



REPUBLIC OF SLOVENIA
MINISTRY OF THE ECONOMY, LABOUR AND SPORT
METROLOGY INSTITUTE OF THE REPUBLIC OF SLOVENIA



**I FEEL
SLOVENIA**

OIML R 91:2025

Software examination during
type approval and verification

9.9.2026



OIML R 91:2025

WEBINAR

Software examination ...

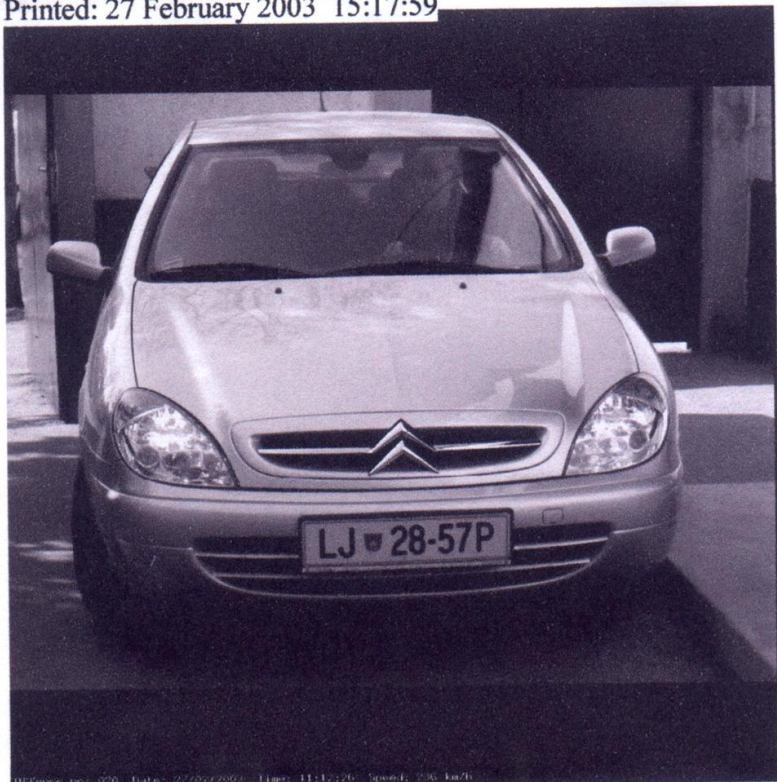
OIML Webinar, 9.9.2026

Roman Flegar, M.Sc.

... the most demanding topic today ...

WHY SOFTWARE EXAMINATION

Printed: 27 February 2003 15:17:59



The answer is ...

Photo Number: 20
Date: 27/02/2003
Time: 11:12:26
Direction: Approaching
Speed: 236 km/h
License plate:

... you need
go very deep

...

```
00000000h: 52 41 32 30 30 32 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E ; 27/02/2003
00000010h: 31 31 3A 31 32 3A 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E ; 11:12:26000020 2
00000020h: 33 36 3C 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E ; 36<.....
00000030h: 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E ; .....
00000040h: 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F ; .....
00000050h: 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E ; .....
00000060h: 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E ; .....
00000070h: 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E ; .....
00000080h: 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E ; .....
00000090h: 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E ; .....
000000a0h: 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E ; .....
000000b0h: 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E ; .....
000000c0h: 20 31 36 39 20 20 20 35 20 20 20 39 20 20 20 30 ; 169 5 9 0
000000d0h: 20 20 20 31 20 20 20 31 20 20 20 31 2E 2E 2E 2E ; 1 1 1....
000000e0h: 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E ; .....
000003e0h: 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E ; .....
000003f0h: 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E 2E ; .....
00000400h: FF D8 FF E0 00 1 00 00 00 00 00 00 00 00 00 00 ; JFIF.....
00000410h: 00 00 00 00 FF D8 00 00 00 00 00 00 00 00 00 00 ; .....
00000420h: 07 07 07 09 09 00 00 00 00 00 00 00 00 00 00 00 ; .....
00000430h: 13 0F 14 1D 1A 1F 1E 1D 1A 1C 1C 20 24 2E 27 20 ; ..... $. '
00000440h: 22 2C 23 1C 1C 28 37 29 2C 30 31 34 34 34 1F 27 ; ",#..(7),01444.'
```

Time and date of offence

Car speed

Direction

Clear name of manufacturer

Algorithem for storing bit images

Photo of offence?

