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**Q.31**



# Areas of German Metrological Infrastructure

## Legal Metrology

### Voluntary Area

**Principle:**

Conformity assessment of measuring instruments by user of instrument

**Basis:**

Internal measurement control system (ISO 9001, ISO 19012)

**Most important activities:**

Calibration

**Infrastructure:**

PTB, DKD

### Legally Controlled Area

**Principle:**

Conformity assessment of measuring instruments by state / state controlled institutes

**Basis:**

Legal requirements for measuring instruments for specific applications

**Most important activities:**

Pattern approval, Verification

**Infrastructure:**

PTB, Verification Offices, state approved testing laboratories

# Principles of Legal Metrology

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- Public guarantee of correct measurement
- Confidence in reliable measurement results
- Protection of citizen and consumer
- Fair trade
- Elimination of conflicting interests

# Scope of Legal Metrology

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## Basis

- European Directives
- National Law on Metrology and Verification

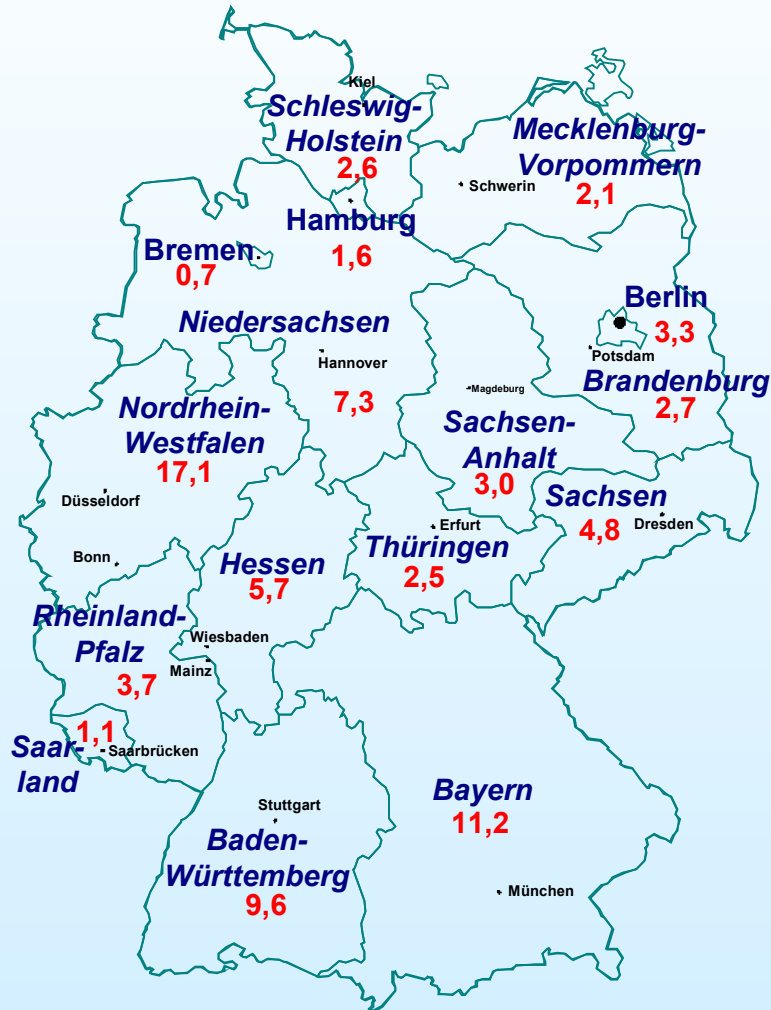
## Fields of application (examples)

- Commercial transactions (utility meters, weighing instruments, petrol stations, taximeters)
- Official transactions (taxes, fees)
- Road traffic surveillance (velocity, distance, weight)
- Environmental protection (exhaust gas)
- Health protection (ionising radiation, noise) \*)

\*) Medical devices with measuring functions:

EC-Directive 98/79/EC: “Medical devices: In vitro diagnostics”

# Federal Structure of Germany



## Statistical data:

Number of inhabitants: 81 mio.

