



# 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

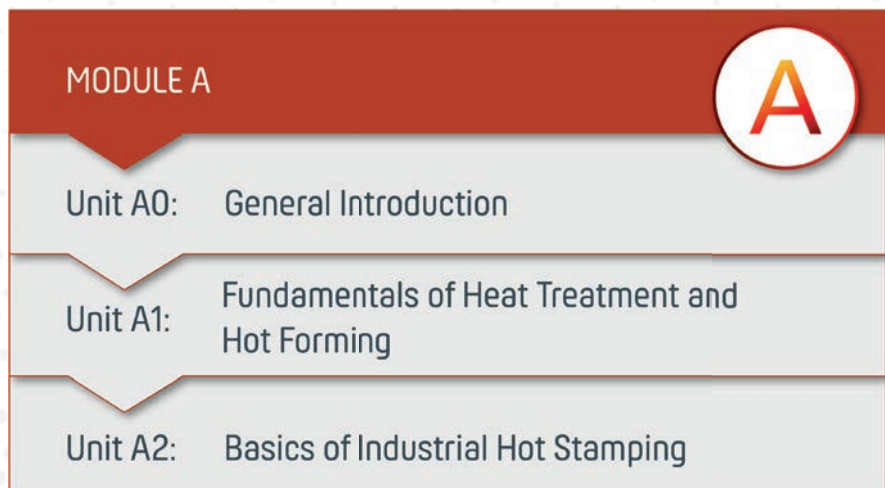
## Target Audience

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.



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

### Unit A0: General Introduction

**Contents.** An overview of the historical development, the current state-of-the-art, as well as numerous examples of PHS applications will be given. Market developments are indicated. The expectations of different OEMs for future PHS application will be explained.

**Aims & Targets.** Participants will obtain a comprehensive overview of 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.

### Unit A1: Fundamentals of Heat Treatment and Hot Forming

**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, microstructures, and mechanical properties, as well as on the forming behavior, formability, and flow

stress. Similarly, questions about high temperature tribology will be answered.

**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: 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 process-

ing 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, as is shown in Figure 2. It takes place at the METAKUS PHS Training Center in Germany.

Schedule	1st Day	2nd Day	3rd Day	4th Day
AM	Welcome & Introduction	Unit A1 Lab	Unit A2 Seminar	Unit A2 Lab
	Unit A0 Seminar			
	Unit A1 Seminar			
Noon	Lunch break	Lunch break	Lunch break	Lunch break
PM	Unit A1 Seminar	Unit A1 Seminar	Unit A2 Seminar	Unit A2 Seminar
		Unit A2 Seminar		Feedback Round

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