



DFM

Danish National Metrology Institute

ANNUAL REPORT 2021



METROLOGY: THE SCIENCE OF MEASUREMENT

Metrology is the science of measurements and is the backbone of our high-tech society. Most aspects of daily life are influenced by metrology, and increasingly accurate and reliable measurements are essential to drive innovation and economic growth.

DFM PROFILE

DFM is appointed as the Danish National Metrology Institute and contributes to the integrity, efficiency and impartiality of the world metrology system. DFM is also responsible for coordinating the Danish metrology infrastructure. DFM is a fully owned subsidiary of DTU, the Technical University of Denmark.

DFM ACTIVITIES

DFM's scientific research results in new knowledge, measurement techniques and standards, which support the needs of Danish industry and authorities for accurate measurements.

The services offered are high-level calibrations and reference materials traceable to national primary or reference standards, training courses related to metrology and consultancy services.

DFM has a special role in developing measurement capabilities needed by small and medium sized high-tech companies in order for them to evolve and prosper.

DFM works to ensure global confidence in Danish metrology services, which are critical for competing in the global marketplace.

DIVERSITY AND SUSTAINABILITY

Diversity, inclusion and a global outlook are important to DFM in order to expand its strongholds in research. It is DFM's view that diverse teams perform better than homogeneous teams.

DFM aims to ensure that metrology supports sustainability through new standards and regulations that guide the sustainable development of products, services and processes, via reliable and widely accepted measurements.

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DESIGN

FaenoDesign.dk 5579 - 0720

Photo: Finn Brøndum and DFM

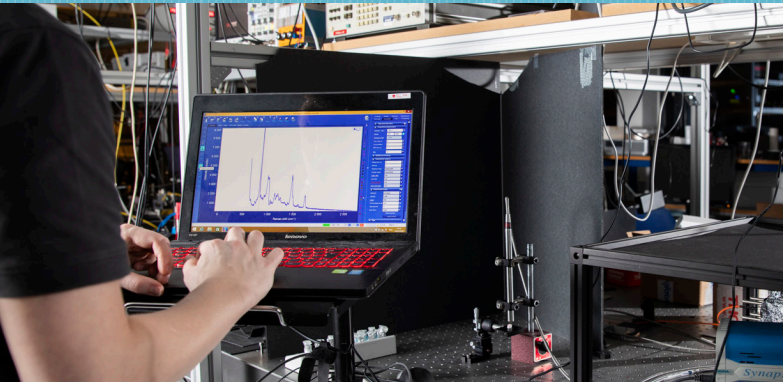
June 2022

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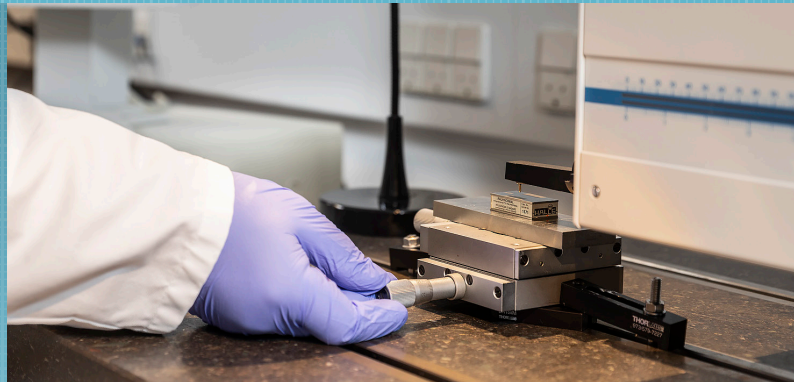
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WHY DO WE NEED METROLOGY?

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Optical investigation of nanostructures on a plastic foil produced by Roll-to-Roll printing



Calibration of roughness standard - an essential link in the traceability chain for roughness measurements

Imagine a society in which there are no common measurement standards. Consumers would not be able to trust that they paid the right amount for food, gas, electricity, petrol, water and other consumables. Manufacturers would not be able to trust that parts bought from several suppliers could actually be assembled, and we would not be able to monitor the change in pollution of our environment and evaluate their effects on global warming.