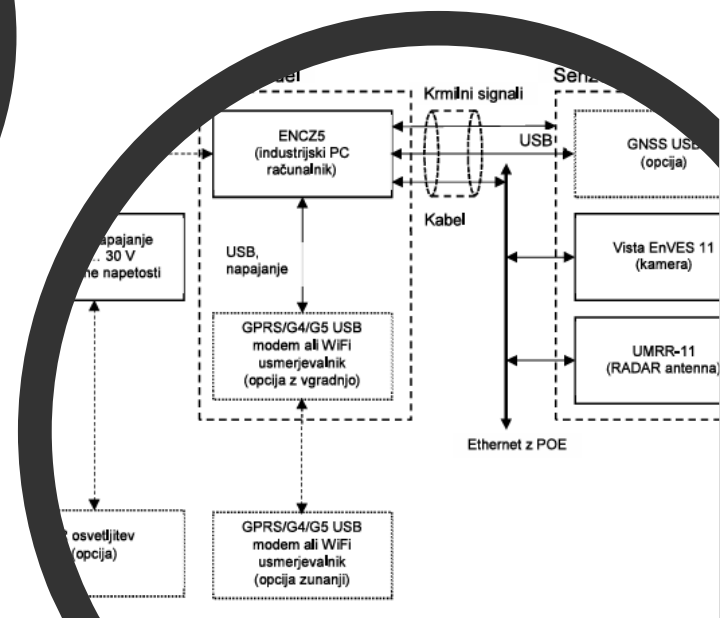
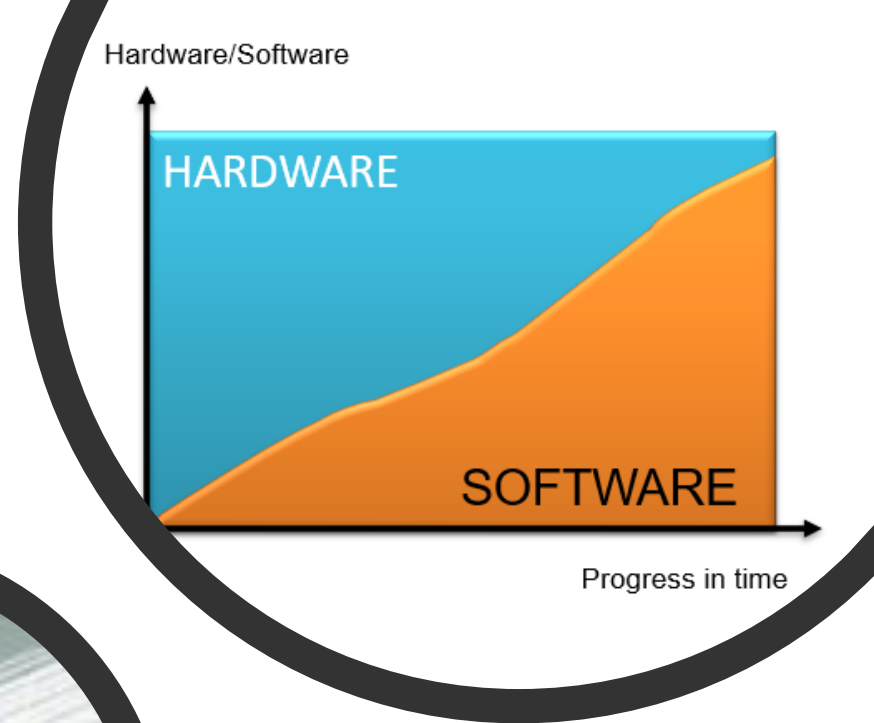
Software testing is an art at legal metrology

- Beginnings in 2005 with WELMEC 7.2, later on OIML D 31 around 2008, same contributors, same ideas and solutions ...
- Every speed meter and every manufacturer has their own solutions, protocols and “ideas” what and how to protect and how to document the software functions.



