Group of Electron Beam Technology

Department of New Technologies

ISI ASCR Institute of Scientific Instruments AS CR, v. v. i.

THEMATIC RESEARCH FOCUS

Research area

– Electron beam welding
– Vacuum brazing and vacuum feedthroughs
– Special electronics

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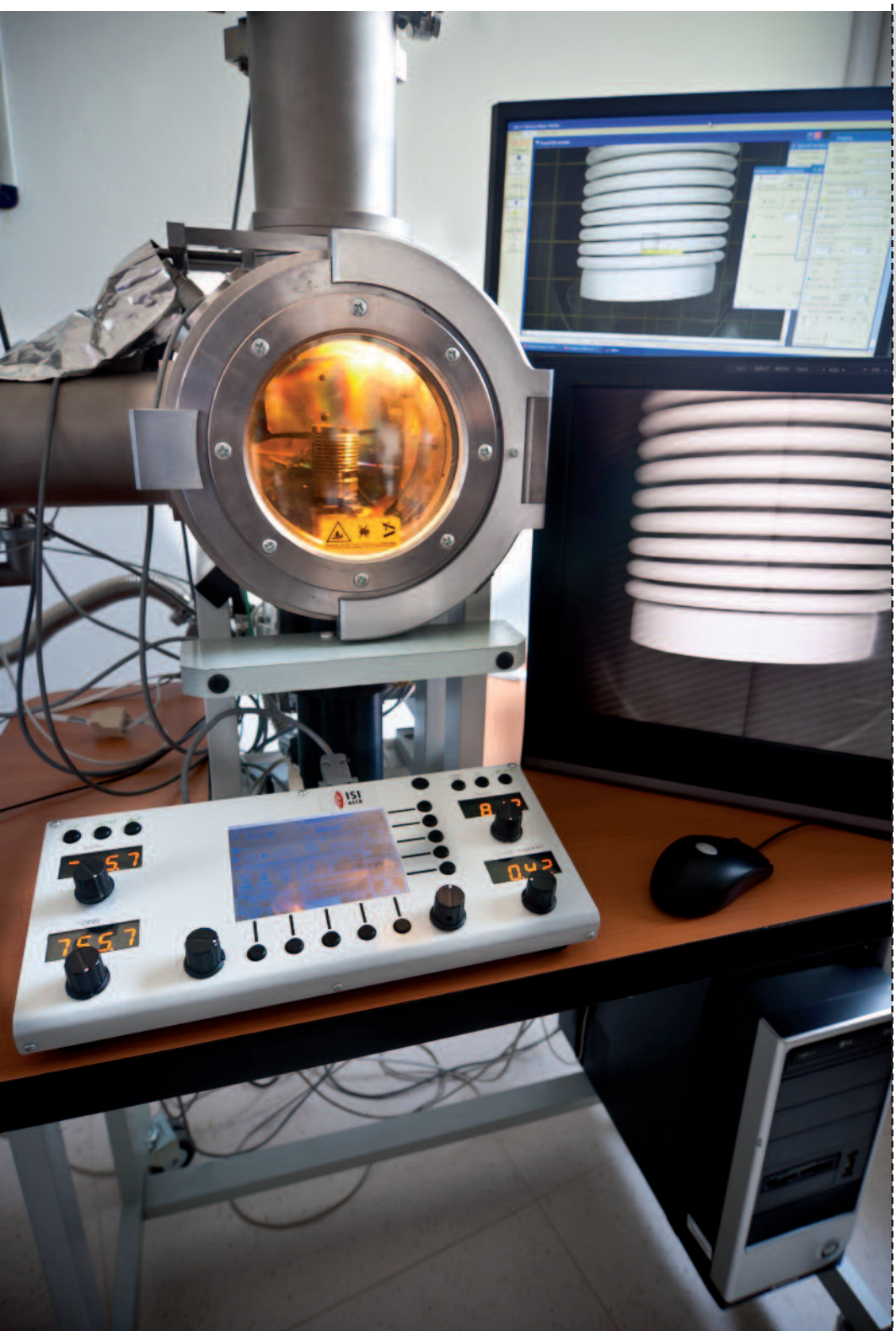


Electron beam welder MEBW-60/2 at ISI Brno

Excellence

Electron beam welding of dissimilar metals, custom-made vacuum feedthroughs, precise high voltage supplies

Mission

Development of new joining techniques of various metals, as well as design of the necessary equipment, such as electron beam welders and vacuum furnaces

DEVELOPED TECHNOLOGIES

Content of research

– Electron beam welding of dissimilar metals
– Development of electron beam welders including high voltage power supplies
– Brazing of metals with brittle non-metallic materials using pliable active filler metals
– Development of vacuum feedthroughs based on glass-to-metal seal

