



HRVATSKO ASFALTERSKO DRUŠTVO

CROATIAN ASPHALT ASSOCIATION

DIGITALIZATION IN ROAD
CONSTRUCTION, FUTURE IS NOW

DIGITALIZACIJA U GRADNJI CESTA,
BUDUĆNOST JE SADA

ERSUN GÖRENER, INFRA TEST PRÜFTECHNIK

MEĐUNARODNI SEMINAR ASFALTNI KOLNICI 2021

INTERNATIONAL SEMINAR ASPHALT PAVEMENTS 2021

OPATIJA, 30.09. – 01.10. 2021.



- Road Construction?
- Future?
- Digitalization?

WHAT IS ROAD CONSTRUCTION?

- ROAD CONSTRUCTION IS A COMPLEX PROCESS MADE UP OF MANY INTERCONNECTED ELEMENTS....

MAIN ELEMENTS OF ROAD CONSTRUCTION (JUST AN EXTRACTION)



WHAT'S MISSING?

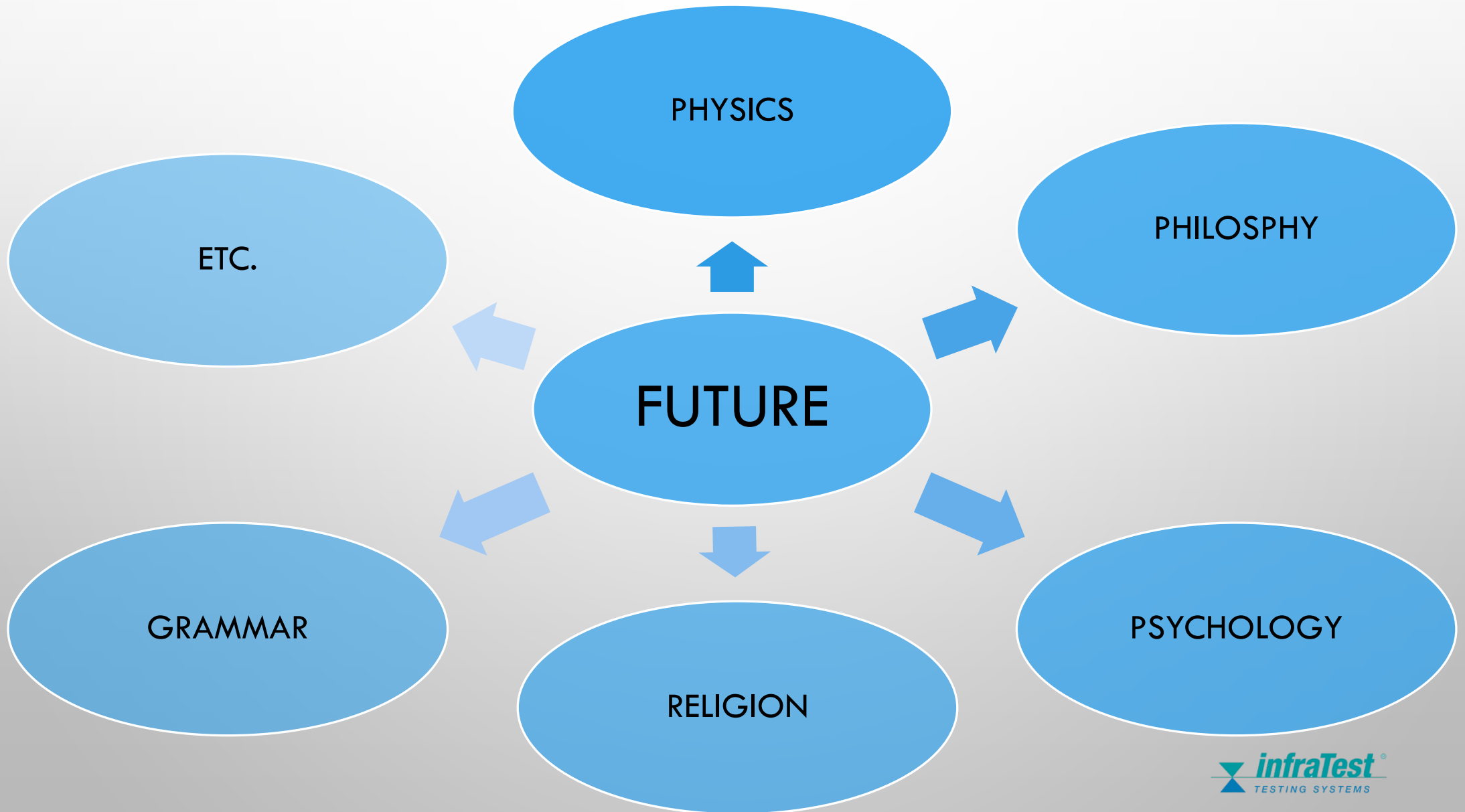




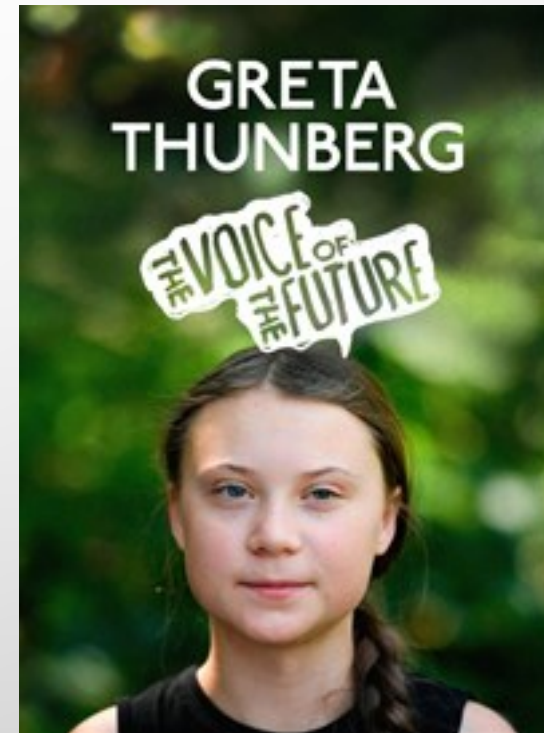
- Road Construction
 - Future?
 - Digitalization?

WHAT IS FUTURE?

GOOGLE: "WHAT IS FUTURE?"