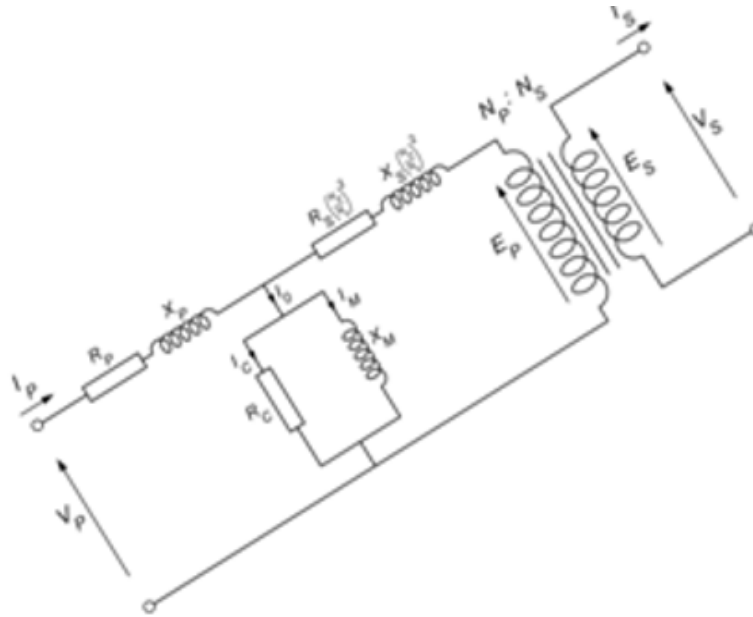
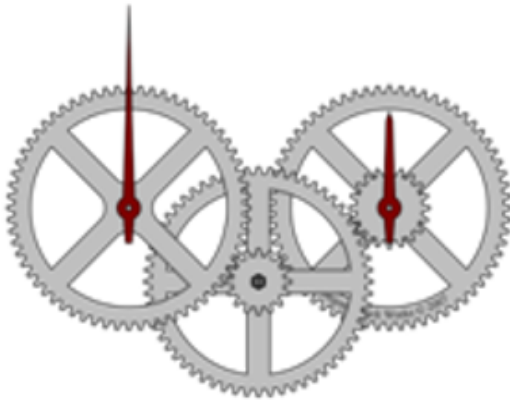
Software is the most important part

- Software defines speed meter
- ... every building block is a “computer” with a “software” based ...
 - Measuring
 - Operating
 - Communicating – internally/externally
 - Checking
 - Protection
 - Encryption
 - Documenting
 - Interface



Software is equivalent to ...

