



INTERNATIONAL INSTITUTE OF WELDING

A world of joining experience

Doc. XII-2709-2024

Annual Assembly Dodecanisa, Rhodes, Greece 2024

Venue: Rodos Palace Hotel, Trianton Avenue, Ixia 85100

Agenda

C-XII: Arc Welding Processes and Production Systems

July 8 - 11, 2024

Room: Listed by day of meeting

Chair: Prof. Satoru Asai (Japan)

Monday 8 July 2024, 0900 – 1830 @ DELPHI

CommissionXII Meeting

1. Opening of the Meeting
2. Attendees and Apologies, Identification of C-XII delegates
3. Adoption and Agreement of Agenda
4. Approval of the minutes from the last annual assembly in Singapore (Doc. XII-2639-2023)
5. Brief report of Joint Intermediate Meeting in Cambridge, UK
6. Direction and topics of Comm.XII
7. Presentation of documents:

0915: Session I Sensing & Monitoring

Chair: Prof. Satoru Asai (Chairman of Comm.XII)

- [01] 0915: High-resolution thermal imaging for melt pool dynamics studies in welding processes
Vinícius Jorge, Issam Bendaoud, Fabien Soulié, Cyril Bordreuil (France)
Doc. XII-2665-2024
- [02] 0935: Development of a multi-sensor system for automated weld seam evaluation based on thermal and electrical signals
André Haelsig, Jonas Hensel, Kevin Hofer, Florian Jurke (Germany)
Doc. XII-2675-2024
- [03] 0955: Acoustical monitoring of the shielding gas flow rate in the GTAW process
Jean Pierre Bergmann, Jörg Hildebrand, Michael Knester, Lukas Peter, Maximilian Rohe, Martin Sennewald (Germany)
Doc. XII-2670-2024
- [04] 1015: Analysis of solidification crack sensitivity in GTAW of 7xxx aluminum alloys by strain rate, temperature, geometric shape
Minjung Kang, Dong-Yoon Kim, Hansol Ko, SeungHwanLee, Jeonghun Shin, Jiyoung Yu (South Korea)
Doc. XII-2677-2024

**[05] 1035: Visit of IIW Staff :Election of C-XII Chairman
Elisabetta Sciaccaluga (IIW)**

1045-1115: Coffee break

1115: Session II: Machine learning

Chair: Dr. Stephan Egerland (Chairman of Sub-Comm. B)

- [06] 1115: Weld quality estimation using welding monitoring and CNN in square groove weaving welding
Kazufumi Nomura, Ryota Ota, Masahito Mochizuki, Fumiya Imura, Masaharu Amano, Hiroki Mori
(Japan)
Doc. XII-2692-2024
- [07] 1135: Deep learning to characterize the morphology of the arc and metal transfer in Gas Metal Arc
Welding
J. Eduardo Alvarez Rocha, Patricio F. Mendez , Lucas N. Taípe (Canada)
Doc. XII-2707-2024
- [07] 1155: Application of Deep Learning to Weld Pool Penetration Control in CO2 Welding
Satoshi Yamane,XiangWang Gong , ChuanZhi Wang, Takahito Nakamura, Takuya Nagai, Keito Ishizaki
(Japan)
Doc. XII-2693-2024
- [08] 1215: Investigation of a quantified sound probe for stud weld quality measurement with numerical
simulation data and real world welds using machine learning
Jean Pierre Bergmann , Peter Hellwig, Maximilian Rohe, Jörg Hildebrand , Kiril Schmidt (Germany)
Doc. XII-2669-2024
- [09] 1235: Developing and Evaluating a Real-time Machine Learning-based Detection System for Solidification
Cracks in GTAW Processes using Infrared Thermal Imaging
Benchaphorn Chanprasertkul, Titinan Methong, Chettapong Janya-anurak , Ratchadaporn Boonrungsee
(Thailand)
Doc. XII-2667-2024