WHAT IS FUTURE



WHAT IS FUTURE



WHAT IS FUTURE



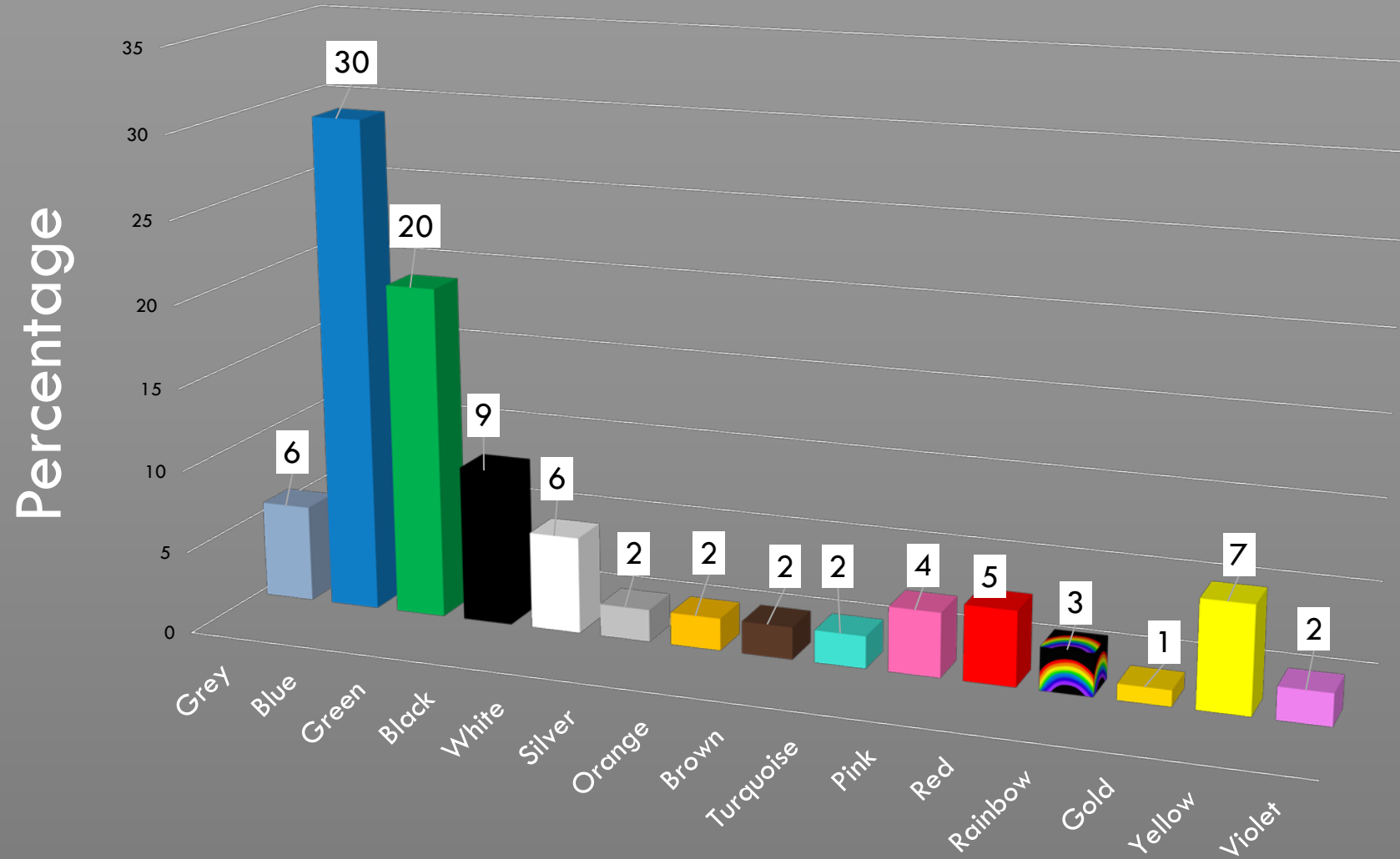


Automatic Extractor



Asphaltanalysator

Color of the future





- Road Construction
- Future
 - Digitalization?

WHAT IS DIGITALIZATION?

UNIVERSITY OF QUEENSLAND EXPERIMENT



PITCH DROP EXPERIMENT

Date	Event	Duration
1927	Hot pitch poured	
October 1930	Stem cut	
December 1938	1st drop fell	98
February 1947	2nd drop fell	99
April 1954	3rd drop fell	86
May 1962	4th drop fell	97
August 1970	5th drop fell	99
April 1979	6th drop fell	104
July 1988	7th drop fell	111
November 2000	8th drop fell [A]	148
April 2014	9th drop fell [B]	156



IS THIS DIGITALIZATION?



// DIGITALIZATION IS THE USE OF DIGITAL TECHNOLOGIES TO CHANGE A BUSINESS MODEL AND PROVIDE NEW REVENUE AND VALUE-PRODUCING OPPORTUNITIES; IT IS THE PROCESS OF MOVING TO A DIGITAL BUSINESS. //

QUOTE: „GARTNER GLOSSARY- [HTTPS://WWW.GARTNER.COM/EN/INFORMATION-TECHNOLOGY/GLOSSARY/DIGITALIZATION](https://www.gartner.com/en/information-technology/glossary/digitalization)“

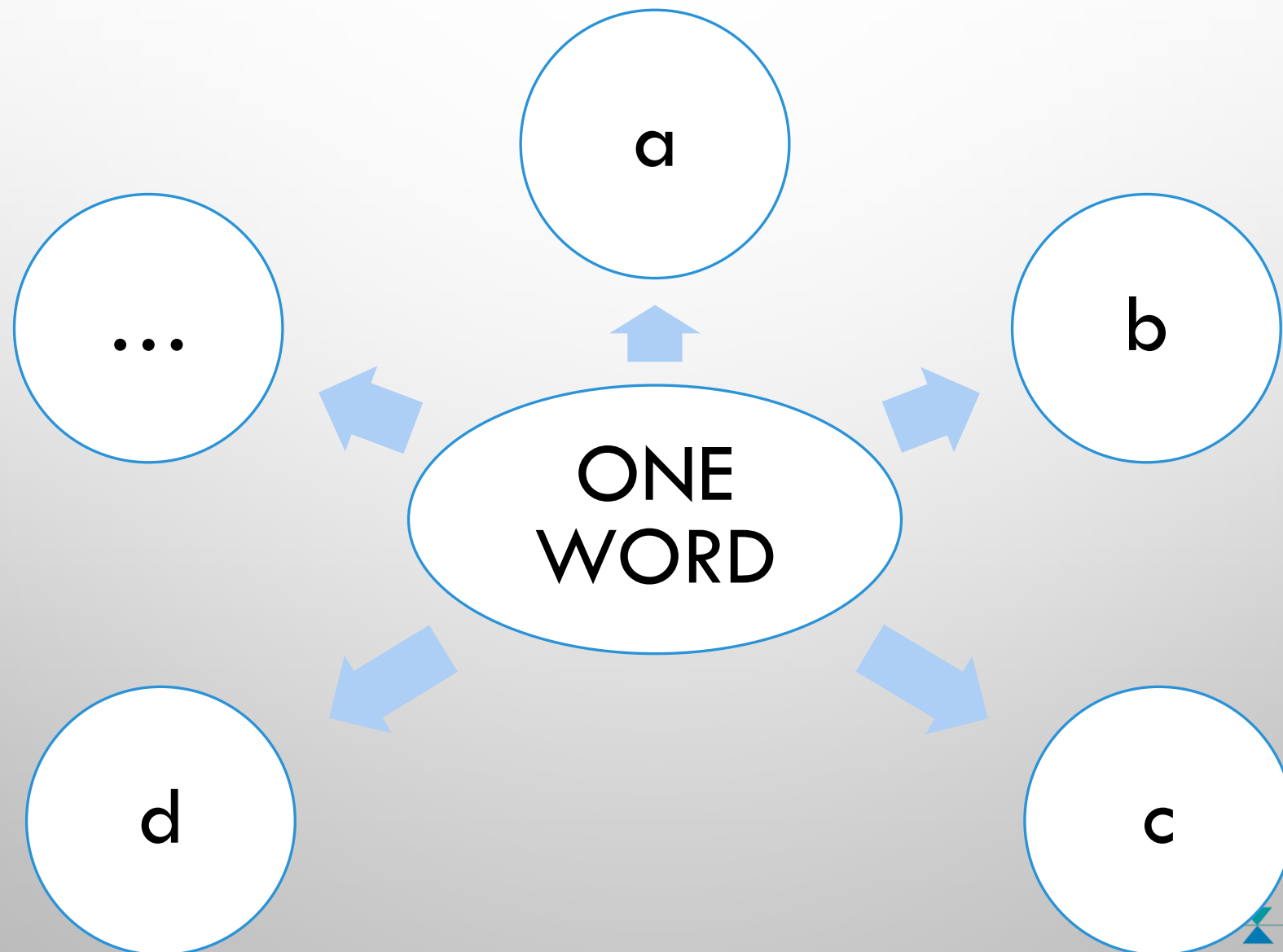
TODAY...





- Road Construction
- Future
- Digitalization?