Mechanics = Electronics = Software



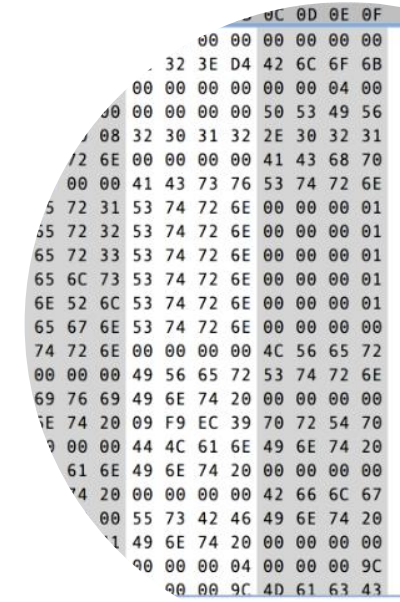
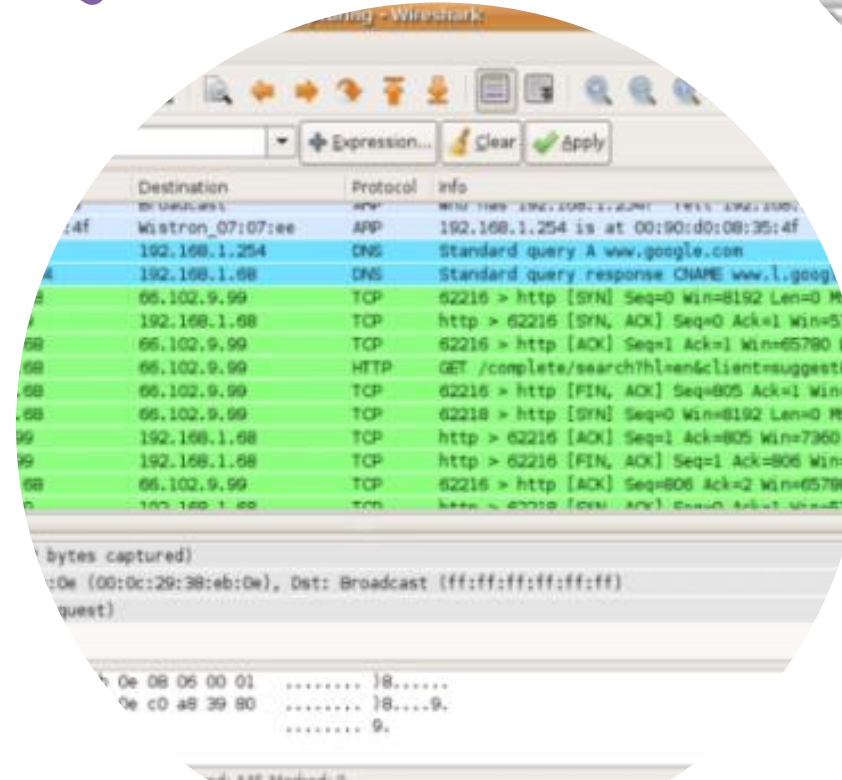
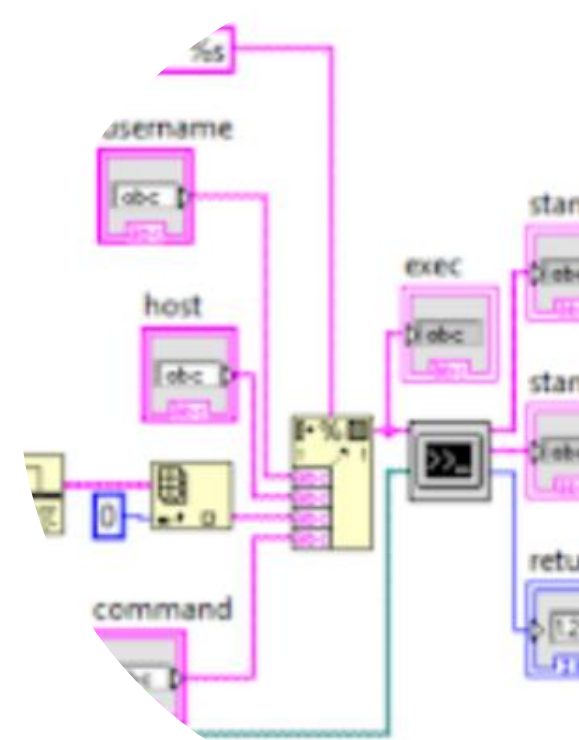
What you need to know



- Different knowledge and tools for open:
 - Hardware interfaces: Ethernet, RS232, RS485, CAN, I2C , ...
 - Communication interfaces: TCP/IP, UDP, BT, Wifi ...
 - Encryption: CRC16, CRC32, SHA256, PKI, ...
 - User interfaces: visual, SOAP, client sever models ...
 - Operating systems ...
 - Programming languages ...