Afternoon Session, 1430-1830

1430: Session III : Robot & Automation

Chair: Prof. Sven-F. Goecke (Chairman of Sub-Comm.C)

- [10] 1430: Robotic MAG welding: Seam tracking through arc sensor for uphill and downhill welding position
Olivier Cheminat, Alexis Ferrari, Alex Gutschmidt, Arthur Jamet, David Plélan (France)
Doc. XII-2671-2024
- [11] 1450: Adaptive process control for regulated slag formation in gas metal arc welding
Alexander Biber, Rahul Sharma, Uwe Reisgen (Germany)
Doc. XII-2663-2024
- [12] 1510: Automated arc welding and quality assessment of large scale support structures for offshore wind
turbines
Cagtay Fabry, Andreas Pittner, Michael Rethmeier (Germany)
Doc. XII-2673-2024
- [13] 1530: Overcoming Challenges in Aluminum Welding for the Automotive Industry: A Study on Wire
Chemistry and Dimensions
Kevin Fleming, Timothy Hurley, Tinku Kumar, Badri Narayanan, Niyanth Shridharan (India)
Doc. XII-2691-2024
- [14] 1550: Optimizing TIG Double-Electrode Welding: Insights into Electrical and Geometric Parameter Effects
on Process Stability and Seam Quality
Uwe Füssel, Paul Schilling, Hans Christian Schmale, Tim Ungethüm (Germany)
Doc. XII-2708-2024

1615-1645: Coffee break

1645: Session IV: High efficiency welding

Chair: Dr. M.J.M. Hermans (Vice-chairman of Comm.XII)

- [15] 1645: High-power arc welding of thick steels with electromagnetic weld backing
Fatma Akyel, Sergej Gook, Ömer Üstündag, Nasim Bakir, Christian Brunner-Schwer, Michael Rethmeier (Germany)
Doc. XII-2642-2024
- [16] 1705: High speed welding in automatised TIG welding: How to improve process and quality?
Olivier Cheminat, Laurent Jubin, Eric Nguédé, David Plélan (France)
Doc. XII-2672-2024
- [17] 1725: Twin-wire ultra-high frequency pulsed plasma arc welding of TiAl-4822 alloy
Xueming Hua, Fang Li, Chen Shen, Jianwen Xin, Yuelong Zhang (China)
Doc. XII-2678-2024
- [18] 1745: Forming mechanism of lack-of-fusion defect in swing-arc narrow gap GMA vertical-up welding
Xiaoyu Cai, Bolun Dong, Sanbao Lin, Zhida Ni (China)
Doc. XII-2692-2024
- [19] 1805: Narrow gap welding of titanium alloy samples with width of 45...60 mm with controlled magnetic field
Akhonin S , Bilous V , Qin B , Selin R , Wang H , Zhang Y (Ukraine) : *Non-physical*
Doc. XII-2690-2024

