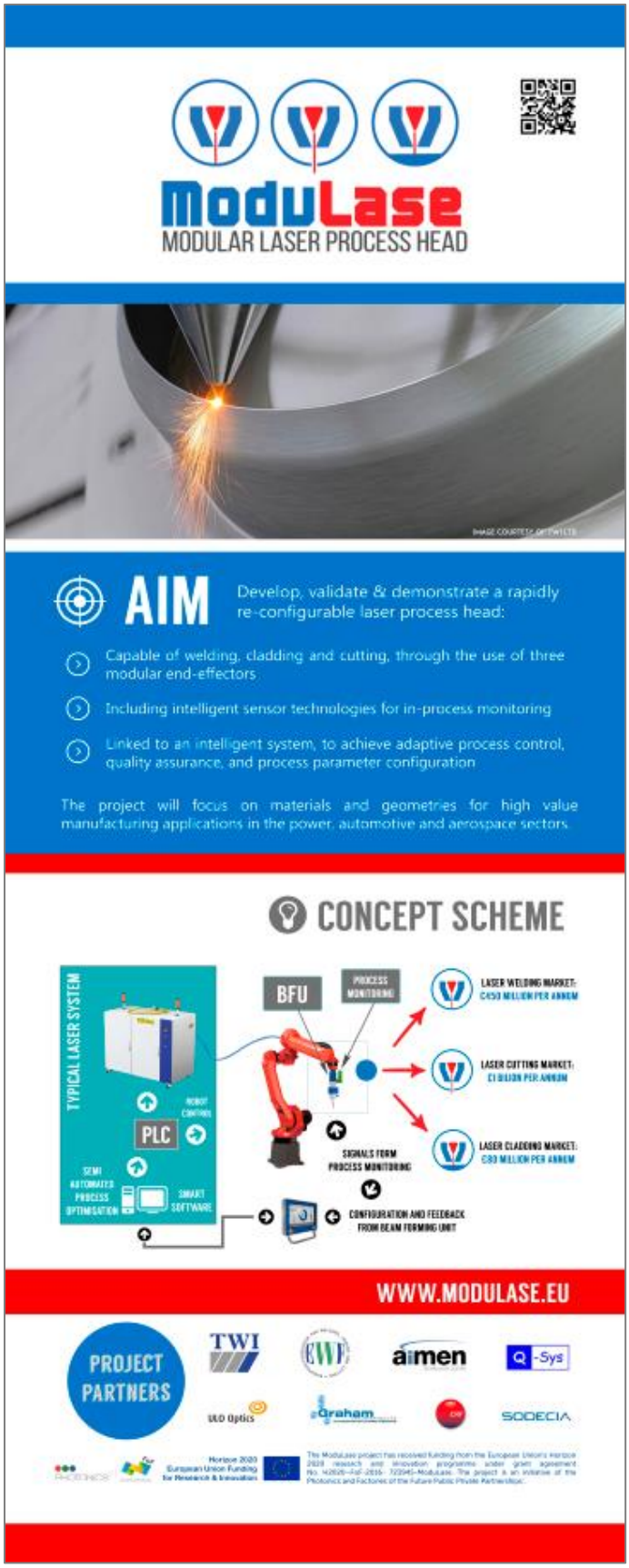


Figure 20 ModuLase Roll-up.

7 Press Release

Bringing laser-based Additive Manufacturing to the Mainstream

The ModuLase project aims to develop and perform a pilot line validation of a modular re-configurable Laser Process Head as part of the Factories of the Future public-private partnership

As industries evolve to produce better, more efficient and increasingly sophisticated products, pressure is mounting on the technologies used to produce them in order to respond to those requirements. Additive manufacturing and laser-based manufacturing illustrate this trend, since they are increasingly relevant as key modern production technologies due to their unrivalled capability for performing a wide range of materials processing applications. One caveat remains for a broader adoption, which is the fact that the flexibility of the laser source is limited by the need to change the processing head for these processes to be performed. By addressing this issue, the ModuLase project will develop a re-configurable, highly flexible processing head system, capable of covering welding, cladding and cutting, compatible with existing and future fibre-delivered laser process systems. The project will deliver solutions to the aerospace, power and automotive industries.