PROBLEM OF WORDING



DIGITALISATION DURING ASPHALT PRODUCTION ?

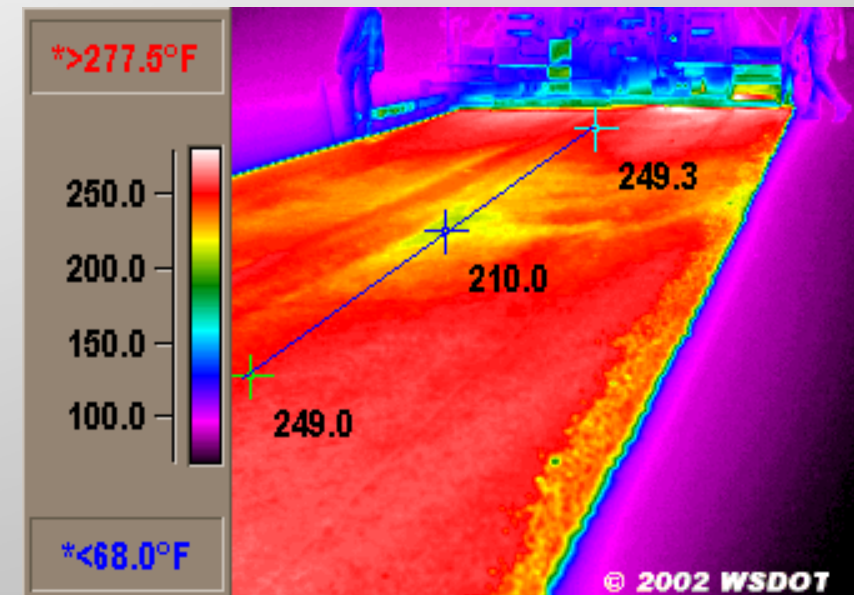


- DIGITAL DELIVERY NOTES
- VEHICLE TRACKING
- TEMPERATURE TRACKING
- TORQUE TRACKING
- ETC.

DIGITALISATION DURING ASPHALT PAVING AND COMPACTING?



- DISTANCE MEASURING BETWEEN PAVER AND COMPACTER
- MEASURING OF TEMPERATURE AND COMPARE ONLINE WITH COMPACTION DATA
- ETC.



WHAT'S IN THE ROAD? QUALITY CONTROL...



WHAT'S DIGITAL HERE?



