

# Rechtliche Grundlagen

**VDMA e.V.**

**Fachverband Landtechnik**

Dr. Johannes Hipp

Dr. Nicolas Hummel

17.09.2024

2. Köllitscher Feldrobotiktag

## Agenda

- **Autonomy in agriculture**
  - Automotive vs. Agriculture
  - International Influences
  - Organisations
  - VDMA
- **Summary**

# Autonomy in agriculture



Source: [www.lely.com](http://www.lely.com)



Source: [www.claas.de](http://www.claas.de)



Source: [www.terra.horsch.com](http://www.terra.horsch.com)



Source: [www.futurefarming.com](http://www.futurefarming.com)



Source: [www.amazone.net](http://www.amazone.net)



Source: [www.media.cnhindustrial.com](http://www.media.cnhindustrial.com)



Source: [www.deere.com](http://www.deere.com)



Source: [www.combined-powers.com](http://www.combined-powers.com)



Source: [www.fendt.com/de](http://www.fendt.com/de)

# Autonomy

## Automotive vs. Agriculture

### Automotive



#### → Autonomous driving

- Comfort,
- Safety,

#### Based on:

- Legislation (2019/2144),
- Cyber Security (ISO/SAE 21434),
- Level of autonomy (SAE).

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SAE LEVEL 0™	SAE LEVEL 1™	SAE LEVEL 2™	SAE LEVEL 3™	SAE LEVEL 4™	SAE LEVEL 5™
You <b>are</b> driving whenever these driver support features are engaged – even if your feet are off the pedals and you are not steering			You <b>are not</b> driving when these automated driving features are engaged – even if you are seated in “the driver’s seat”		
You <b>must constantly supervise</b> these support features; you must steer, brake or accelerate as needed to maintain safety			When the feature requests, you <b>must drive</b>	These automated driving features will not require you to take over driving	

Source: [www.sae.org/blog/sae-j3016-update](http://www.sae.org/blog/sae-j3016-update)

### Agriculture



#### → Autonomous WORK → Quality of process

- Field boundaries (“Drive”),
- Agricultural processes in the fields and at the farmyard,
- Autonomous driving at public roads not in the focus,
- Shortage of skilled workers (?),

#### Boundary conditions:

- Cyber Security not addressed yet (ISO/WD 24882),
- No guidance from politics,
- Ensuring of yield and function is essential for user,
- Communication between tractor and implement (TIM ?)



# Autonomy in agriculture

## With steering wheel



Source: [www.deere.com](http://www.deere.com)



Source: [www.futurefarming.com](http://www.futurefarming.com)



Source: [www.media.cnhindustrial.com](http://www.media.cnhindustrial.com)

## Without steering wheel



Source: [www.claas.de](http://www.claas.de)



Source: [www.combined-powers.com](http://www.combined-powers.com)



Source: [www.terra.horsch.com](http://www.terra.horsch.com)

## Autonomous self driving implements



Source: [www.lely.com](http://www.lely.com)



Source: [www.fendt.com/de](http://www.fendt.com/de)



Source: [www.amazone.net](http://www.amazone.net)

# International organizations and influences



**CEMA**  
European Agricultural Machinery Association

 France – INRAE ARPA Protocols

 Japan – IAM/NARO Test codes

 Australia – Code of Practice

 Great Britain – Code of Practice



Asian and Pacific Network for Testing of Agricultural Machinery

## **Agricultural machinery and tractors** **Safety of partially automated, semi-autonomous and autonomous machinery**

- Part 1**            **Machine design principles and vocabulary**  
(Gestaltungsleitsätze und Vokabular für Maschinen)
- Part 2**            **Design principles for obstacle protective systems**  
(Gestaltungsleitsätze für Hindernisschutzsysteme)
- Part 3**            **Design principles for autonomous operating zones**  
(Gestaltungsleitsätze für autonome Betriebsbereiche)
- Part 4**            **Verification methods and principles**  
(Verifizierungsmethoden und Validierungsgrundsätze)



# ISO 18497-1:2024

## Categorization

	Manual Non-Automated (3.1)	Partially Automated (3.2)	Semi-Autonomous (3.3)	Autonomous (3.4)
<b>Functions (3.5)</b>	Non-Automated (3.6)			
		Automated (3.7)		
<b>Modes</b>	Manual Mode (3.9)			
		Autonomous Mode (3.10)		