Area: 357,00 km<sup>2</sup>

Extension: 876 km north-south  
640 km east-west

Density of population: 222/km<sup>2</sup>

Neighbouring states: CH, A, CFR, P,  
DK, NL, B, L, F

# Legal regulations

## Responsibility

## Regulation

**Parliament**

- National law
  - Metrology Act
  - Units of Measurement Act

**Federal Ministry**

- Ordinances
  - Verification Ordinance
  - Prepackages Ordinance
  - Fees Ordinance

**PTB**

**Verification Authority**

- Administrative Regulations
  - Testing Rules
  - Verification Instructions
  - Directives for Prepackages

Reference

- Accepted rules of technology:
  - Standards
  - PTB requirements

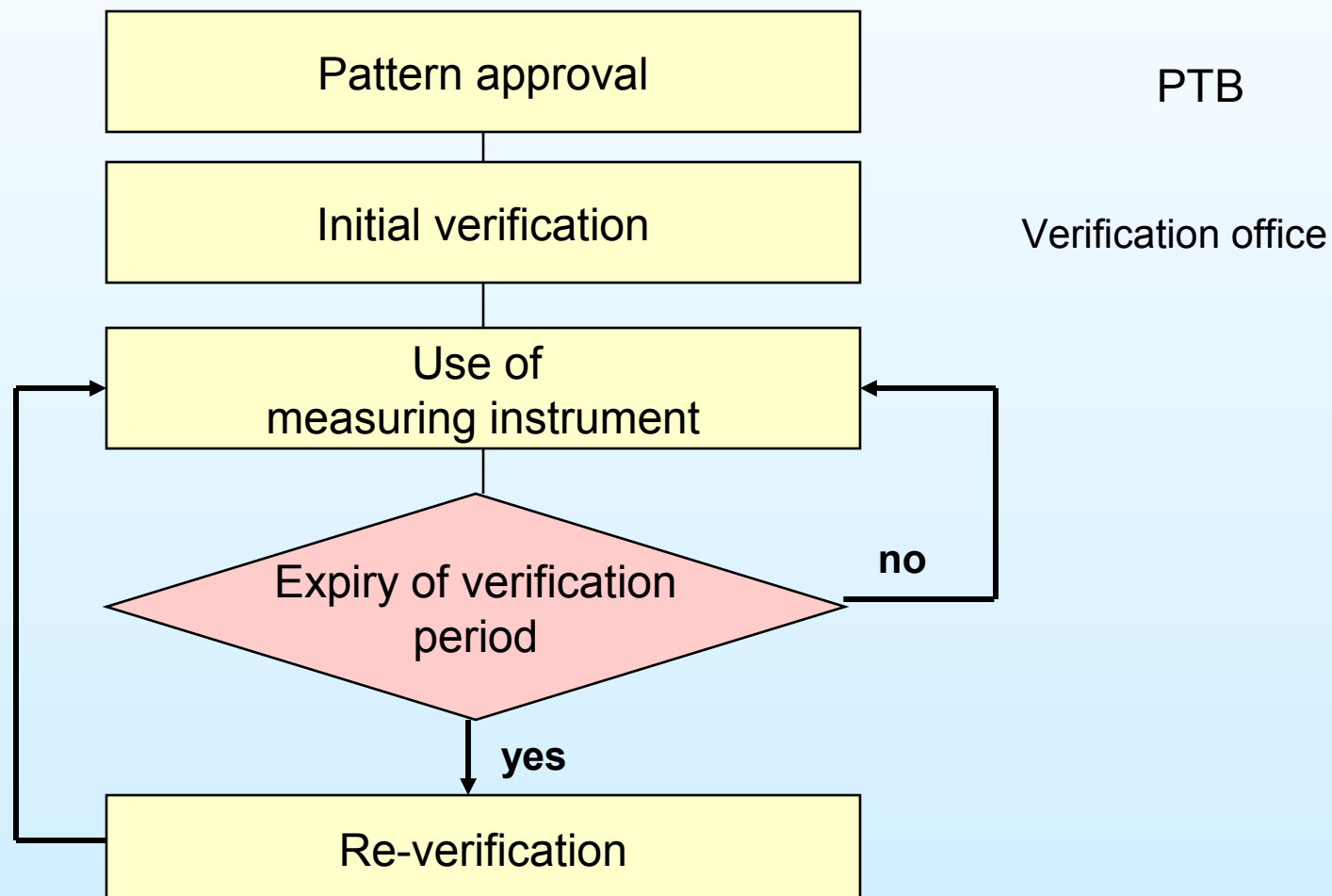
