



**MINE.IO**

A Holistic Digital Mine 4.0 Ecosystem



# **Standardization and empowering European mining Leader: JOT**



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# Identified Standards from Survey...

Partners	Standards	Type of involvement	Focus of this standard	Mine.io components	Relevance for Mine.io categories									
					Develop sustainable and smart mining technologies for exploitation of EU mineral resources	Contribute to a more safe and environmentally friendly, resource- and production efficient sustainable	Develop methods, technologies and processes aiming for digitisation and automation of raw materials	Contribute to the implementation of the following actions of the EU Action Plan on Critical Raw Materials: Action 8: Develop Horizon Europe R&I projects on processes for exploitation and processing of critical raw materials to reduce environmental impacts starting in 2021 and Action 3: Launch critical raw materials R&I in 2021 on waste processing, advanced materials and substitution.						
PoliTO	ISO/AVI TR 3502	Develop	Robotics and automation	4, 5, 12, 14, 17	Yes	No	Yes	Yes						
LTU	ISO-17757	Develop	Robotics and automation	14, 21		Yes	Yes	Yes						
Innov-acts	ISO 10303	Use	Interoperability and Big Data	16	Yes	No	No	No						
TECNALIA	IEEE 2418.2-2020	Use	Interoperability (sharing of data and resources between different systems)	24	No	No	Yes	Yes						
University of Oulu	Global Industry Standard on	Develop	Mine waste management	18, 24		Yes		Yes						
ICCS	ISO 13374 - MIMOSA OSA-CBM	Use	Interoperability (sharing of data and resources between different systems)											
ACCELIGENCE Ltd	European Union Aviation Safety Agency (Open Category A1/A3)	Use	Robotics and automation	21	Yes	Yes	Yes	Yes						
GFT	BPMN (Business Processing modelling notation)	Use	Orchestration (configuration, coordination, and management of systems)	24	No	No	Yes	Yes						
Muon Solutions		Develop	Terminology	1, 2, 3, 5, 25, 26	Yes	Yes	Yes	Yes						
Fluorchemie	Advanced automated mining	Develop	Security & safety	4, 9, 11, 12, 14, 26	Yes	Yes	Yes	No						
Wigner Research Centre for Physics		Monitor/Develop	Interoperability (sharing of data and resources between different systems)	1, 2, 3, 4, 6, 18, 23	Yes	No	No	Yes						
Jotne	ISO 10303	Contribute/Monitor	Circular economy, Interoperability (sharing of data and resources between different systems), Orchestration (configuration, coordination, and management of systems), IoT	4, 5, 6, 10, 13, 17, 25, 26	Yes		Yes	Yes						
	ISO 23247	Monitor/Use	Terminology, Interoperability (sharing of data and resources between different systems), Portability (enables using the system in different environments)	4, 6, 14, 21, 22	Yes	Yes	Yes							
HMU	LoRaWAN	Use	IoT, Big Data	17	Yes	No	Yes	No						

1. Underground muography instrumentation
2. Waterproof casing for an underwater muon detection system
3. Underwater muon imaging system
4. Autonomous exploration underwater robot
5. Digital twin underwater data export software system
6. Infrastructure for flooded mine exploration/ digitalization
7. Smart drill core analysis with X-ray diffraction
8. Smart drill core analysis with X-ray computed tomography
9. Development of new concepts for automated big data mining and AI for MWD-data
10. Development of virtual test bed for demonstration of MWD results
11. Primary track pavement
12. Primary electronic sub-system
13. Secondary sub-system (mechanical, electronic and hardware)
14. Autonomous driving
15. Dual energy x-ray sorting using deep learning
16. PIT System and software
17. Sensor based-digital-twins-for-smelting system
18. Surveillance and monitoring of tailings facilities
19. Passive seismic interferometry
20. Characterization system for stockpiles
21. UAV system prototype
22. Digital architecture for the 3d slagheap model (data acquisition module included)
23. Simulation processes algorithms for the 3D dump model evolution
24. Sustainable waste management based on distributed ledger technology
25. Digital Twin Infrastructure including IoT
26. Data Interoperability

# continue...

ENRX	ISO 12100	Develop/Use	Security & safety	12, 13, 14	Yes	Yes	Yes	
	ISO 13849	Use	Portability (enables using the sys	12, 13, 14	Yes	Yes	Yes	
	ISO 26262	Use		12, 13, 14	Yes	Yes	Yes	
	ISO 19363	Use	Security & safety	11, 12, 13	Yes	Yes	Yes	
	CISPR 11	Use	Security & safety	11, 12, 13	Yes	Yes	Yes	
	CISPR 16	Use	Security & safety	11, 12, 13	Yes	Yes	Yes	
	ICNIRP 2010	Use	Security & safety	11, 12, 13	Yes	Yes	Yes	
	J2954/2_202212	Contribute/Monitor	Interoperability (sharing of data and resources between different systems)	11, 12, 13	Yes	Yes	Yes	
	IEC 61980	Monitor/Use	Interoperability (sharing of data and resources between different systems)	11, 12, 13	Yes	Yes	Yes	
	ISO 15118	Use	Interoperability (sharing of data and resources between different systems)	11, 12, 13	Yes	Yes	Yes	
KGHM Polska Miedź S.A.	ISO 11898	Use	Interoperability (sharing of data and resources between different systems)	12, 13	Yes	Yes	Yes	
	IEC 60502-1	Use	Security & safety	11, 12	Yes	Yes	Yes	
TU Bergakademie Freiberg			Terminology, Quality, Security & safety	16	No	No	No	No
	ETSI EN 300 220-1 V3.1.1	Use	Portability (enables using the system in different environments), Orchestration (configuration, coordination, and management of systems), Quality, Security & safety, IoT		Yes	No	Yes	No
Fraunhofer	ISO/AWI TR 3502	Develop	IoT	6	No	No	Yes	No
	ISO 13849	Use	Orchestration (configuration, coordination, and management of systems), Quality, Security & safety	7, 8, 15	No	Yes	No	No
	DIN 54113-1	Use	Security & safety	7, 8, 15	No	Yes	No	No

# Identified Standards based on the Survey

1. ISO 10303 AP242, AP239: EDMtruePLM
2. ISO/IEC 19510:2013: Business Process Model and Notation Version 2.0 [BPMN v2.0]
3. PREDICTIVE MAINTENANCE MODULE: MIMOSA OSA-CBM
4. IEEE 802.11 Standard: MQTT Protocols
5. European Regulations concerning to Unmanned Aircraft Vehicles (UAVs) / Unmanned Aircraft Systems (UAS)
6. SAE Standards: J2954/2\_202212

# Focus on use of Standards relevant to Mine.io Categories..

- ☐ Develop sustainable and smart mining technologies for exploitation of EU mineral resources
- ☐ Contribute to a more safe and environmentally friendly, resource- and production efficient sustainable mining
- ☐ Develop methods, technologies and processes aiming for digitization and automation of raw materials production.
- ☐ Contribute to the implementation of the following actions of the EU Action Plan on Critical Raw Materials:
  - ☐ Action 8: Develop Horizon Europe R&I projects on processes for exploitation and processing of critical raw materials to reduce environmental impacts starting in 2021
  - ☐ Action 3: Launch critical raw materials R&I in 2021 on waste processing, advanced materials and substitution.]

# Technologies requires Standards...

- ☐ Cosmic-ray Muography
- ☐ ..



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# Thank you for your attention!

Any questions?



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