Source: ISO 18497-1:2024

## Categories

### manual non-automated

non-automated only machine functions that are intended to operate in manual mode during all of the machine's operating cycle

### partially automated

non-automated and automated machine functions that are intended to operate in manual mode during all of the machine's operating cycle

### semi-autonomous

automated machine functions that are intended to operate in autonomous mode during part of the machine's operating cycle in addition to non-automated and automated machine functions that are intended to operate in manual mode to complete some of the tasks assigned

### autonomous

automated machine functions that operate in autonomous mode during all of the machine's operating cycle

## Functions

### non-automated

technique, method, or system of operating and controlling machine function(s) by operator interaction

### automated

technique, method, or system of operating and controlling machine function(s) by automatic means

## Modes

### manual mode

mode of machine operation in which machine function(s) are controlled by an operator

### autonomous mode

mode of machine operation in which a machine performs functions related to its defined tasks without operator interaction



# CEMA

Project of type-C standard for Autonomous Soil-Working Function



## CEMA

European Agricultural  
Machinery Association

**CEMA PT4**  
Small group

Project of type-C standard for  
Autonomous Soil-Working Function

### PT4 Smallgroup

- Drafting a Type-C standard to be delivered to ISO in 2025
- A draft built from the ISO 12100:2010 approach
- Focus on Autonomous Soil-Working Functions at first
- Harmonization towards new Machinery Regulation planned
- Rely on the revision of the Type B ISO 18497:2024

**AEF**

Autonomy in Agriculture Day



## Conference Bologna 29th of November 2023

Autonomy in Agriculture – where does the AEF fit?

- Follow up to AEF Meeting – Milwaukee 2022
- Presentations of international manufacturer (CNH, Krone, Lemken, Claas...)
- Global challenges on autonomy in agriculture
  - standardization
  - Legislation

**AEF “Autonomy in Ag” Team**

## TRACTORS STANDARD CODES



 **CODE 1**

Testing of front mounted protective structures on narrow-track wheeled agricultural and forestry tractors

 **CODE 6**

Testing of agricultural and forestry tractor performance.

 **CODE 2**

Testing of the rear-mounted protective structures on narrow-track wheeled agricultural and forestry tractors.

 **CODE 7**

Testing of the strength of protective structures for agricultural and forestry tractors (dynamic test).

 **CODE 3**

Testing of protective structures on tracklaying tractors.

 **CODE 8**

Testing of the strength of protective structures for agricultural and forestry tractors (static test).

 **CODE 4**

Protective structures for telehandlers (testing of falling-object and roll-over protective structures fitted to self-propelled variable reach all-terrain trucks for agricultural use).

 **CODE 9**

Noise measurement at the driver's position(s).

 **CODE 5**

Testing of falling object protective structures.

 **CODE 10**

# OECD Sub-working Group (SWG) „Robot Tractors“



## Mandat:

- to exchange information on actual developments in agriculture, industry, research, etc.
- to continue the liaison with ISO TC23SC19 for the 18497 work (especially the Part 4 work) and reinforce collaboration with other relevant organizations (Agricultural Industry Electronics Foundation, European Commission, relevant United Nations bodies, CEMA)
- to identify issues hindering the development and use of this technology in various use
- to develop repeatable and reproducible laboratory in- / out-door tests
- to explore the feasibility of developing a common test code, focusing on minimum requirements, avoiding duplication of work (standards) and ensuring value for money to manufacturers and end users.
- Key Principles: Voluntary tests, no double testing, added value for industry, contribute to global trade.