Reference

# Measuring instruments subject to legal control (Examples)

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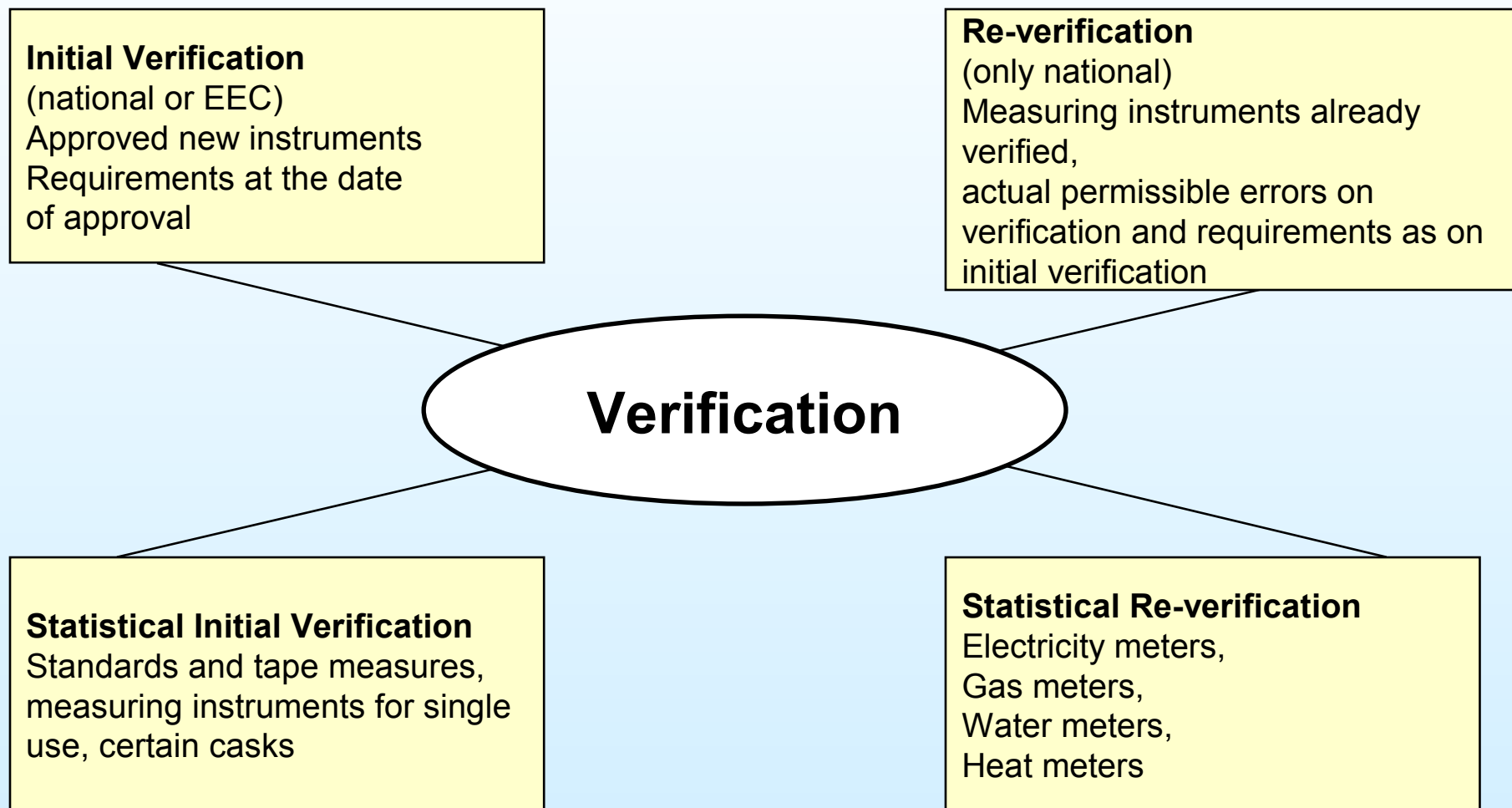
- Length measuring instruments
- Area measuring instruments
- Measuring systems for liquids
- Measuring assemblies on road tank cars
- Water meters
- Gas meters
- Electricity meters
- Heat meters
- Gross calorific value measuring instruments
- Non-automatic weighing instruments
- Automatic weighing instruments
- Weights
- Moisture meters for cereal grains
- Taximeters
- Instruments for speed control
- Tyre pressure gauges
- Exhaust gas measuring instruments
- Sound level meters
- Radiation protection measuring instruments