Software tools

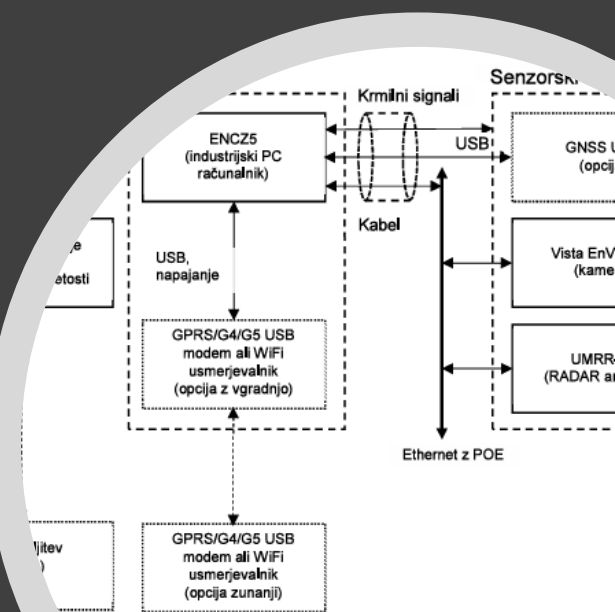
- Notepad
- Hex Editors
- Network monitors: Wireshark
- Terminal software: Putty, Term, ...
- Browsers
- Scripting and programming tools: Python, LabView, VBasic, ...



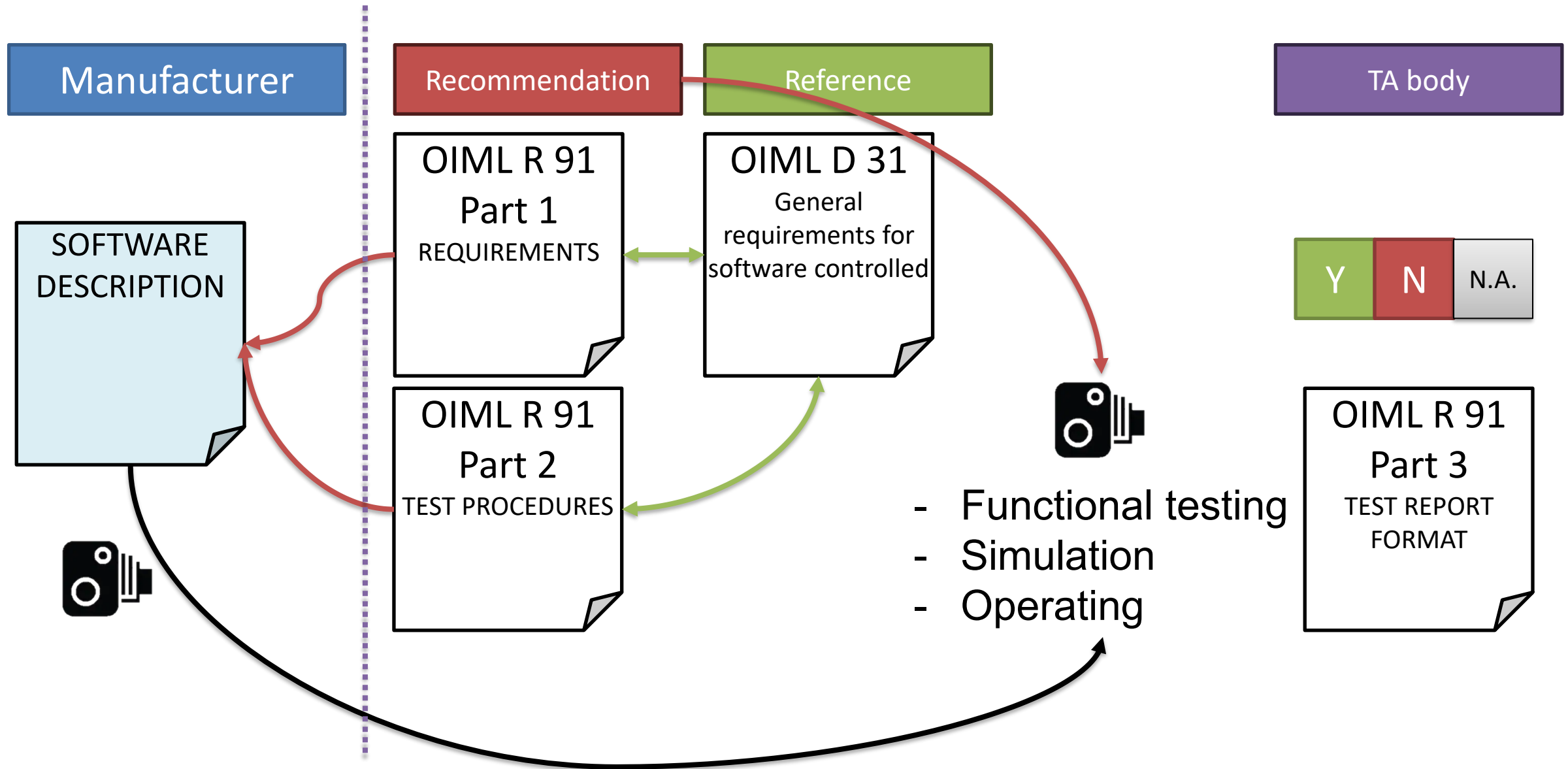
OIML R 91:2025 AND “THE SOFTWARE”