**Chair:** Türkiye

**Co-Chair:** France, Japan and OECD Co-Ordinating Center



# OECD

## Sub-working Group (SWG) „Robot Tractors“

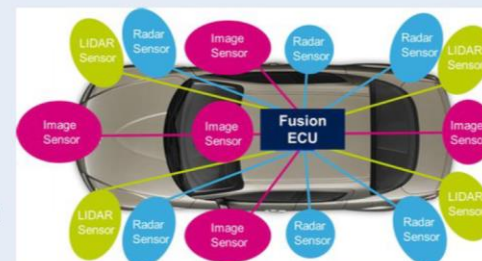
- Australian Code of Practice
- INRAE ARPA protocols
- Liaison with ISO/TC 23/SC 19/WG 8 on ISO 18497
- Technologies - Sensors for autonomy

### Autonomous Vehicle Sensors & Systems



#### Building Blocks of Autonomous Vehicles

- Radar
- Vision
- Lidar
- HD Maps
- V2X
- DMS
- Sensor Fusion



Source: OECD

### ARPA1



Test Track with 18497 reference obstacle

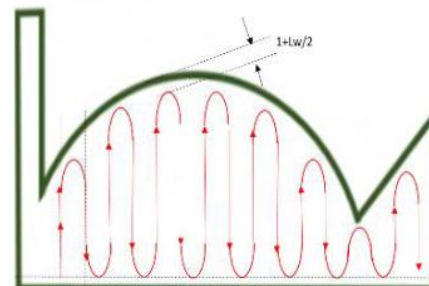


### ARPA2



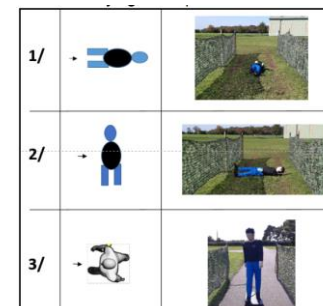
ARPA2 reception system characterization under harsh environmental conditions (fog, rain, night, dust)

### ARPA3

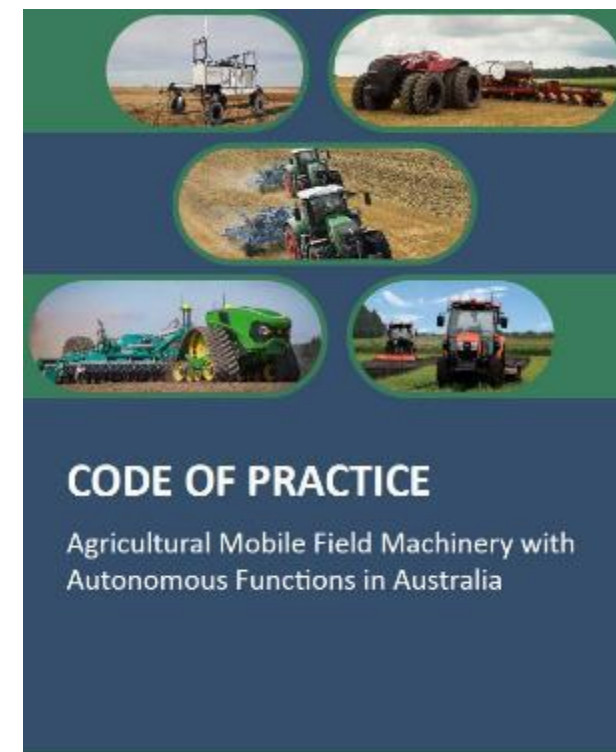


ARPA3 Works area integrity evaluation

### ARPA4



Source: OECD



**CODE OF PRACTICE**  
Agricultural Mobile Field Machinery with Autonomous Functions in Australia



Source: OECD

# Liaison ISO OECD



2022-04-22  
ISO/TC 23/SC 19  
N1433



ISO TC 23/SC 19 "Agricultural Electronics"

Secretariat: DIN

## Liaison between OECD Sub-working group on Robot Tractors and ISO/TC23/SC19/WG8

To ISO/TC 23/SC 19, P-Members, O-Members, Liaison Members  
From Dr. Hermann Buitkamp, ISO TC 23/SC 19 Committee Manager