# Test cycle of measuring devices


























# Kinds of verification

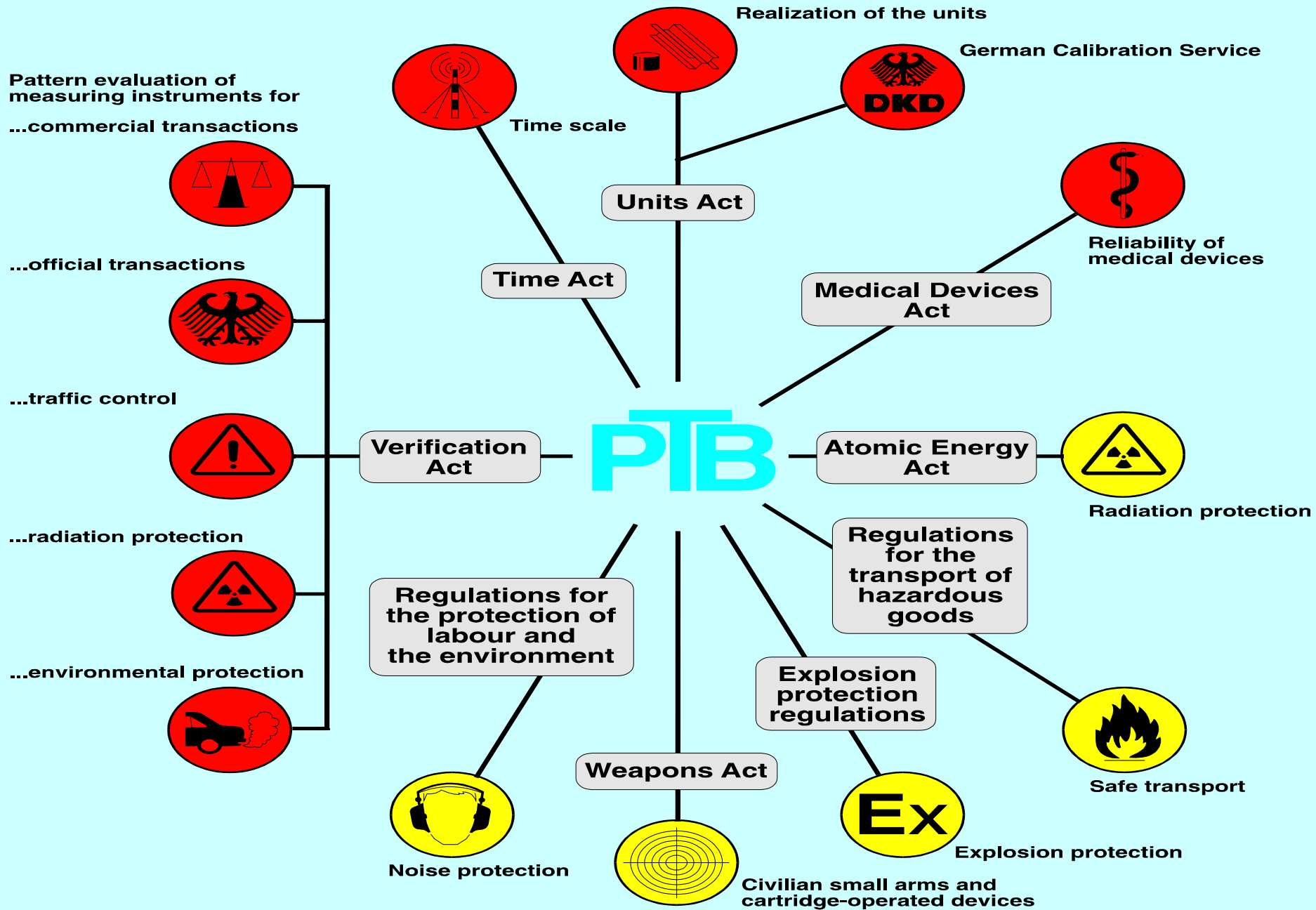


# Mandatory Verification

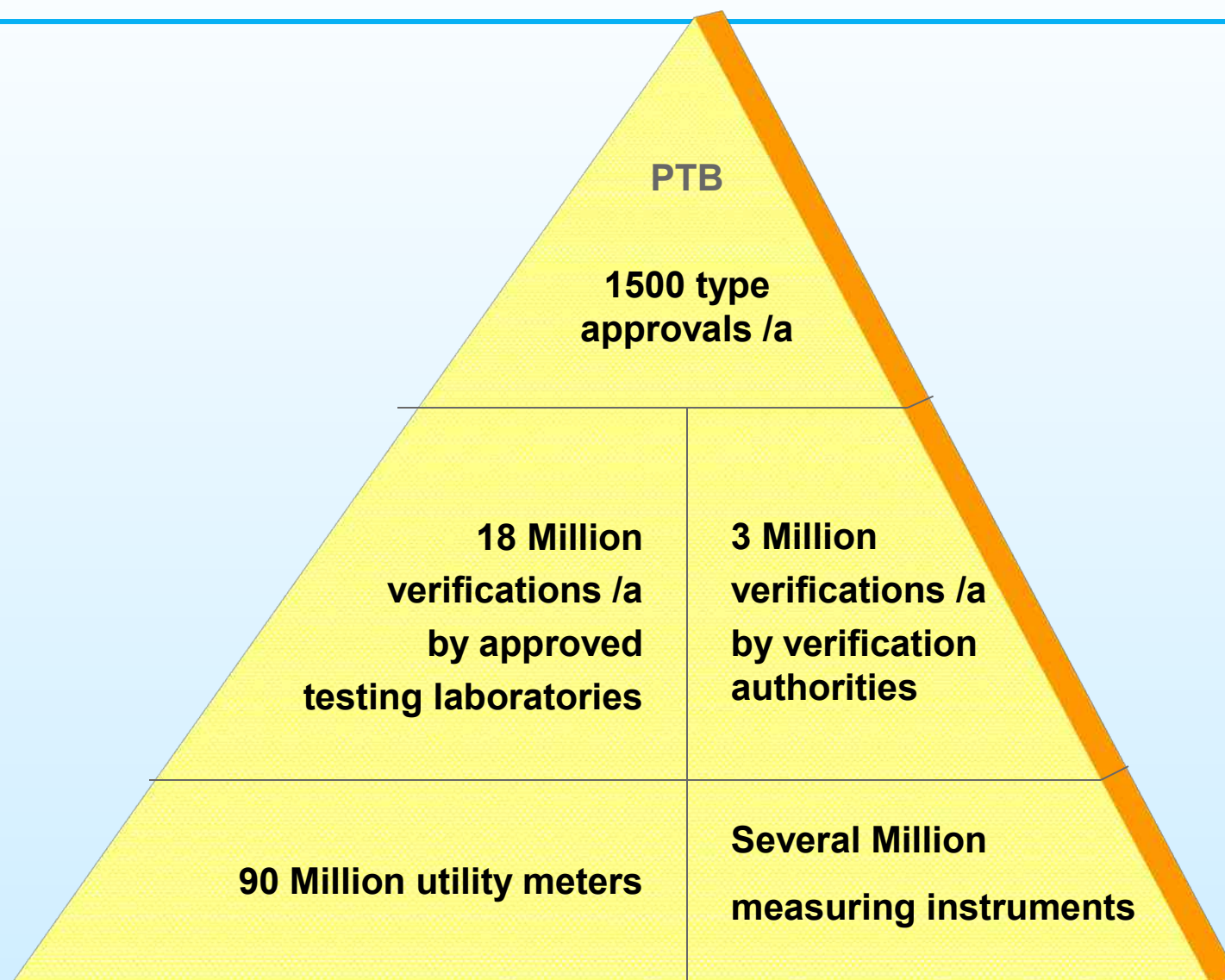
	Approval without pattern evaluation	Pattern approval	EEC - approval	Validity of verification period in years
Length measuring instruments				∞
Counter balances				2
Petrol pumps at petrol stations				2
Radiation dosimeters				2
Sound level meters				2
Taximeters				1
Tyre pressure gauges				2
Exhaust carbon monoxide meters				1
Velocity meters				1
Electricity meters				16+4*
Water meters				6+3*
Gas meters				8+4*
Heat meters				5+3*

∞ unlimited

\*  
Extension is possible under certain conditions



# Role of type approvals



# Infrastructure data (09/2000)

Institution	Number	Employees
PTB <ul style="list-style-type: none"> <li>▪ total</li> <li>▪ Legal Metrology</li> </ul>	1	1750 80
Verification authorities	16	1700
Verification offices	78	
Accredited testing laboratories	390	21 00

# Tasks of the verification offices

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- Initial verification (EEC and national)
- Periodic verification
- Checking of prepackages (at the manufacturer's)
- Checking of capacity serving measures (at the manufacturer's)
- Market surveillance
- Accreditation of testing laboratories
- Surveillance of testing laboratories