ONE MORE THING



ALL ELECTRIC ROAD CORE DRILLING DIGITAL + FUTURISTIC



FUTURE IN THE LABORATORY

EXTRACTION IN THE PAST





INNOVATION: ASPHALTANALYSER 2005



INNOVATION: ASPHALTANALYSER 2010



INNOVATION: ASPHALTANALYSER 2015



INNOVATION: APHALTANALYSER 2017



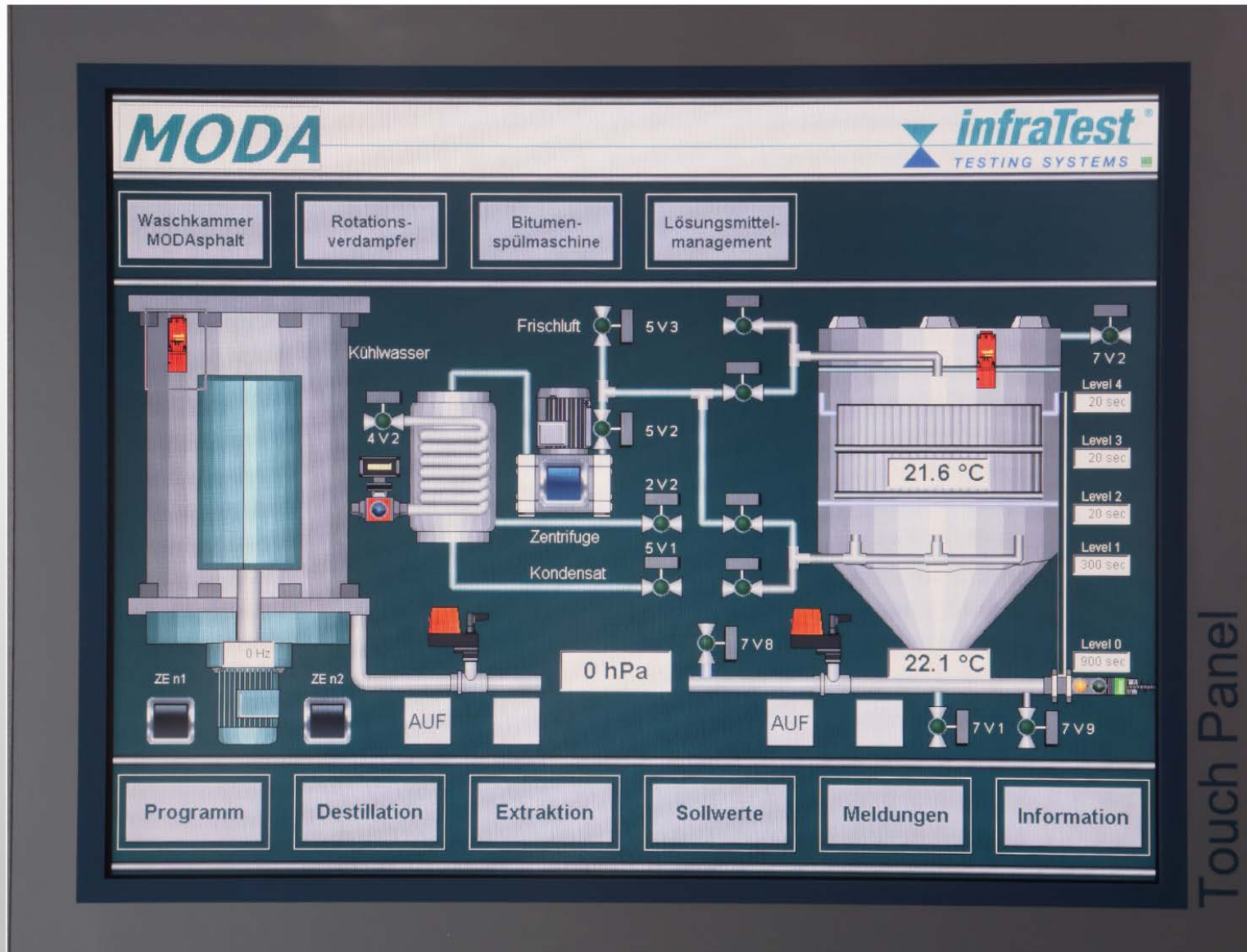
INNOVATION: ASPHALTANALYSER 2020



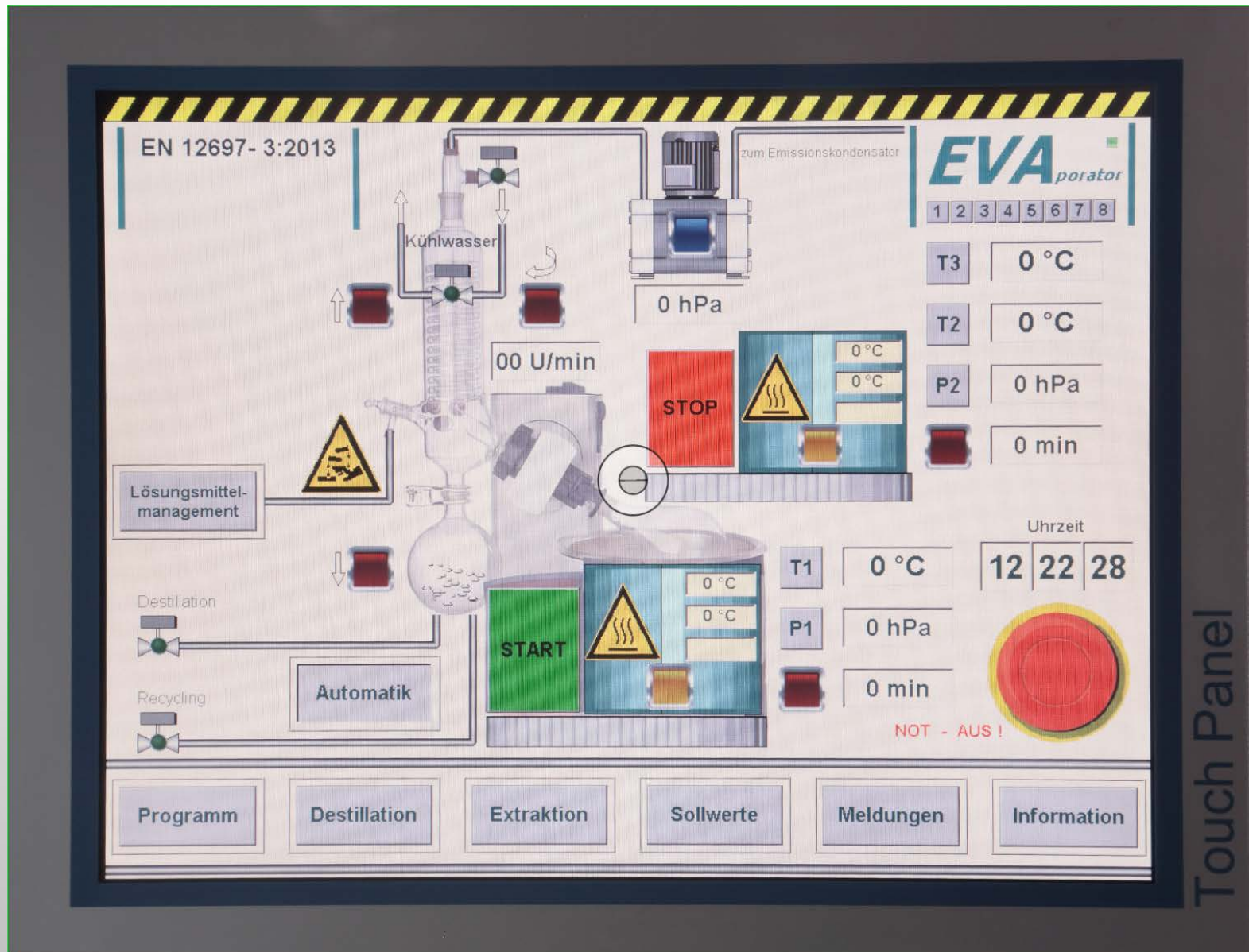
INNOVATION: ASPHALTANALYSER 2021



INNOVATION: ASPHALTANALYSER 2021

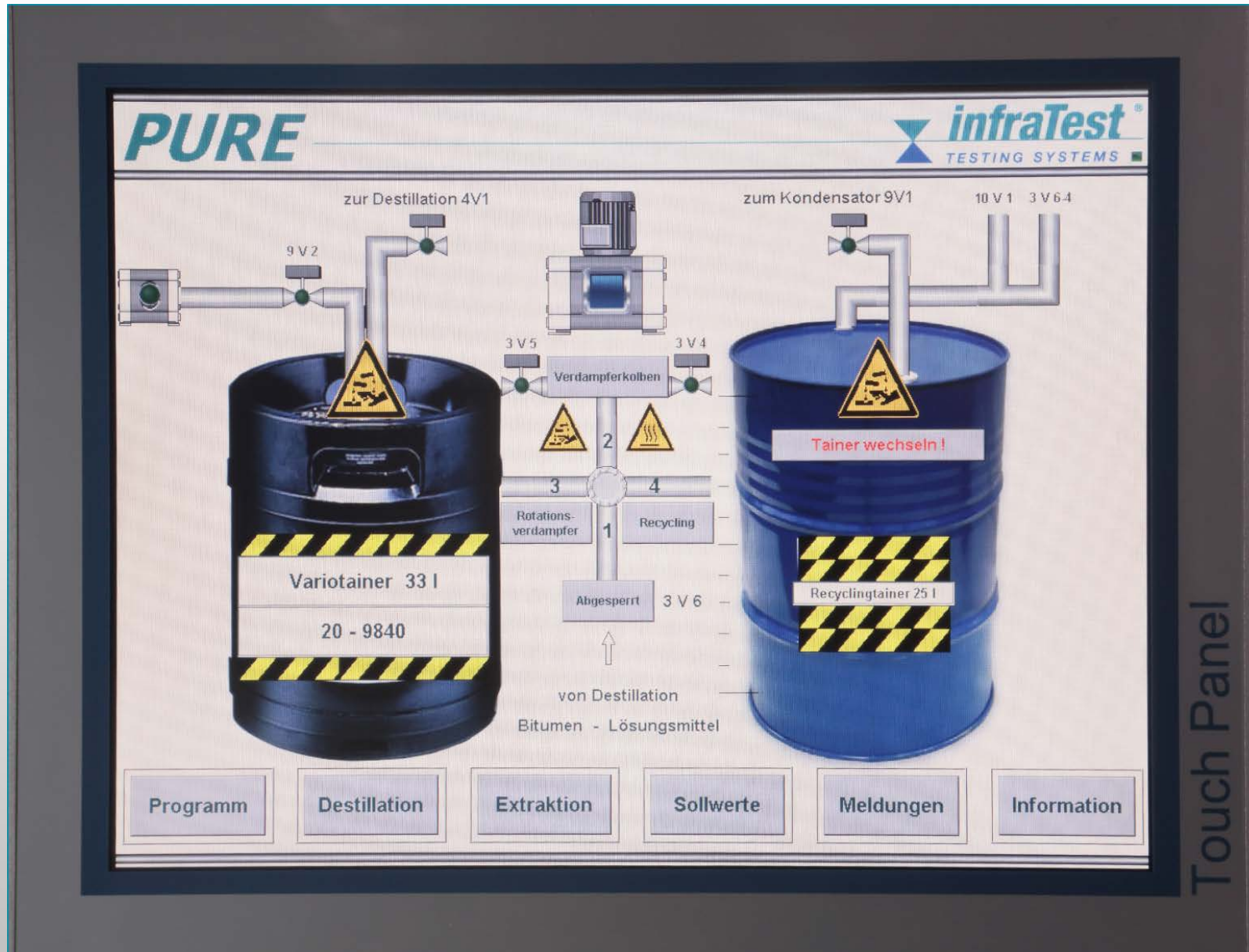


INNOVATION: ASPHALTANALYSER 2021



Touch Panel

INNOVATION: ASPHALTANALYSER 2021



INNOVATION: ASPHALTANALYSER 2023

- EXTRACTION WITH HANDLING ROBOT:



INNOVATION: ASPHALTANALYSER 2023



CLOUD BASED DATA



STATE OF THE ART

- WE MAKE MIX DESIGNS
- WE PRODUCE ASPHALT
- WE PAVE ASPHALT
- WE COMPACT ASPHALT
- WE ANALYSE ASPHALT DURING THE PRODUCTION
- WE ANALYSE THE ASPHALT AFTER FEW YEARS (TAKING CORES)
- BUT??????