Close of Day 1 Activities

Tuesday 9 July 2024, 0855 -1830 @ DELPHI

Joint Meeting of C-I, C-IV, and C-XII

Morning Session, 0855-1300

Session 1: Chair: Professor Satoru Asai

0855: Opening of Joint Meeting of C-I, C-IV, and C-XII – Professor Satoru Asai

- [J1] 0855: 3D Printing and Surfacing of Inconel 625 through Automated Wire Arc Additive Manufacturing
Constantinos Goulas, Marcel J. M. Hermans, Aditya Rajes, Remco Rook, Baikhati Elok Satiti, Harry Thompson, Wei YaAuthors (Netherlands)
Doc. XII-2706-2024/I-1616-2024/IV-1647-2024
- [J2] 0915: A heat source for milli – scale WAAM technology
Saki Shigematsu, Hisaya Komen, Manabu Tanaka, Tadasuke Murata, Akihisa Murata (Japan)
Doc. XII-2696-2024/I-1617-2024/IV-1648-2024
- [J3] 0935: Mitigation of ductility dip cracking in Invar 36 alloy during wire arc additive manufacturing through enhanced cooling and in-situ alloying of TiC particles
Constantinos Goulas, Marcel Herman, Vera Popovich, Arjun Sood (Netherlands)
Doc. XII- 2687-2024 /I-1618-2024/IV-1649-2024
- [J4] 0955: Forming regulation in additive manufacturing based on a novel model: In-order stacking of primitives
Shujun Chen, Jun Xiao, Zhaoyang Yan (China)
Doc. XII- 2685-2024 /I-1619-2024/IV-1650-2024
- [J5]1015: Feasibility study on machine learning methods for the prediction of process parameters for the WAAM process using SS-316L filler material
Arash Hasan Reize , Peethambaran Subadra Sharath, Shahram Sheikhi (Germany)
Doc. XII- 2682-2024 /I-1620-2024/IV-1651-2024
- [J6] 1035: Presentation by IIW Staff
Elisabetta Sciaccaluga (IIW)

Coffee Break (1045– 1115)

Session 2: Chair: Professor Satoru Asai

- [J7] 1115: Combination of the melt pool geometry parameters with the audio data for defect detection in GMAW and WAAM
Dmytro Havrylov (Canada)
Doc. XII-X 2684-2024 /I-1621-2024/IV-1652-2024
- [J8] 1135: Influence of edge surface quality on Hybrid Laser Arc Welding of structural steel S355J2
Martin Petreski, Dobro Runchev, Gligorche Vrtanoski, Aleksandra Krstevska (North Macedonia)
Doc. XII- 2668-2024 /I-1622-2024/IV-1653-2024
- [J9] 1155: Application of Tailor Welded Blanks to Rudder Frame Using Laser-Arc Hybrid Welding
Tetsuo Era, Kento Takeda, Tetsuji Egawa, Keiichi Kashiwabara, Masahide Tatsutomi, Hiroshi Uchiyama (Japan)
Doc. XII- 2689-2024 /I-1623-2024/IV-1654-2024
- [J10] 1215: Investigating the effect of shielding gas on arc plasma behaviors and welded quality in GMAW-GTAW hybrid welding process on AA5083 aluminium alloy
Titinan Methong, Ratchadaporn Boonrunsee, Benchaphorn Chanprasertkul (Thailand)
Doc. XII- 2666-2024 /I-1624-2024/IV-1655-2024
- [J11] 1235: Effect of current waveform in MIG arc on weld bead formation in plasma-MIG hybrid welding
Shinichi Tashiro, Kazuya Ishida, Kazufumi Nomura, Dongsheng Wu, Anthony B Murphy, Toshifumi Yuji, Manabu Tanaka Authors (Japan)
Doc. XII- 2701-2024 /I-X1625-2024/IV-1656-2024

Afternoon Session, 1425-1830

Session 3: Chair: Dr. Patrick Hochanadel

1425: Opening of Afternoon Session of C-I, C-IV, and C-XII – Dr. Patrick Hochanadel

- [J12] 1425: Effect of Welding Speed on Keyhole Behavior and Spatter Formation in Full Penetration Laser Beam Welding using High-Speed Synchrotron X-Ray Imaging
C. Diegel, K. Schricker, L. Schmidt, M. Seibold, H. Friedmann, P. Hellwig, F. Fröhlich, J.P. Bergmann, F. Nagel, P. Kallage, A. Rack, H. Requardt, and Y. Chen (Germany)
Doc. XII-2711-2024/I-1626-2024/IV-1619-2024
- [J13] 1445: Online Monitoring of Penetration Depth during Hybrid Laser/GMA Welding of Stainless Steels by an Inline Coherent Imaging Sensor
F. Kong and M. Yao (United States)
Doc. XII-2712-2024/I-1627-2024/IV-1620-2024
- [J14] 1505: Laser Beam Submerged Arc Hybrid Welding of Thick High-Strength Pipeline Steels
M. Clemens, S. Olschok, and U. Reisgen (Germany)
Doc. XII-2713-2024/I-1628-2024/IV-1621-2024
- [J15] 1525: Challenges in Modelling Dynamic Heat Sources in High-Power Laser Beam Welding
M. Bachmann, W. Meng, A. Artinov, and M. Rethmeier (Germany)
Doc. XII-2714-2024/I-1629-2024/IV-1622-2024
- [J16] 1545: Investigation on the Microstructure and Mechanical Properties of Dissimilar Joint of PBF-LB/M/IN718 to AISI 316L by Laser Welding
S. Parchegani, H. Piili, M. Amraei, S. Afkhami, and A. Salminen (Finland)
Doc. XII-2715-2024/I-1630-2024/IV-1608-2024

