



# MODULE A – YOUR ENTRY INTO PHS TECHNOLOGY

Our **Intensive Training in Press Hardening Module A** gains access to everything, which is necessary for a safe and smooth start into press hardening technology. The technological core of hot stamping, i.e. the integration of hot forming and heat treatment, is explained as well from a materials technology as from a process technology perspective. It constitutes a 4-day journey from theory to practice covering aspects e.g.:

- > state-of-the-art PHS application
- > market development
- > phase transformation, microstructure & mechanical properties
- > press hardening steels & coatings
- > process monitoring & control
- > selection of process parameters.

Since more than a decade the unique Module A line-up of contents has proven to be an effective measure to avoid rookie mistakes.

## Target Audience

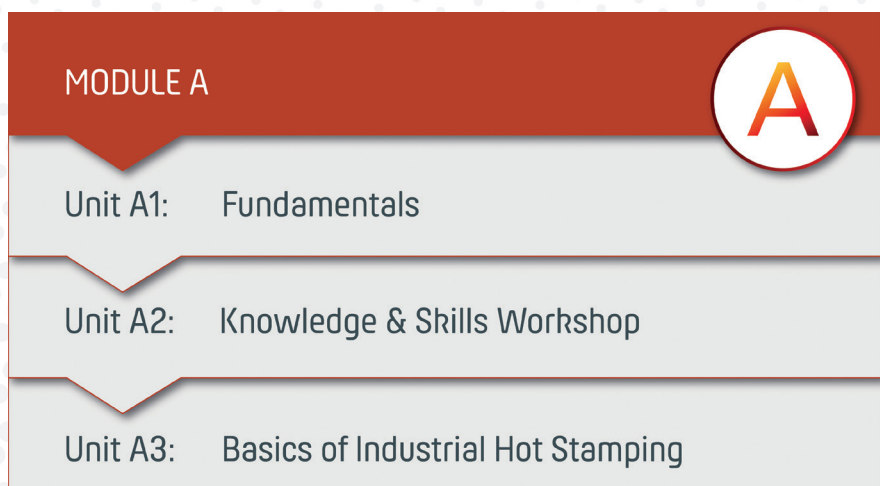
The Intensive Training Module A constitutes the foundation of all following PHS-related trainings and coachings. It therefore must be successfully completed before continuing on to any other training. Participants are typically engineers, technicians, and foremen in the fields of production and quality assurance, as well as maintenance, production planning and control, marketing and sales, and tool design and manufacturing.

## Program

The training contents are divided into 3 topical units, Figure 1. In advance, an introductory part has to be prepared at home by a new textbook for professional development on Press

*In principle it's simple – as long as you understand the theory behind it!*

Hardening which will be provided to each participant several weeks before the training. The knowledge & skills workshop repeats and deepens the information obtained by the textbook and the units in a playful way.



Line-up of learning units of Intensive Training in Press Hardening Module A

## Unit A1: Fundamentals

**Contents.** The fundamentals of heat treatments for steel and steel forming at high temperatures as well as selected aspects of press hardening applications will be provided in a combination of seminars and practical experience. This will include lab internships, which deal with the central mechanisms of plastic deformation. In particular, these seminars focus on the basic influence of heat on phase transformations, micro structures, and mechanical properties, as well as on the forming behavior, formability, and flow stress.

**Aims & Targets.** Using their acquired knowledge and skills, participants will be able to set defined properties for selected steels that are suitable for heat treatment processes. They will further understand the influence of thermal processing on forming conditions. Fundamental principles of heat treatment of steel will be elaborated.

## Unit A2: Knowledge & Skills Workshop

**Contents.** In this unit A2 the information on the basics of industrial press hardening given in the textbook will be repeated and deepened in a playful way. It comprises an overview of the historical development, the current state-of-the-art, as well as numerous examples of PHS applications in contemporary car bodies. Market streams and developments are indicated. Perspectives and expectations of different OEMs on future

PHS application are explained and discussed. Special attention is paid to the design and application of functionally graded parts, i.e. parts with varying properties (e.g. tailor heat-treated blanks/parts, TWBs, TRBs, patched blanks/parts etc.). All available options and principles to adjust varying properties during the production of so called functionally graded press hardened parts will be comprehensively explained. Existing process variants will be evaluated as well with regard to implicit technological risks and limits as to the achievable local resolution of resulting part properties.

**Aims & Targets.** Participants will obtain by this workshop a comprehensive overview over more than four decades of development in PHS technology, ultimately putting the training group on the same page regarding their perception of technological contents and market expectations. Options to adjust varying part properties (e.g. soft zones) in a press hardening process are fully understood as well with respect to their technological potential as to existing restrictions.

## Unit A3: Basics of Industrial Hot Stamping

**Contents.** A major challenge in press hardening is processing safely and reliably, while efficiently combining heat treatment and forming. The different process variations of the press hardening process, from a process-oriented technological viewpoint as well as from a material oriented technological viewpoint, will be explained in detail

in the seminar. In the presentations, the individual properties of different material processing systems will be taken into account. The creation of functionally graded, press hardened components using strategies that are time-dependent and have locally variable temperature controls is comprehensively explained. The influence of different material processing systems when in contact with selected tool steels and the influence of coatings on the tribological system design will also be of interest. This knowledge will be reinforced by practical work experience in the laboratory by performing extensive press hardening trials. Questions, which concern the selection of appropriate methods for thermal process control, will also be addressed.

**Aims & Targets.** The participants will gain the ability to reliably handle and utilize the latest material processing systems, which are essential for press hardening body panels under mass production conditions. Based on their acquired knowledge, participants will be capable of making appropriate process parameter choices for different material systems as well as for functionally graded PHS parts in terms of adjusting defined mass and/or property gradation patterns. Methodological skills on through process monitoring of interdependent process and part characteristics will be available.

## Schedule Module A

The training consists of four full days of seminars and lab internships. It takes place at the METAKUS PHS Training Center in Germany.

Schedule	1 <sup>st</sup> Day	2 <sup>nd</sup> Day	3 <sup>rd</sup> Day	4 <sup>th</sup> Day
AM	Welcome & Introduction	Unit A1 Lab	Unit A3 Seminar	Unit A3 Seminar
	Unit A1 Seminar	Unit A2 Knowledge & Skills Workshop		
Noon	Lunch break	Lunch break	Lunch break	Lunch break
PM	Unit A1 Seminar	Unit A3 Seminar	Unit A3 Lab	Unit A3 Seminar
				Feedback Round

**Four-day schedule  
of Intensive Training  
Module A.**