Metrology has played an important role in all civilisations. In the earliest civilisations, metrology was used to regulate trade by establishing local standards for weights and measures, but as the world trade expanded, the demand for international standards for weights and measures increased. In parallel, the technological revolution created a demand for other standards than just mass and length: The steam engines required standards for temperature and pressure, the electrical machines required measurement standard for voltage, current and resistance, and other technological inventions spurred the demand for further measurement standards.

Today we live in a global and high technology society. This demands a wide range of international measurement standards of high quality and a system to make sure that all measurements performed in society are traceable to those standards. DFM is part of an international network of national metrology institutes, which work closely together to ensure that the necessary measurement standards are available to the local society and that the measurements performed in different parts of the world are equivalent. These include measurements of physical and chemical quantities, measurements that industries rely on to foster innovation and to develop efficient manufacturing methods, measurements that secure fair trade, consumer protection, health and safety, law and order, and environment monitoring. Measurement are of increasing importance in connection with financial transactions, particularly to secure accurate time stamp of such transactions.

The situation is not static. New technologies continues to appear and the demand for addressing new fields, such as quantum technologies and life sciences, only increases. If the national metrology institutes were not able to meet these demands, the technological development would fade out. So not only do we need metrology in order to run a society, we also need to improve continuously our metrological capabilities!

MANAGEMENT REPORT 2021

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Bjarne Fjeldsted, Chairman of the Board and Michael Kjær, CEO.

DFM total revenue increased 9 % to 46,8 mio.DKK, while profit before tax increased to 1,5 mio. DKK. from 0,9 mio.DKK in 2020, due to increasing commercial revenue. Commercial revenue reached 11,1 mio.DKK versus 10,0 mio.DKK in 2020. Revenue from DFM participation in research projects also increased to 7,8 mio.DKK from 6,8 mio.DKK in 2020.

The management considers both revenue and profit as satisfactory.

In 2021, DFM focused on developing new advanced metrology services supporting industry, while also increasing activities for building new critical national infrastructure within time and frequency and quantum metrology. Investments within these areas was significantly increased. We are pleased and grateful to be cooperating closely with many strong NMI's and universities within the areas and look forward to further increasing our collaboration in the future.

Bjarne Fjeldsted
Chairman of the Board

Michael Kjær
CEO

INCOME STATEMENT AND BALANCE SHEET

INCOME STATEMENT (1000 DKK)

	2021	2020
Commercial revenue	11 067	10 049
Project revenue	7 818	6 834
Government funding	27 888	25 991
Total revenue	46 773	42 874
Travel and out-of-pocket expenses	17 889	11 800
Total out-of-pocket expenses	17 889	11 800
Gross profit	28 884	31 074
Staff costs	23 622	27 002
Total costs	23 622	27 002
Operating profit before depreciation and impairment losses	5 262	4 072
Depreciation and impairment losses on property, plant and equipment	3 457	3 038
Operating profit before financial income and expenses	1 805	1 034
Financial income	13	75
Financial expenses	269	183
Profit before tax	1 549	926
Tax on profit for the year	340	204
Profit for the year	1 209	722
Profit for the year to be carried forward		

BALANCE SHEET AT 31 DECEMBER (1000 DKK)

ASSETS	2021	2020
Deposits	1 016	1 014
Total investments	1 016	1 014
Equipment	8 599	7 907
Leasehold improvements	13 612	14 796
Total property, plant and equipment	22 211	22 703
Total non-current assets	23 227	23 717
Contract work in progress	9 277	8 229
Trade receivables	1 259	1 128
Prepayments	14	152
Other receivables	666	139
Total receivables	1 939	1 419
Cash at bank and in hand	30 356	29 802
Total current assets	41 572	39 450
Total assets	64 799	63 167
EQUITY AND LIABILITIES	2021	2020
Share capital	1 000	1 000
Retained earnings	20 027	18 818
Total equity	21 027	19 818
Prepayments from customers and of funding	30 012	27 821
Trade payables	1 767	788
Other payables	11 993	14 740
Total current liabilities	43 772	43 349
Total equity and liabilities	64 799	63 167