Coffee Break (1615 – 1645)

Session 4, Chair: Dr. Patrick Hochanadel

- [J17] 1645: Welding of Laser Powder Bed Fusion Manufactured Haynes 282 alloy: Microstructure and Mechanical Properties
J. Kunnackath Krishnan, M. Arunkumar, and G. Phanikumar (India)
Doc. XII-2716-2024/I-1631-2024/IV-1623-2024

- [J18] 1705: Effect of Local Gas Supply on Keyhole Dynamics in Laser Beam Welding of High-Alloy Steel AISI 304 by means of High-Speed Synchrotron X-Ray Imaging
L. Schmidt, K. Schricker, C. Diegel, H. Requardt, Y. Chen, A. Rack, and J.P. Bergmann (Germany)
Doc. XII-2717-2024/I-1632-2024/IV-1624-2024
- [J19] 1725: Laser Welding with Superimposed Beam Oscillation in the Direction of Propagation
M. Pieper (Germany)
Doc. XII-2718-2024/I-1633-2024/IV-1625-2024
- [J20] 1745: A New Additive Manufacturing Technique by Laser Melting of Sheets Binding Metal Powder
A.F.H. Kaplan, P. Guo, J. Volpp, H. Naesstroem, R. Lupoi, R. Casati, S. Marola, (Sweden)
Doc. XII-2719-2024/I-1634-2024/IV-1626-2024
- [J21] 1805: The Study on the Prediction Model of Weld Depth during Fiber Laser Deep Penetration Welding based on Primary Absorption of the Front Keyhole Wall
B. Zhu, J. Zou, R. Xiao, T. Huang (China)
Doc. XII-2720-2024/I-1635-2024/IV-1627-2024

1825: Close Out of First Day Joint Meeting of C-I, C-IV, and C-XII – P. Hochanadel

Wednesday 10 July 2024, 0900 - 1830 @ DELPHI CommissionXII Meeting

0900: Session V: Physics of welding I

Chair: Prof. Manabu Tanaka (Chairman of Sub-Comm.F)

0900: Opening and Welcome

- [20] 0905: In-situ X-ray imaging for metal transfer dynamics in gas metal arc welding
Yuriko Sato, Takahisa Shobu, Aki Tominaga, Tomokazu Sano, Yosuke Ogino (Japan)
Doc. XII-2698-2024
- [21] 0925: In-situ measurement and numerical simulation of molten wire flow and temperature distribution in GMA welding process
Yosuke Ogino, Yuriko Sato, Sota Nakajima, Takahisa Shobu, Aki Tominaga, Tomokazu Sano (Japan)
Doc. XII-2699-2024
- [22] 0945: Optimization the droplet detachment mechanism of filling- alloyed, high-chromium cored wires during GMAW
Jonas Hensel, Kevin Hoefer (Germany)
Doc. XII-2680-2024
- [23] 1005: Numerical Analysis of the Arc and Bubble Behavior in Ultrasonic Frequency Pulse Current-Assisted Underwater Wet Flux Cored Welding
Ji Chen, Xuefei Cui, Chuansong Wu, Bo Zhao (China)
Doc. XII-2676-2024
- [24] 1025: Physics of ERW: The effect of ablation in high-frequency electric resistance welding (HF-ERW) of linepipe
Calista D , Lehnhoff G , Patricio Mendez P , Prisco U (Canada)
Doc. XII-2704-2024