ModuLase will encompass all stages of the process chain and provide additional flexibility, cost reduction and execution speed without compromising the overall quality, hence providing a better overall performance. By providing the groundwork for a more thorough utilization of laser-based manufacturing, ModuLase will provide a critical tool for the Factories of the Future public-private partnership which sets a vision and outlines routes on its 2014-2020 roadmap towards high added value manufacturing technologies. As result of this vision, the factories of the future will be clean, highly performing, environmental friendly and socially sustainable.

The ModuLase project will develop a re-configurable highly flexible processing head system, which will be capable of covering welding, cladding and cutting, with a changeover time of less than one minute between processes. The new head system will achieve this through the use of three modular end-effectors and, will include intelligent sensor technologies for in-process monitoring. Lastly, since linked to an intelligent system, the ModuLase system will achieve adaptive process control, quality assurance and semi-automated process parameter configuration.

Technology and knowledge transfer are one paramount issue that will also be part of the project, facilitating the collaboration with EU SMEs and large industries, and enabling the rapid deployment and commercialisation of the new technology.

The ModuLase project partners are TWI (United Kingdom), QSYS (Netherland), ULO (United Kingdom), AIMEN (Spain), EWF (Belgium), CRF (Italy), SODECIA (Germany) and GEL (United Kingdom).

Project specifications and technical deliverables

The technology to be developed and validated in ModuLase consists of the following:

- A Beam Forming Unit (BFU), capable of delivering a wide-range of laser beam energy distributions, suitable for the different processes;
- Modular ‘plug and play’ end-effectors, which can be rapidly attached to the BFU to provide the additional functionality required for the different processes;
- An in-process monitoring and quality assurance system, achieved through co-axial process monitoring and algorithms to support adaptive process control;

- A software system, which allows automated re-configuration of the process head and (semi) automated process optimisation, through a user-friendly human-machine-interface.

Figure 21 shows a schematic overview of the ModuLase system.

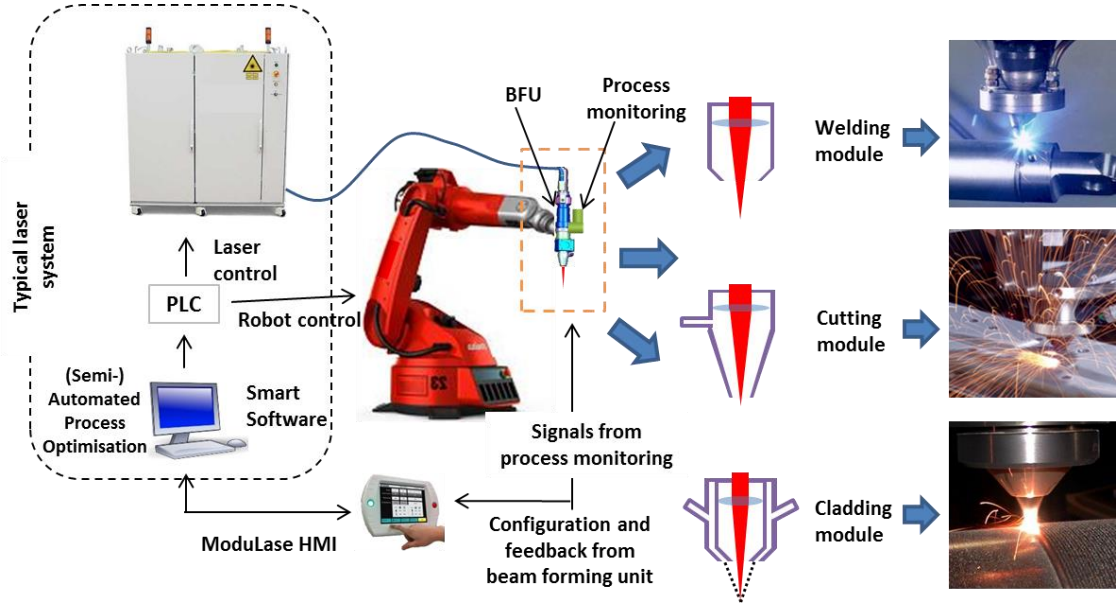


Figure 24 Overview of the ModuLase system, comprising a re-configurable process head (with BFU and modular end-effectors), process monitoring sensors, and a control system for adaptive process control and (semi) automated process optimisation.