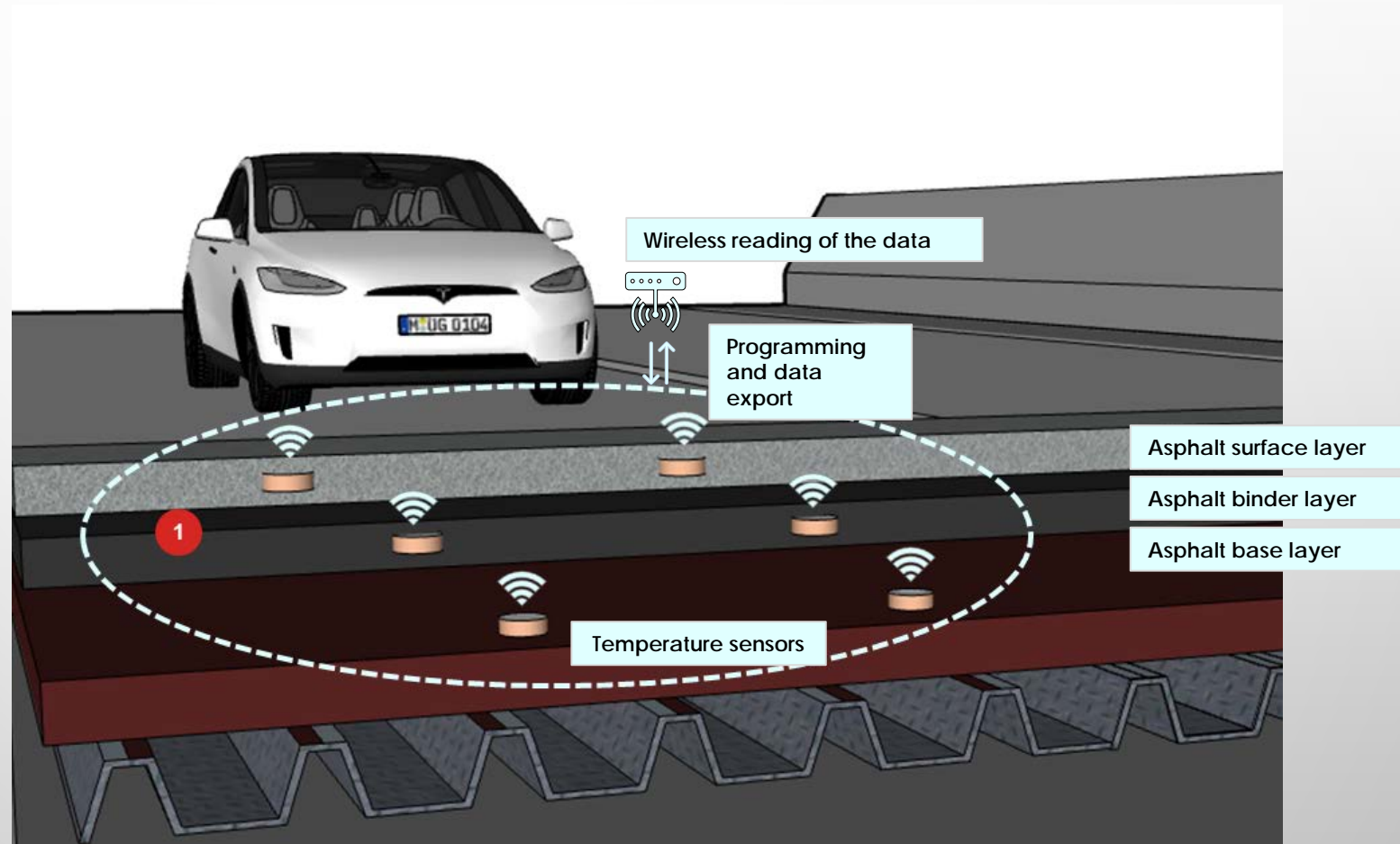
WHAT IS HAPPENING IN THE PAVEMENT?

TEMPERATURE SENSORS



TEMPERATURE SENSORS

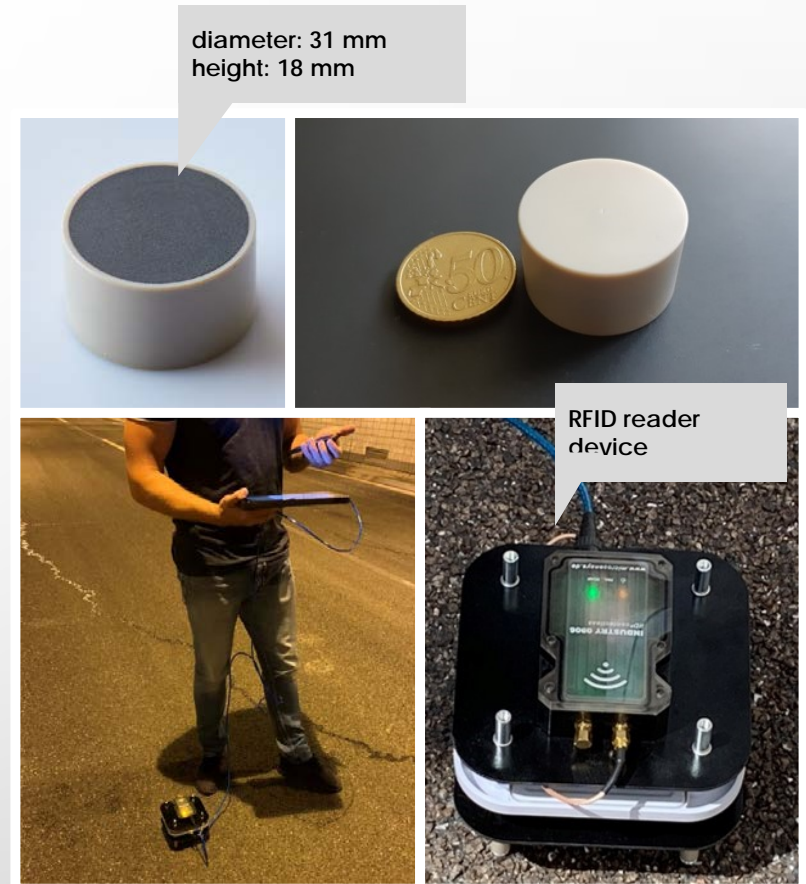
- **Very** robust sensors
- **Multilayer** installation possible



TEMPERATURE SENSORS

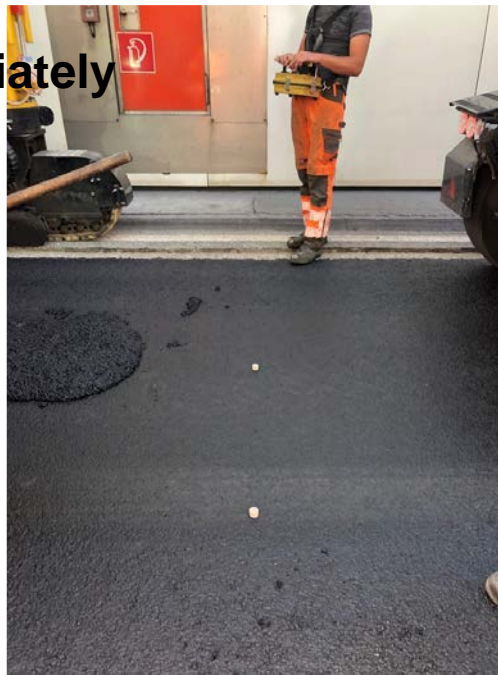
- **Independently** measurement at defined time intervals of the temperature in the road
- **Measurement interval** can be changed
- **Internal** data storage
- **Programming** and **configuration** also possible after installation (wireless)
- Data export / reprogramming of the sensors takes place wirelessly using **RFID technology**
*
- **Battery** operated (2-3 years)