### Resolution 483:2022

Liaison of ISO/TC23/SC19/WG8 to OECD sub-working group for robot tractors

#### Considering

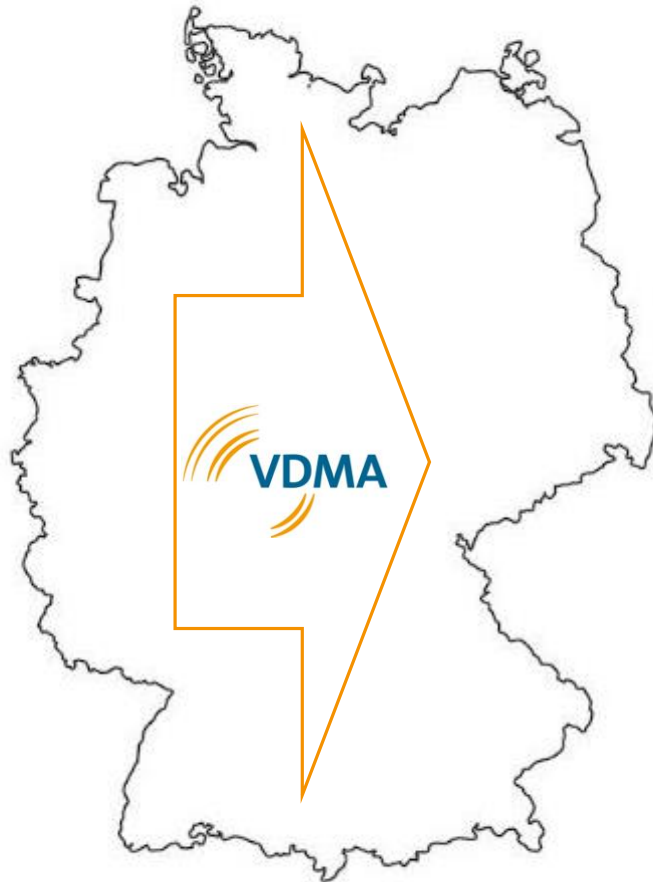
- the invitation for cooperation of OECD sub-working group for robot tractors to ISO/TC23/SC19 and the
- result of voting of the ballot of 2022-04-22,

#### ISO TC23/SC19

- agrees to create a liaison of ISO/TC23/SC19/WG8 and OECD sub-working group for robot tractors
- approves Joe Flaughner as the WG8 liaison officer,
- accepts Jose Brambila-Macias and Marie Russel for OECD tractor test code sub-working group for robot tractors as liaison officers

The liaison was approved by 16 members, 0 members voted against, and 7 members abstained.

# Tasks for VDMA agricultural machinery



## Standardization bodies

### Technical Committees (TA)

- **TA1** – Tractors
- **TA2** – Equipment for soil working, seeding, fertilization & spraying
- **TA4** – Harvesting equipment
- **TA8** – Transportation
- **TA11** – Gardening
- **TAE** – Electronics



→ **TA – crossing topic**

# VDMA Workshop

Need for standardisation on autonomy in agriculture



## **31<sup>st</sup> of January 2024 at VDMA Frankfurt Workshop – VDMA platform "Autonomous agricultural machinery"**

- The idea was formulated at „NLA Vorstand“
- Branch internal discussion
- Overview on possible solutions, involved ministries and other organisations
- Coordination between ISO, AEF, OECD...

## **2<sup>nd</sup> of September 2024 at VDMA Frankfurt Task Force – Sensorsystemtestung zur Objekterkennung zum Schutz von Personen**

- The idea was developed during the VDMA autonomy Workshop on 31st of January
- Development of test procedures evaluating the performance of sensor systems
- Reports at the NLA-meetings



# Task Force

## Sensorsystemtestung zur Objekterkennung zum Schutz von Personen

### Specification of the objectives and scope:

- The sensor system tests are not specifically about detecting people, but about protecting people.
- The aim is to prove the detection capability of objects: Sensor type A with the software B under the test situation C has the probability of detecting object D in E meters of XX %

### A sensor system test includes

- Sensor(s)
- Software(s) that can be integrated in the sensor or external (on/offboard the sensor) → Black box
- A safety-relevant function (object, environmental condition)
- Objects must also be defined and classified for personal protection

### Medium-term goal:

- On the basis of IEC/TS 62998-1, adaptation to agriculture-specific applications.
- ISO TS technical specification?

## Summary

- Identifying the need for standardization
- VDMA platform
  - "Autonomous agricultural machinery"
- Intersectoral exchange
- International exchange
- Communication between tractor and implement
- Machinery Regulation, EU Data Act, EU CRA
- Clarifying legal issues

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