The ModuLase project will also develop welding, cladding and cutting process knowledge for the target markets. Existing laser processing knowledge will be used, where possible, to supplement the additional processing knowledge developed within ModuLase. This knowledge will be embedded within a software system, which will:

- Control the positions of the optics within the BFU, allowing automated changing of the laser beam energy distributions;
- Communicate with the other ancillary equipment (laser, robot, powder feed etc.);
- Communicate with the in-process monitoring system and process control algorithms to provide process control;
- Have a human-machine-interface (HMI) to allow (semi) automated process parameter optimisation, by allowing the end user to input process requirements.

The (semi) automated selection of process parameters (including laser beam energy distributions) and adaptive process control, will result in a unique and remarkable product that will maximise the laser sources potential for material processing and facilitates non-expert industrial adoption.

The ModuLase project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. H2020–FoF-2016- 723945-ModuLase. The project is an initiative of the Photonics and Factories of the Future Public Private Partnerships.

Below is the publication of a ModuLase press release at the Welding and Cutting magazine, Issue 06 from 2016.

NEWS

The "ModuLase" project: Bringing laser-based additive manufacturing to the mainstream

As industries evolve to produce better, more efficient and increasingly sophisticated products, there is a mounting pressure on the technologies used to produce them in order to respond to those requirements. Additive manufacturing and laser-based manufacturing illustrate this trend, since they are increasingly relevant as one of the back-bones of modern production technologies, as a result of their unrivalled capability for performing a wide range of materials processing applications.

Solutions to the aerospace, power and automotive industries

One caveat remains for a broader adoption, which is the fact that the flexibility of the laser source is limited by the need to change the processing head for these processes to be performed. By addressing this issue, the European "ModuLase" project will develop a reconfigurable highly flexible processing head system, capable of covering welding, cladding and cutting, compatible with existing and future fibre-delivered laser process systems. The project will deliver solutions to the aerospace, power and automotive industries.

„ModuLase" will encompass all stages of the process chain and provide additional flexibility, cost reduction and execution speed without compromising the overall quality, hence providing a better overall performance. By providing the groundwork for a more thorough utilisation of laser-based manufacturing, it provides a critical tool for the "Factories of the Future" public-private partnership which sets a vision and outlines routes on its 2014-2020 roadmap towards high added value manufacturing technologies. As result of this vision, the factories of the future will be clean, highly performing, environmental friendly and socially sustainable.

The "ModuLase" project will develop a reconfigurable highly flexible processing head system, which will be capable of covering welding, cladding and cutting, with a changeover time of less than one minute between processes. The new head system achieves this through the use of three modular end-effectors, include intelligent sensor technologies for in-process monitoring and, lastly, since it is linked to an intelligent system, will achieve adaptive process control, quality assurance, and semi-automated process parameter configuration.

Technology and knowledge transfer are one paramount issue that will also be part of the project, facilitating the collaboration with EU small and medium-sized enterprises (SME) and large industries, and enabling the rapid deployment and commercialisation of the new technology. Project partners include TWI (United Kingdom), QSYS (Netherland), ULO (United Kingdom), AIMEN (Spain), EWF (Belgium), CRF (Italy), SODECIA (Germany) and GEL (United Kingdom).

Project specifications and technical deliverables

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- A software system, which allows automated re-configuration of the process head and (semi) automated process optimisation, through a user-friendly human-machine-interface.

The "ModuLase" project will also develop welding, cladding and cutting process knowledge for the target markets. Existing laser processing knowledge will be used where possible, to supplement the additional processing knowledge developed within "ModuLase". This knowledge will be embedded within a software system, which will:

- Control the positions of the optics within the BFU, allowing automated changing of the laser beam energy distributions;
- Communicate with the other ancillary equipment (laser, robot, powder feed etc);
- Communicate with the in-process monitoring system and process control algorithms to provide process control;
- Have a human-machine-interface (HMI) to allow (semi) automated process parameter optimisation, by allowing the end user to input process requirements.

The (semi) automated selection of process parameters (including laser beam energy distributions) and adaptive process control, will result in a unique and remarkable product that maximises the laser sources potential for material processing and facilitates non-expert industrial adoption.

This project has received funding from the European Union's "Horizon 2020" research and innovation programme under Grant Agreement No. 723945. (According to press information from EWF)

Strong engineering industry drives UK productivity

Britain's strong engineering industry is driving productivity, with benefits across the economy, according to new research published in the report "Engineering UK 2016 – The State of Engineering". Engineering is 68% more productive than the retail and wholesale sector, with apprentices making a significant contribution.