1045-1115: Coffee break

1115: Session VI: Physics of welding II

Chair: Prof. ChuanSong Wu (Chairman of Sub-Comm.E)

- [25] 1115: Simulation of Molten Metal Droplet Transfer in Gas Metal Arc Welding Process Using Inertia Force
Yuki Kobayashi, Hisaya Komen, Shota Sekiguchi, Naoki Mukai, Kei Yamazaki, Manabu Tanaka (Japan)
Doc. XII-2696-2024

- [26] 1135: Particle method simulation of blowhole forming process in gas metal arc welding
Masato Miwa, Hisaya Komen, Manabu Tanaka, Yoshihiro Tanabe, Yutaro Matsu, Kengo Hyoma,
Koutarou Inose (Japan)
Doc. XII-2 XII-2695-2024
- [27] 1155: Vortex generated on cathode surface and its role for air entrainment into argon arc plasma
in a pulsed TIG welding with long cathode extension
Masaya Shigeta, Honatsu Sorai, Yosuke Kishimoto, Joe Yoshikawa, Makoto Sugimoto, Hisaya Komen,
Manabu Tanaka (Japan)
Doc. XII-2700-2024
- [28] 1215: Experimental Estimation of Energy Balance on Electrode Surface During TIG Welding
Hisaya Komen, Yuki Asai, Manabu Tanaka, Masashi Nomoto, Kotaro Watanabe, Takahiro Kamo (Japan)
Doc. XII-2694-2024
- [29] 1235: Numerical investigation of electrode splashing phenomena during TIG welding using phase-field
lattice Boltzmann method
Makoto Sugimoto, Masaya Shigeta (Japan)
Doc. XII-2702-2024

Afternoon Session, 1430-1830

1430: Session VII: Process I

Chair: Dr. Stephan Egerland (Chairman of Sub-Comm. B)

- [30] 1430: A novel monitoring and characterization approach of dynamic wire feeding in GTAW process
Ivan O. Pigozzo, Regis H. G e Silva, Alberto B. Viviani (Brazil)
Doc. XII-2641-2024
- [31] 1450: Underwater Flux-Cored Arc Welding (UWFCAW) – how pulling and drag angle affect process stability,
microstructure, and mechanical properties
Antonios Antoniou, Philipp Schempp, Martin Bonnet (Germany)
Doc. XII-2662-2024
- [32] 1510: A study on the influence of welding current on metal transfer control in ‘Pulsed Gas MAG’ welding
Kohei Fujiwara, Tadahisa Tsuyama, Yosuke Ogino, Masahiro Ohara, Takashi Mizuguchi (Japan)
Doc. XII-2664-2024
- [33] 1530: The influence of ambient pressure on arc welding processes with consumable electrode
Alexandre Bracarense, Thomas Hassel, Paulo Modenesi, Andrés Mauricio Moreno Uribe (Germany)
Doc. XII-2674-2024
- [34] 1550: Effect of fluoride on reducing hydrogen in weld metal
Kotaro Watanabe, Yasuhito Totsuka, Ryutaro Chiba, Tomokatsu Iwakami (Japan)
Doc. XII-2703-2024

1615-1645: Coffee break

1645: Session VIII: Process II

Chair: Dr. M.J.M. Hermans (Vice-chairman of Comm.XII)

- [15] 1645: Analysis of bead formation by different molten pool patterns from various inclination angles
Sang-Hyun Ahn, Jun Sung Bae, Dae-Won Cho, Young Whan Park (South Korea)
Doc. XII-2705-2024
- [16] 1705: Arc micro-joining of Al and Cu foils
Dongsheng Wu, Hisaya Komen, Yuki Asai, Manabu Tanaka, Tadasuke Murata, Akihisa Murata (Japan)
Doc. XII-2679-2024
- [17] 1725: The influence of Al element on the weldability and mechanical behavior of flux bands
constricting arc welding (FBCA) for high strength steel
Yuechao Li, Yongtao Liu, Jisen Qiao, Lei Wang (China)
Doc. XII-2686-2024