*radio-frequency identification = Data transmission by electromagnetic waves

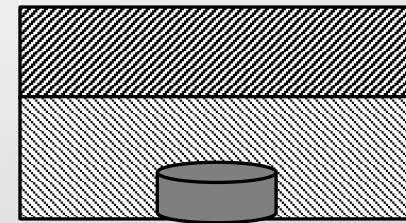
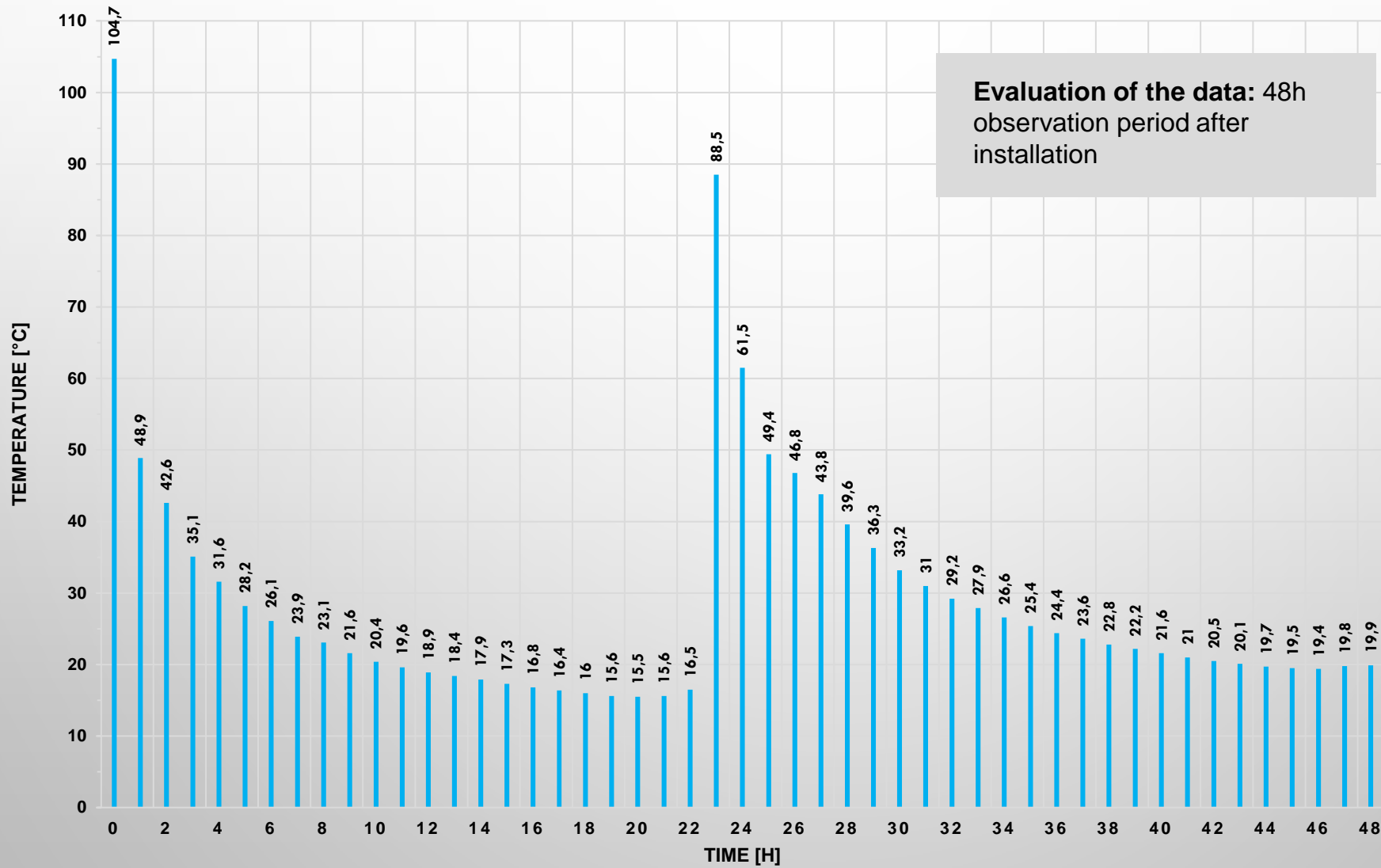


TEMPERATURE SENSORS

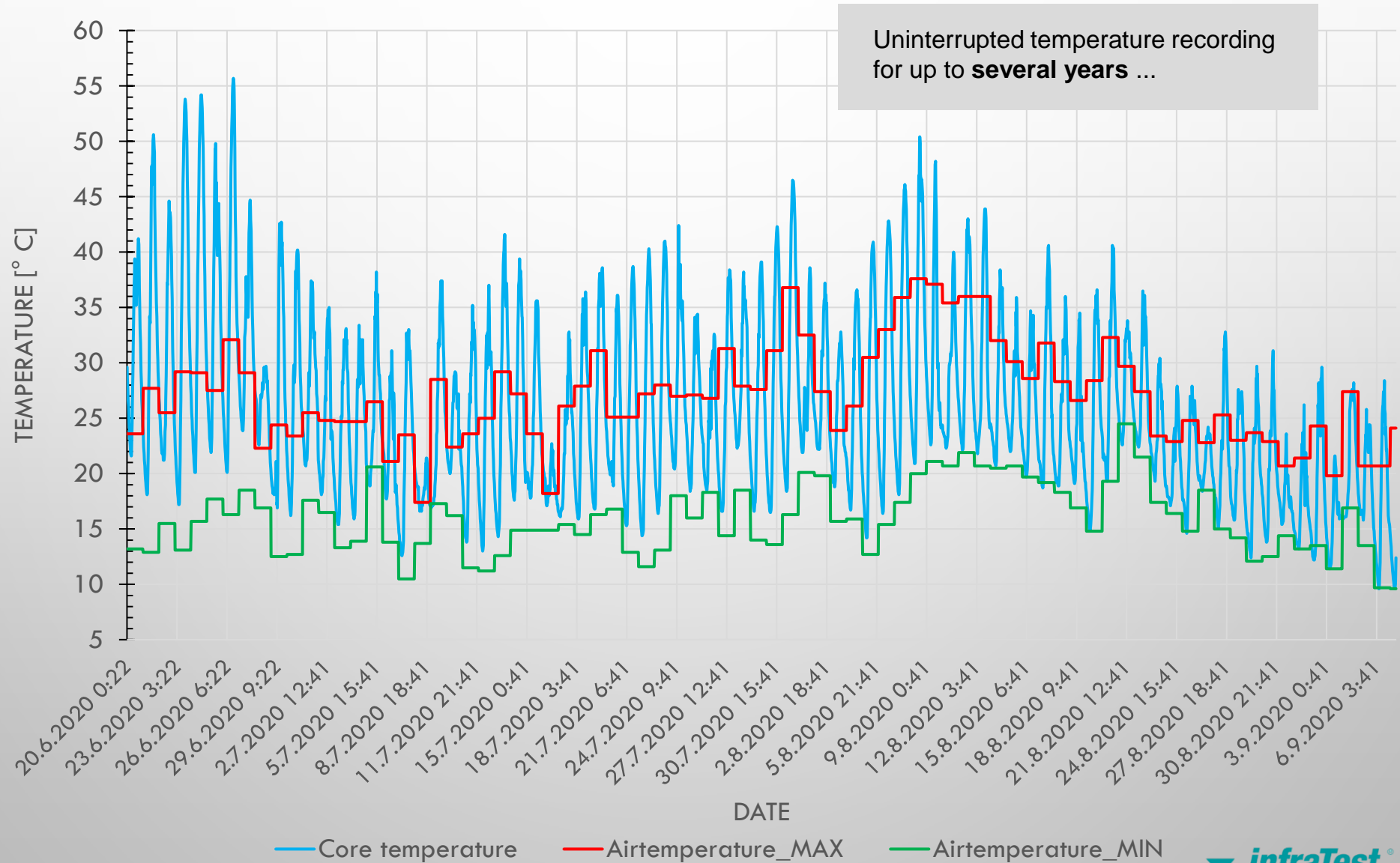
- Sensors are **activated** before installation
- Installation is **automated**
- Data are available **immediately**