Before software testing ... you need to know speed meter...



Relation between documents



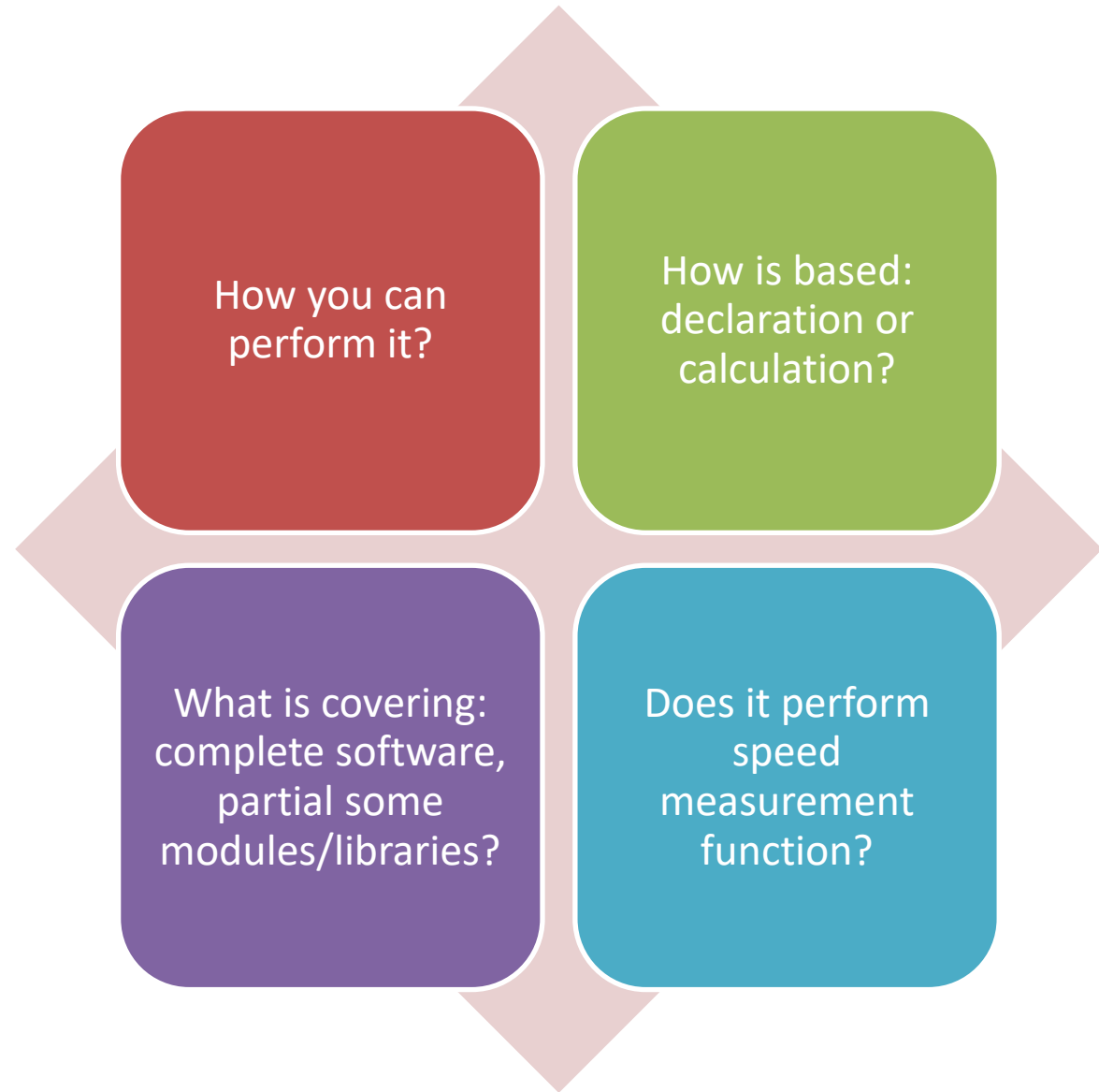
Part 1 - Requirments

- Referencing to the OIML D 31:2023
 - 7.10 General requirements
 - 7.10.1 Software identification
 - 7.10.2 Evidence and prevention of misuse
 - We can talk another 20 hours about software identification ...
 - ... and another 20 days of identification and prevention of misuse
-
- Why
 - Everything is done to support evidence of speed measurement at the court.

Part 2 - Test procedures

- 8.3.1. General requirements
 - Software identification
 - Correctness of algorithms and functions
- 8.3.2 Software protection
 - Evidence and prevention of intervention
 - Prevention of misuse
 - Demands on the user
- Why
 - Equal approach to prove requirement
 - Equal understanding of procedure
 - To achieve mutual acceptance of results

Software identification



Correctness of algorithms and function

MPE in the field



MPE in the laboratory – simulation cases on
boundaries or critical values



Preform intentional misuse, wrong installation,
configuration or setting of the system