The report was produced by EngineeringUK, an independent not for profit organisation that promotes the vital contribution of engineers, engineering and technology in society. The publication analyses the engineering industry's capacity and capability for growth and shows that this resilient sector also has a positive impact on other areas of the economy. For every new job in engineering, two more are created outside of the sector and every £1 gross value added (GVA) generated in engineering generates £1.45 elsewhere. However, the gap between supply and demand for people with engineering skills is still large enough to trigger widespread concern for the long term future.

Over 27% of total UK gross domestic product (GDP) is generated by engineering, amounting to £445.6 bn and turnover for engineering has grown by 3.4% to £1.21 tn.

Figure 21 ModuLase at Issue 06, 2016 from Welding and Cutting Magazine.

8 Overall Plan for Communication Activities across the Project

Communication and Dissemination activities represent a very important part of the ModuLase project. The communication strategy has been designed to ensure that the commercial impact of the project is not endangered. Therefore, the project results to be communicated will split into:

- Publically available information, that will be widely communicated;
- Confidential information, which will not be communicated outside of the consortium.

In addition to communicating the knowledge and results to potential end users, it is intended that all the publicly communicable deliverables will be shared within the scientific and academic communities related to the identified end-users. An overview of communication and dissemination activities that will be implemented in the course of the project are summarised in Table 1.

Table 1 Communication and Dissemination activities in ModuLase

Channel	Target audience	Communication activities
General communication activities		
Web-site	General public	A ModuLase website will be created at M2 that will communicate up-to-date information relating to the project during and after the project. Both a public and confidential area will be available. The website will be promoted as a useful tool for the partners to promote their involvement in ModuLase and it will be linked to partners' website and vice versa.
General marketing activities	General public	Project flyers and banners, which will describe the objectives of the project, will be made available. A press release will be produces at the end of the project. Regular press releases will be send to suitable media channels during the project at important stages of success worth disseminating.
Video	General public	Will be produced and made publically available via conduits, e.g. YouTube
Active communication activities		
Publications	End-users, experts and researchers in manufacturing processes and laser sectors	Authorship of papers in peer reviewed journals and trade magazines, promoting the scientific and technical results of the ModuLase project inclusive of: • Optics and Lasers in Engineering, Laser Systems, Laser Technik Journal etc. • Materials and Design, Eureka etc. • Welding and Cutting • Other trade journals
Conferences, Events and Trade fairs	End-users, experts and researchers in laser-based manufacturing community	Presentation posters/exhibition stands at major international academic conferences for the presentation of the project results and prototype demonstration to potential partners and end users. International academic conferences to include: • The Industrial Laser Applications Symposium (ILAS) • Lasers in Manufacturing (LiM), June 2017 • International Congress on Laser Advanced Materials Processing (LAMP), annually • International Institute of Welding Conference, 2017 and 2018
Workshops and seminars	End-users	Research results will be promoted by the organisation workshops, seminars and other dissemination events during which they will present the results of ModuLase
Demonstration day	End-users (e.g. OEM & manufacturing partners)	OEM and manufacturing partners and relevant sector representatives will be invited to the demonstration day event, as part of WP7. ModuLase results will be presented and discussed with industrial experts.

Channel	Target audience	Communication activities
Interactions with related projects and initiatives	General public	Research projects funded by the EC under previous framework programmes that can provide useful input for the technological background of ModuLase. Most of the consortium members are currently involved in several EU or national funded projects and the existing liaisons will be used for dissemination.
Training	End-users, experts and students (looking at engaging with the Future Workforce)	Training activities as a part of an educational programme defining objectives, target audiences, training needs and skills. Undertaken as lectures at consortium meetings and distributed to the collaborating partners. Also, the organisation of training workshops (internal and external) will allow a wider dissemination of the project results as well as ensure the exploitation of the results after the end of the project.
Course material	End-user, experts, training schools and Universities	Course material resulting from the project will be gathered and used to be delivered in advanced university courses or vocational education and training (VET) courses, in the form of web-based demos, as well as courses for companies.

9 Acknowledgement

The ModuLase project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. H2020–FoF-2016-723945-ModuLase. The project is an initiative of the Photonics and Factories of the Future Public Private Partnerships.