TEMPERATURE SENSORS

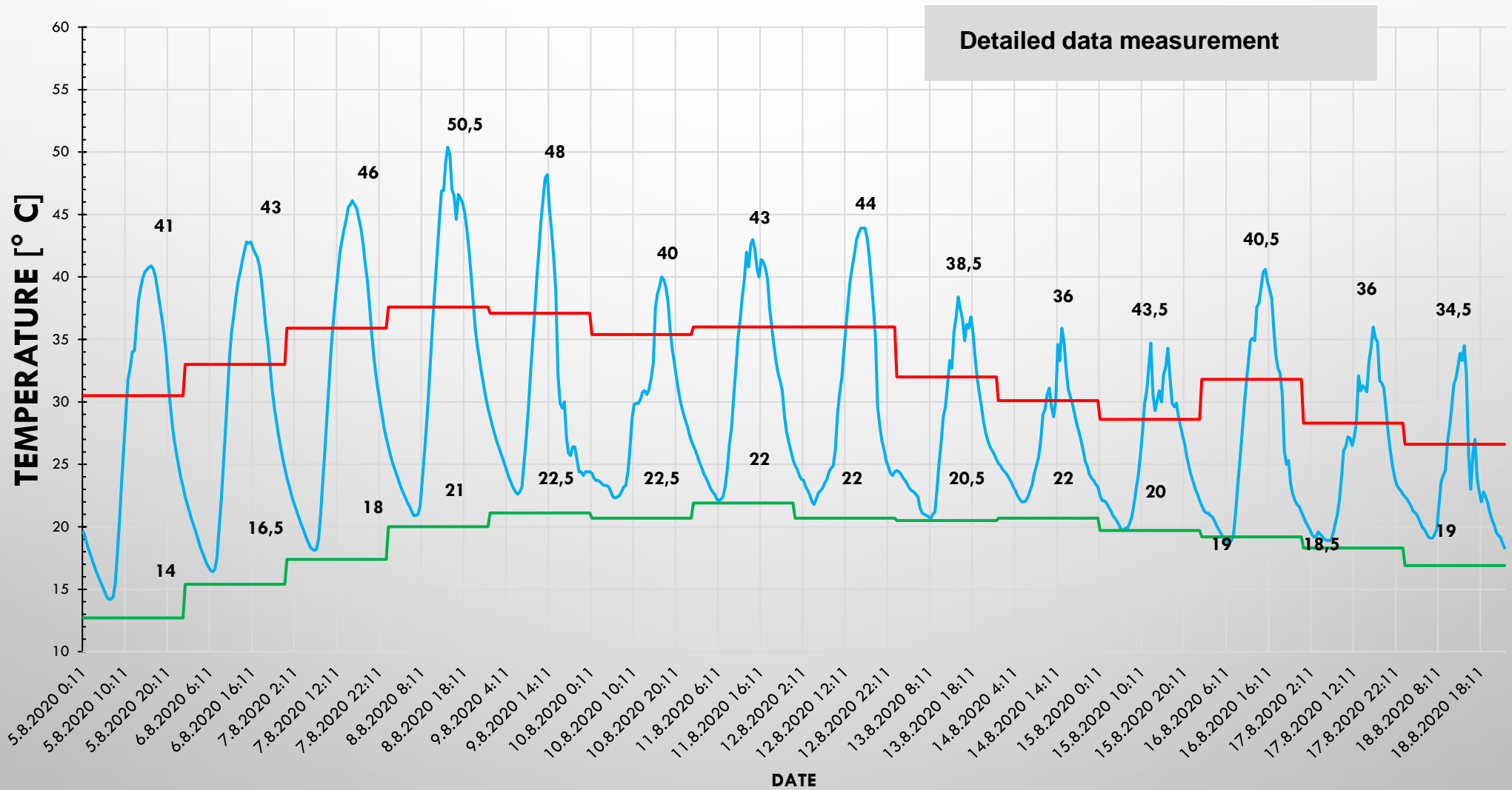


TEMPERATURE SENSORS



— Core temperature — Airtemperature_MAX — Airtemperature_MIN

TEMPERATURE SENSORS



— Core temperature

— Airtemperature_MAX

— Airtemperature_MIN

TEMPERATURE SENSORS


- Investigation of the temperature behavior in the **asphalt core**
- Consideration of the temperatures depending on **external factors**
- **Research** into the behavior of materials in the event of temperature differences
- **Determination** of the temperatures in the layer boundaries



A cylindrical metal mass, likely a seismic mass for an acceleration sensor, is shown in the foreground. It has a dark, textured top surface and a polished metal side. A black cable is visible in the background, curving across the frame. The background is a plain, light-colored surface.

ACCELERATION SENSORS

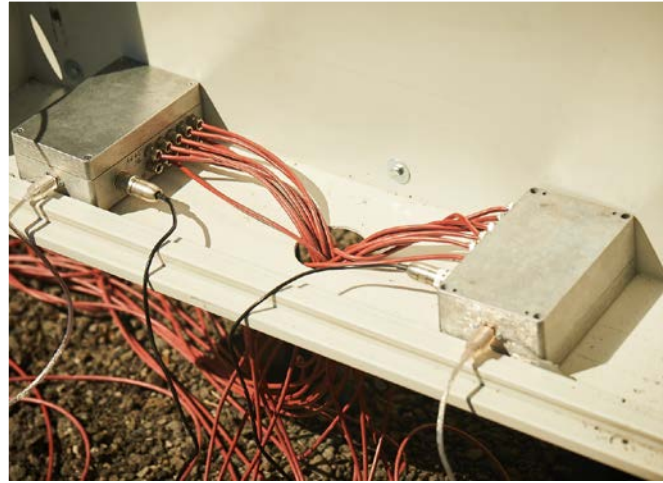
ACCELERATION SENSORS

- When vehicles roll over the road, **vibrations occur**
- **Acceleration sensors** detect vibrations in the form of acceleration
- Acceleration data are transmitted via cable to a control box and then loaded into the **cloud** (high amount of data per station)
- Research Character 