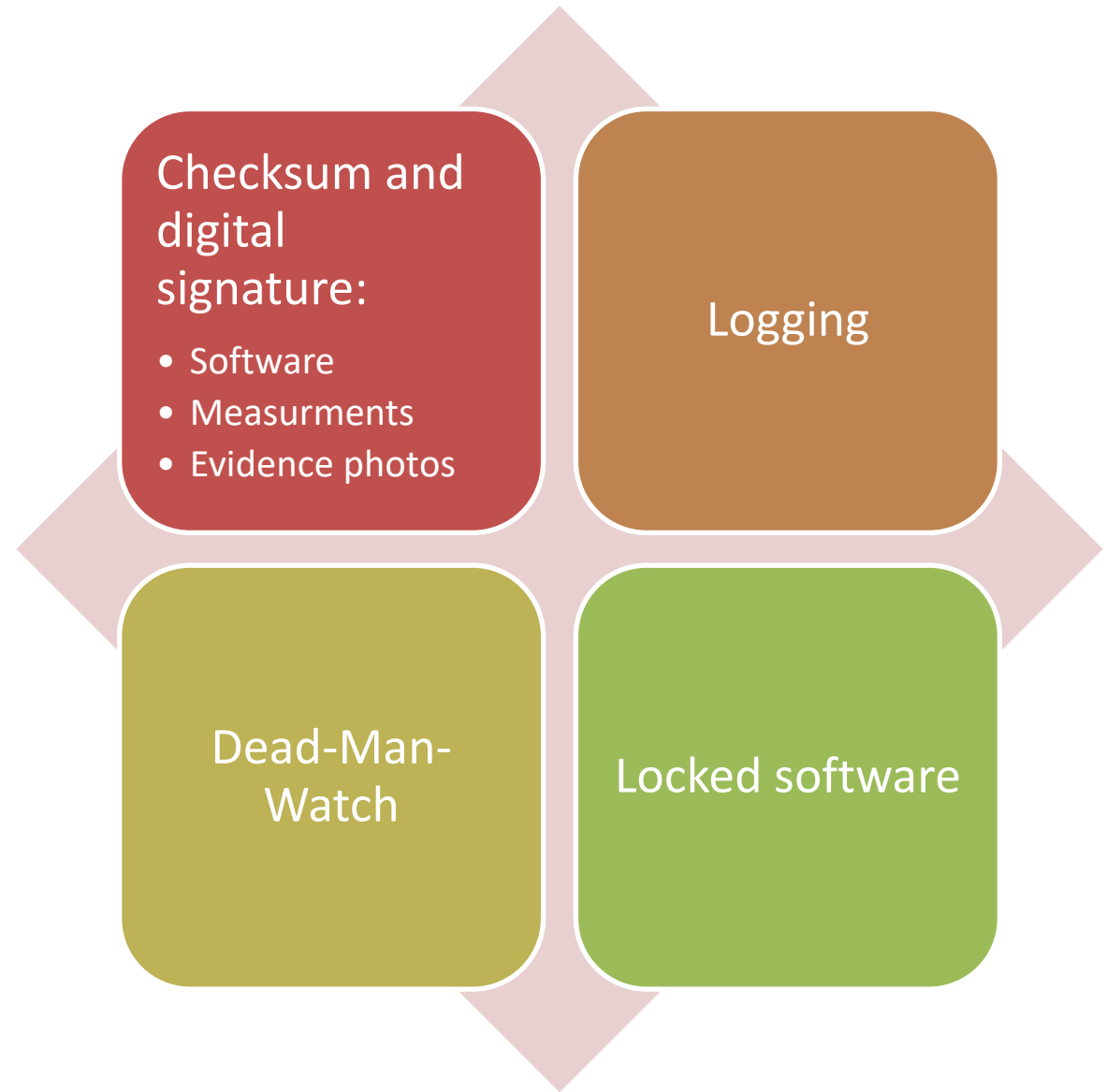
Demands on the user

- How easy is to understand user manual?
- Is too demanding to operate the system?
- Can this lead to unintentional misuse?
- Can this lead to skipping preparation and installation steps?



SOFTWARE PROTECTION

Evidence and prevention of intervention



Prevention of misuse

- Encryption of measurement
- User level access
- Logging
- Checking installation and settings
- Watch-dog
- Selfcheck mechanism



REPORTING

How to report

- Evidence of findings
- Tool which were used
- How you have performed misuse
- How system reacted on the misuse
- Leave a trail of updates and findings

6 Software examination (OIML R 91-2, clause 8)

6.1 General requirements [mandatory] (OIML R 91-2, 8.3.1)

Application no.:		At start	At end	
Type designation:		Temp.:		°C
Observer:		Rel. h.:		%
		Date:		yyyy-mm-dd
		Time:		hh:mm:ss

Results:

#	Requirement	OIML D 31:2023	Pass	Fail	Remark
1	Software identification	6.2.1			
2	Correctness of algorithms and functions	6.2.2			

Remarks:

SOFTWARE EXAMINATION – VERIFICATIONS

Verification

- Software identification
- Status of electronic seals or signatures
- Demand easy access to identification



CONCLUSION

Conclusion



YOU NEED TO KNOW
SPEED METER



MAKE A PLAN FOR EACH
REQUIREMENT



MAKE AND TAKE A NOTE
OF ACTION AND RESULTS



LEAVA A TRAIL OF
IMPROVEMENTS,
CORRECTIONS

THANK YOU ...