# Accredited testing laboratories

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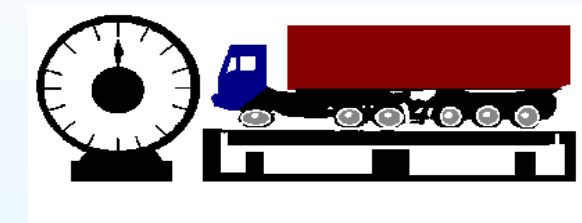
First accreditation in 1902 (only electricity meters)

Now accredited and supervised by verification authorities

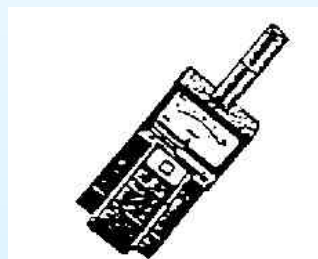
Extension to gas meters, water meters and heat meters in 1969

- Owners: Manufacturers and utilities
- Tasks
  - Initial verification
  - Re-verification
  - Check of conformity for meters in use

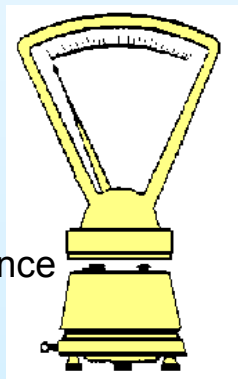
# Verification fees



Road vehicle weigh-bridge



Geiger meter



Counter balance



Gas meter

1500 €

1000 €

Sound level meter



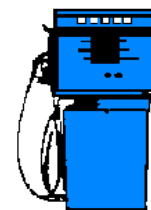
500 €

Storage tanks



250 €

100 €



Petrol pump

50 €

Taximeter



25 €



Electricity meter

10 €



Water meter

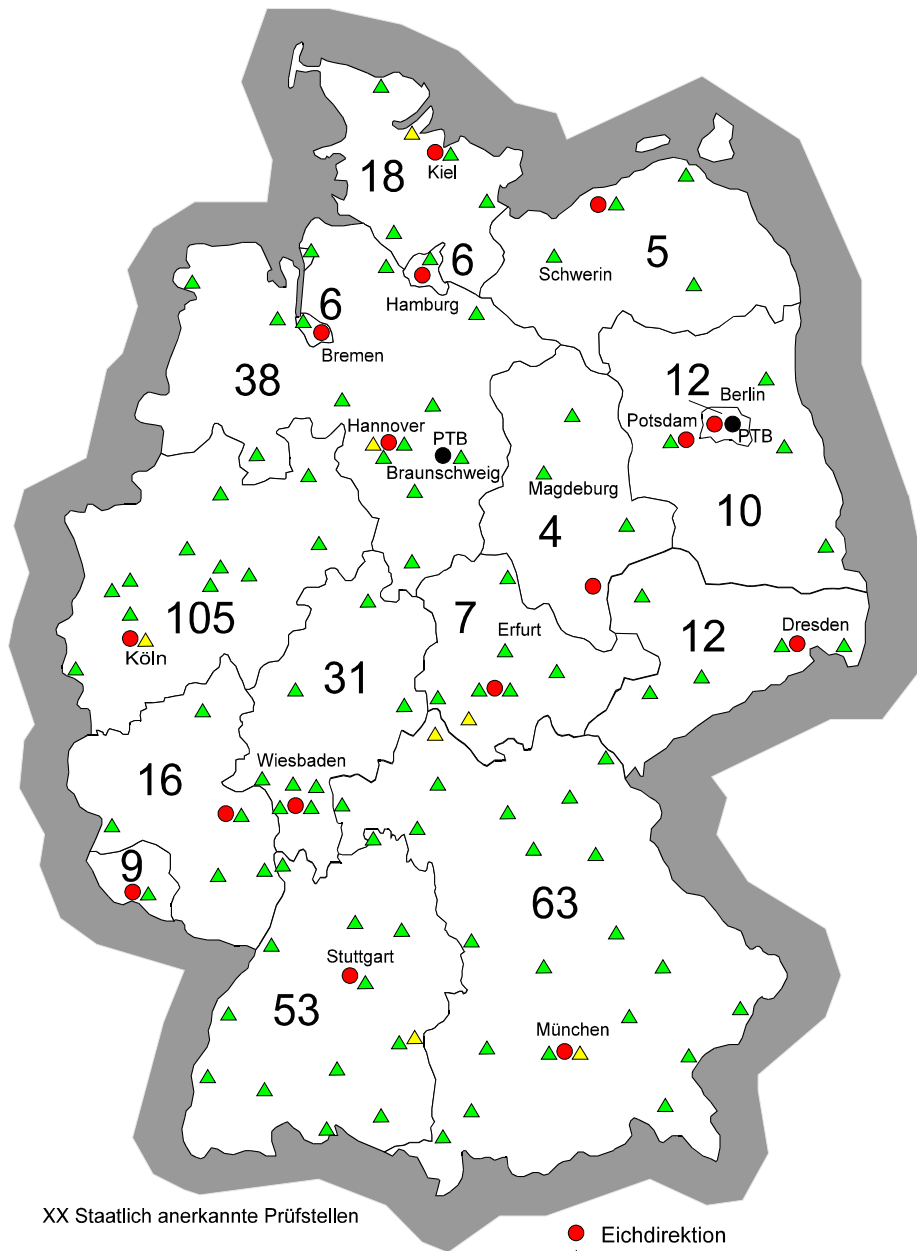
5 €



Weights



## Distribution of Verification offices in Germany



- Eichdirektion
  - ▲ Eichamt
  - ▲ Beschufsamt
- Stand 1.98

# Number of tests / certifications of measuring instruments (1999)



Kind of tests	Number of tests		
	PTB	Verification offices	Accredited test laboratories
Pattern approvals <sup>1)</sup>	2.200	-	} 15.600.000
Initial verifications	-	350.000	
Re-verifications	-	1.040.000	
Statistical verifications	-	1.100.000	3.500.000 electricity meters 500.000 gas and water meters