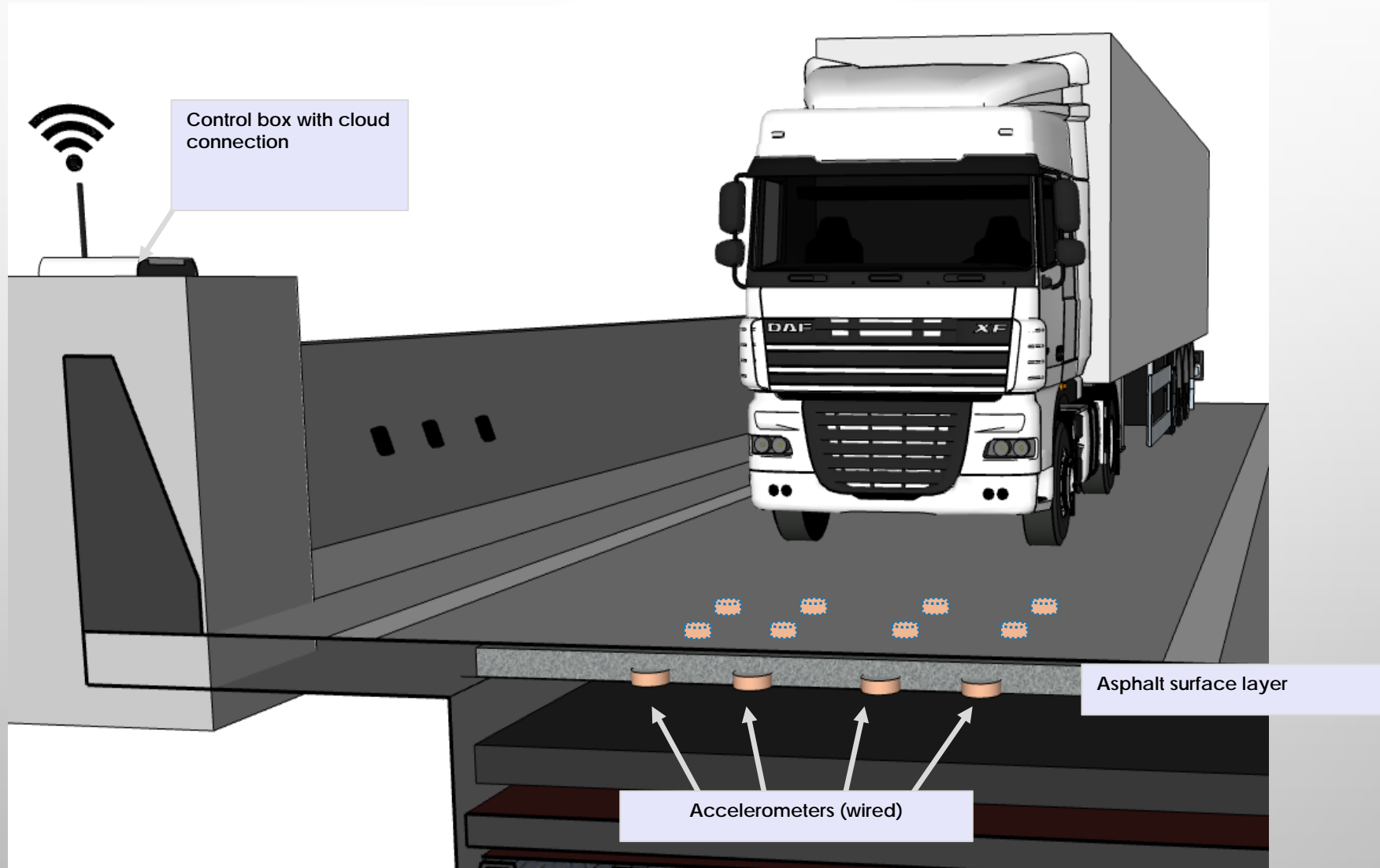


ACCELERATION SENSORS

- **Up to 9 sensors** per station in the transverse profile to record all data



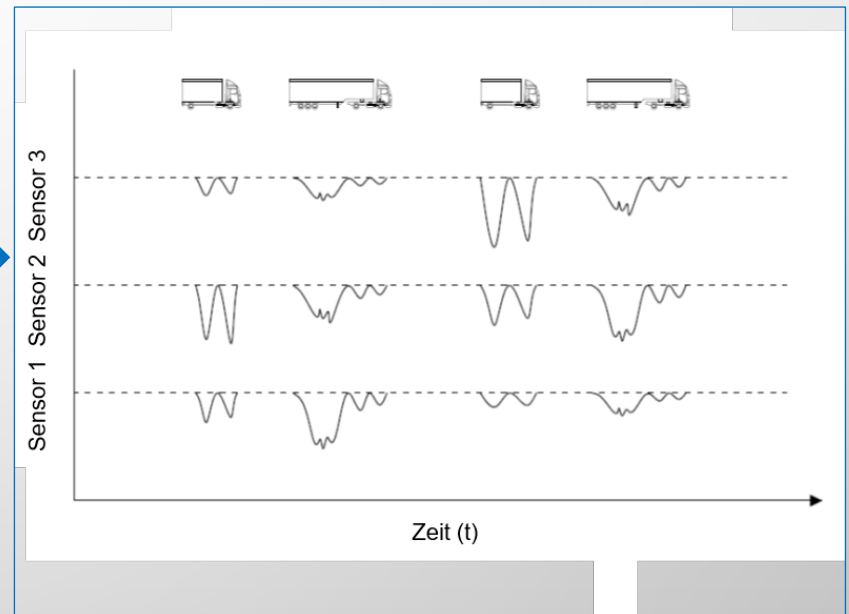
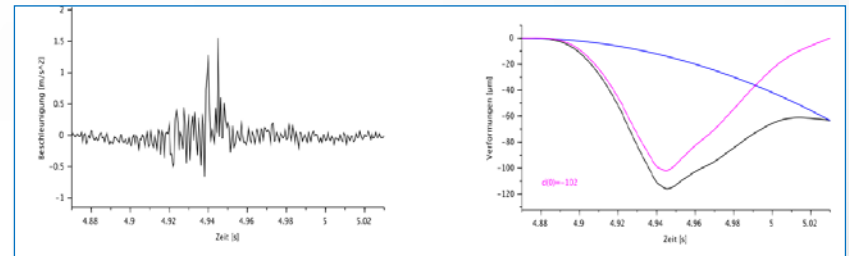
ACCELERATION SENSORS



ACCELERATION SENSORS

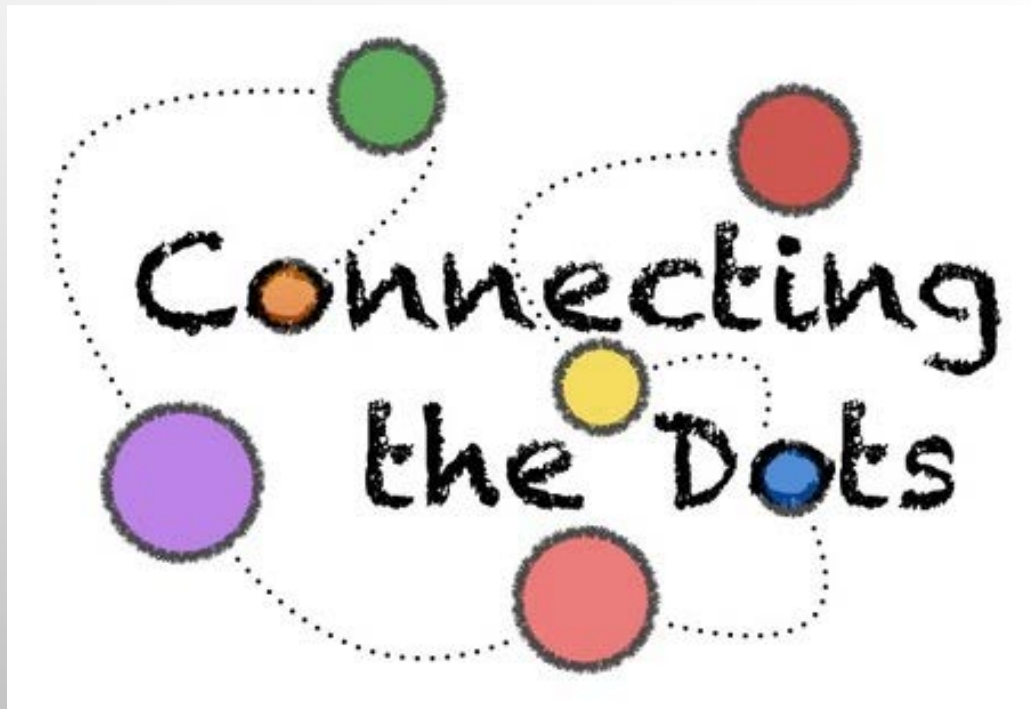
POSSIBLE CONCLUSIONS OF THE DATA ON:

- AXLE LOAD AND AXLE CONFIGURATION
- TRAFFIC DENSITY
- VEHICLE TYPE
- SURFACE CONDITION
- LOAD BEHAVIOR



DIGITALIZATION IS HAPPENING

TODAY



- ASPHALT PRODUCTION
- ASPHALT TRANSPORTATION
- ASPHALT PAVING
- ASPHALT COMPACTION
- QUALITY CONTROL
- MIX DESIGN
- ETC.

THANK YOU VERY MUCH
FOR YOUR ATTENTION