8. Recommendation of submission to IIW Journal “Welding in the World”

- 9. Structure of Commission XII
- 10. Date and place of next meeting

18:25 Close Out of C-XI (Prof. Satoru Asai, Chairman of Commission XII)

Thursday 11 July 2024, 0855 -1300 @ Executive B Joint Meeting of C-I, C-IV, and C-XII

Morning Session, 0855-1300 Session 5, Chair: Doug Kautz

- [J22] 0855: International Additive Manufacturing Qualification System for Personnel
Ana Beatriz Lopez, Adelaide Almeida, R. Bola
Doc. XII-2721-2024/I-1600-2024/IV-1637-2024
- [J23] 0915: Influence of Energy Input and Interpass Temperature on the Mechanical Properties of DED-arc
Manufactured 316L
M. Kohler, I. Schubnell, and K. Dilger (Germany)
Doc. XII-2722-2024/I-1601-2024/IV-1638-2024
- [J24] 0935: Understanding and Overcoming the Challenges in the Welding of Additively Manufactured
Aluminium Alloys
R. Nunes, K. Faes, W. Verlinde, W. De Waele, M. Lezaack, and A. Simar (Belgium)
Doc. XII-2723-2024/ I-1602-2024/ IV-1639-2024
- [J25] 0955: Pathway to Qualification for DED-wire Additive Manufacturing
T. Melfi and M. Douglass (USA)
Doc. XII-2724-2024/I-1603-2024/IV-1640-2024
- [J26] 1015: Wire Arc Additive Manufacturing of High Strength Al-Mg-Si Alloys
A. Pittner, R. Winterkorn, C. Fabry, and M. Rethmeier (Germany)
Doc. XII-2725-2024/I-1604-2024/IV-1641-2024

**1035: Presentation by WiiW
Americo Scotti (IIW)**

Coffee Break (1045– 1115)

Session 6, Chair: Doug Kautz

- [J27] 1115: Influence of Energy Input and Interpass Temperature on the Mechanical Properties of DED-arc
Manufactured 316L Steel
C. Seow (United Kingdom)
Doc. XII-2726-2024/ I-1605-2024/IV-1642-2024
- [J28] 1135: Effect of Deposition Strategies on Mechanical Properties and Residual Stresses at The Transition
Zone of Component and Substrate in Hybrid DED-Arc Manufacturing
R. Scharf-Wildenhain, L. Engelking, A. Haelsig, D. Schroeffer, T. Kannengiesser, and J. Hensel (Germany)
Doc. XII-2727-2024/I-1606-2024/IV-1643-2024
- [J29] 1155: The Effect of Cryogenic Cooling on the Microstructure and Mechanical Properties of Wire and Arc
Additively Manufactured Steels
C. Goulas, M. Ameye, M. Akuh, R. Rook, J.L.G. Argumedo, T. Michelis, W. Ya, I. Gibson, and M. Hermans
(Netherlands)
Doc. XII-2728-2024/ I-1607-2024/ IV-1644-2024
- [J30] 1215: Experimental and Simulation Approaches to Hydrogen Embrittlement Behaviour of Additively
Manufactured Metals and Components
M. Moshtaghi (Finland)
Doc. XII-2729-2024/I-1608-2024/IV-1645-2024
- [J31] 1235: Investigations on the Additive Manufacturing of Structures Made of Copper-Zinc Alloys using

Wire and Arc-Based Welding Processes
M. Schop, T. Ungethum, and H.C. Schmale (Germany)
Doc. XII-2730-2024/ I-1609-2024/IV-1646-2024

1255: Close Out of Joint Meeting of C-I, C-IV, and C-XII – D. Kautz