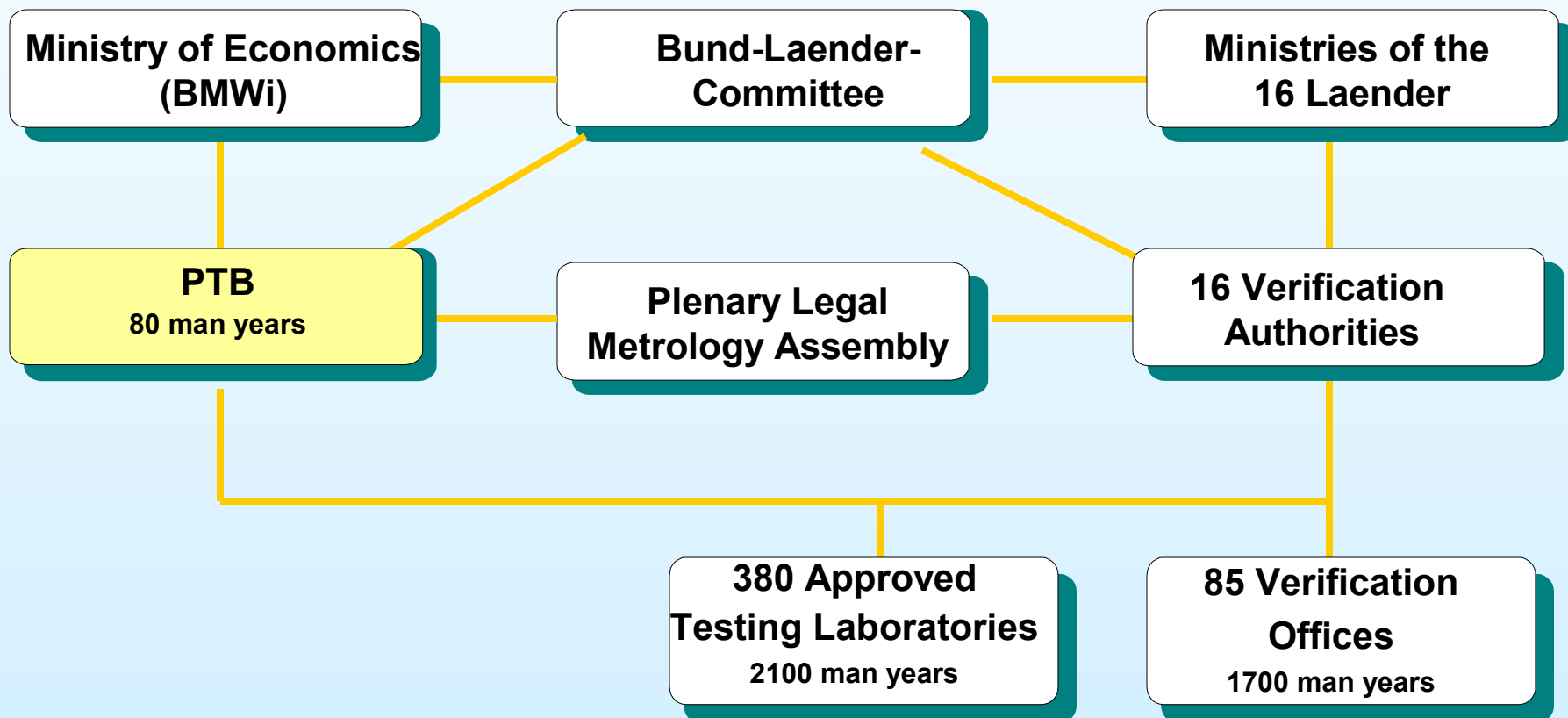
1) incl. additions

# Governmental Co-ordination

Federal Government

Co-ordination Bodies

Government of the Laender



# Tasks of the coordination bodies

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## Bund-Laender Committee

- Advice to Ministries in political, legal and economic matters
- Harmonizing application of legal regulations
- Members
  - Federal Ministry (2)
  - PTB (1)
  - Ministries of the Laender (16)
  - Verification directors (16)
- Meetings
  - 2 per year

# Tasks of the coordination bodies

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## Plenary assembly for legal metrology

- Foundation 130 years ago
- Discussion on new technical requirements
- Passing of a resolution concerning technical regulation
- Members
  - PTB (20-30)
  - Federal Ministry (1)
  - Verification directors (16)
- Meetings
  - 1 per year

# Tasks of the coordination bodies

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## Working committee of the verification directors

- Harmonizing the enforcement in
  - verification
  - testing, inspection
  - surveillance
- Members
  - verification directors (16)
  - PTB (1)
- Meetings
  - 3-4 per year

# Training in the German Academy of Metrology (DAM)



Careers	Intermediate Verification Service	Executive Verification Service
Terms of admission	Technicians or master of engineering	Engineers
Training period <ul style="list-style-type: none"><li>• Practice</li><li>• Theory</li></ul>	9-15 months 3 months	6-18 months 6 months
Training Institutions	Practice: Verification authorities and verification offices Theory: German Academy of Metrology (DAM) in Munich	
Examinations	Diploma	

# Challenges in Legal Metrology

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## Technical

- Measuring systems controlled by software
- Shorter innovation cycles in industry

## Economical

- Liberalisation of the energy markets in Europe
- Manipulation of the measuring results by software

## Political

- European Measuring Instruments Directive (MID)
- Globalisation