Main capabilities

Basic research

– Study of homogenous and heterogeneous joints of various metals

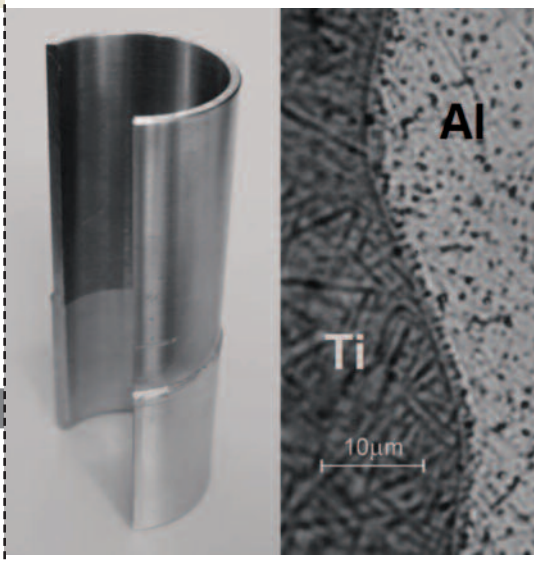
Applied research

– Design of technological devices such as electron beam welders, vacuum furnaces, etc.
– Development of high voltage power supplies
– Various types of vacuum feedthroughs based on glass-to-metal seal (matched kovar-glass or compression seal) both standard types (e.g. D-sub) or custom made

Heat exchanger welded by electron beam

Various components welded by electron beam

Custom-made vacuum feedthroughs



Detail of heterogeneous joint of Ti and Al

Fields of research results application

– Precision engineering
– Automotive and aerospace industry
– Nuclear industry
– Vacuum technology
– Scientific instruments

KEY RESEARCH EQUIPMENT

– Three electron beam welders (up to 60 kV, up to 2kW) developed and produced at ISI with two different types of vacuum chambers. The newest EB welder is currently produced by Focus GmbH (Germany) under licence agreement as MEBW-60/2.
– Upgraded vacuum furnace PZ-810 produced by former Czech company Tesla Roznov
– Laboratory vacuum furnace of in-house design for brazing and heat treatment of smaller parts
– Helium leak detector QualyTest™Dry HLT 270 by Pfeiffer Vacuum

ACHIEVEMENTS

– Electron beam welder with power up to 2 kW with acceleration voltage up to 60 kV. The welder is nowadays produced and marketed as MEBW-60/2 by German company Focus GmbH under licence agreement.
– Electron beam welding of dissimilar metals (e.g. Ti-Al) for applications in cryogenics
– Electron beam welding along requested trajectory
– Standard and custom-made vacuum feedthroughs suitable for nuclear industry from single-pin up to 24 pin feedthroughs

MAIN COLLABORATING PARTNERS

Collaboration with academic partners

– Brno University of Technology (Brno, CZ)
– University of West Bohemia in Pilsen (Plzeň, CZ)
– Masaryk University (Brno, CZ)
– Institute of Physics of Materials ASCR, v. v. i. (Brno, CZ)

Collaboration with companies

– Focus GmbH (Hünstetten, Germany)
– Tescan, a. s. (Brno, CZ)
– První brněnská strojírna, a. s. (Brno, CZ)
– PBS ENERGO, a. s. (Třebíč, CZ)
– Honeywell Turbo Technologies (Brno, CZ)
– KOMO mark, s. r. o. (Ostrava, CZ)
– Lavat, a. s. (Chotutice, CZ)
– MESIT přístroje spol. s r. o. (Uherské Hradiště, CZ)
– Rigaku Innovative Technologies Europe, s. r. o. (Praha, CZ)
– ŠKODA JS, a. s. (Plzeň, CZ)
– Strojírny Bohdalice, a. s. (Bohdalice, CZ)
– Glatt – Pharma, spol. s r.o. (Hradec Králové, CZ)
– VÚHŽ a. s. (Dobrá, CZ)
– UJP PRAHA, a. s. (Praha, CZ)
– Siemens, s. r. o., odštěpný závod Industrial Turbomachinery (Brno, CZ)
– FEI Czech Republic (Brno, CZ)
– DELONG INSTRUMENTS, s. r. o. (Brno, CZ)
– Visteon-Autopal, s. r. o. (Nový Jičín, CZ)
– ČKD KOMPRESORY, a. s. (Praha, CZ)
– ÚJV Řež, a. s. (Husinec, CZ)
– Tecpa s. r. o. (Brno, CZ)

Dual 9-pin D-sub vacuum feedthrough

EXPECTATIONS

Offers

– Know-how in the field of electron beam welding and vacuum brazing
– Welding and brazing equipment capacities for job shop production
– Development and small-lot production of vacuum feedthroughs

Requirements

– Collaboration with industrial partners on common projects dedicated to applied science
– Knowledge and technologies for materials analysis
– New complementary technologies

Electron beam welder MEBW-60/2