# Role of PTB

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## Co-ordination of Legal Metrology by Department Q.3

- Supporting the Ministry of Economics (BMWi) for legislation
- Representing German position in EU-Commission, EU-Council, WELMEC and OIML
- Advice for PTB-laboratories, verification authorities and approved testing laboratories
- Database for type approvals (Internet and CD-ROM)

# Future Developments

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## **European Measuring Instruments Directive (MID)**

- Harmonised requirements in legal metrology
- Conformity assessments by notified bodies

## **PTB fulfils the criteria for notified bodies**

### **Consequences for PTB:**

- Notified body for
  - Type approval (as hitherto)
  - Approval of design and QM system
- Competition with foreign notified bodies
- Establishment of a central notified body in PTB

# Outlook

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Development from measuring instruments to open systems

- Tests of instruments getting more difficult (software, internet)
- Guarantee of correct measuring results in the bill
- Surveillance of the instrument users more important
- Higher qualification to be met by personnel in legal metrology

# Challenges in Legal Metrology

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# MID: Regulated measuring instruments/-systems

MI-001 Water Meters

MI-002 Gas Meters and Volume Conversion Devices

MI-003 Active Electrical Energy Meters

MI-004 Heat Meters

**(MI-001 to MI-004: for residential, commercial, light industrial use)**

MI-005 Measuring Systems for the Measurement of  
Quantities of Liquids other than Water

MI-006 Automatic Weighing Instruments

MI-007 Taximeters

MI-008 Material Measures (length, capacity measure)

MI-009 Dimensional Measuring Instruments

MI-010 Exhaust Gas Analysers

# PTB-Workinggroup Q.31 Legal Metrology

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**Thank you for your attention !!**

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WG Q.31 (Legal Metrology)**