KEY FIGURES

KEY FIGURES IN MILLION DKK	2017	2018	2019	2020	2021
Net sales	35.0	37.1	42.8	42.9	46.8
Gross balance	41.1	42.1	42.3	63.2	64.8
Profit or loss for the financial year ¹⁾	0.5	0.7	0.9	0.7	1.2
Net capital	17.7	18.2	19.1	19.8	21.0
Commercial sale	4.0	7.1	10.2	10.0	11.1
- to small enterprises (less than 50 employees)	0.5	0.9	1.0	1.0	1.1
- to medium size enterprises (50-250 employees)	0.9	1.5	1.9	1.9	1.9
- to large enterprises (more than 250 employees)	0.9	2.0	2.5	1.9	2.3
- to Danish public institutions	0.2	0.3	0.3	0.3	0.3
- to foreign enterprises and institutions	1.5	2.4	4.3	4.9	5.5
Foreign net sales	3.3	4.3	7.7	4.8	5.1
RESEARCH AND DEVELOPMENT					
Number of collaborative projects	29	23	24	29	28
- thereof innovation consortia	2	1	0	0	0
- thereof international projects	27	20	20	27	25
R&D activities (million DKK)	30.6	29.6	32.8	35.0	34.7
- thereof self-funded	3.0	2.6	2.8	3.2	3.3
R&D work (man-year)	17.6	19.7	21.1	31.2	27.7
NUMBER OF CUSTOMERS					
Danish private enterprises	57	146	168	142	154
- thereof small enterprises (less than 50 employees)	30	67	59	55	56
- thereof medium size enterprises (50-250 employees)	7	32	51	37	45
- thereof large enterprises (more than 250 employees)	17	47	43	34	39
Danish public institutions	3	20	15	16	14
Foreign enterprises and institutions	33	44	52	43	41
Total customer base	90	210	220	185	195
NUMBER OF STAFF CATEGORIZED BY EDUCATION (MAN-YEAR)					
Dr & PhD	25	26	27	31	27
MSc	3	1	1	1	1
Other technical staff	2	2	3	3	3
Administrative staff	4	4	5	5	5
Average number of staff	34	33	36	39	36
NUMBER OF PUBLICATIONS					
Refereed publications	21	19	10	19	16
PhD and Master theses	0	0	1	0	0
Other reports	7	2	0	0	0
Conference papers	17	17	24	10	12
Calibration certificates and measurement reports	717	1 543	1 645	1 622	2 140
EDUCATION					
DFM courses (number of days)	3	4	2	0	0
DFM courses (number of participants)	21	28	21	0	0
Supervision/teaching at universities (number of students/courses)	6	3	4	4	5
Co-supervision of master thesis students (number of theses)	0	0	1	1	1
Contribution to teaching at universities (number of days)	6	3	4	4	5
Committee work (number of committees)	29	29	28	27	27
- thereof international committee work	25	25	24	23	23
EFFICIENCY					
Turnover per employee (1000 DKK)	1 129	1 126	1 147	1 102	1 308
Profit per employee (1000 DKK)	16	17	24	19	34
Commercial turnover per DKK of governmental funding	0.2	0.3	0.4	0.4	0.5
R&D turnover per DKK of governmental funding	1.4	1.4	1.3	1.4	1.5

1) Excluding extraordinary items

DANISH METROLOGY INSTITUTES

According to the CIPM Mutual Recognition Arrangement, a country can have one national metrology institute (NMI) and a number of designated institutes (DI). In Denmark, these metrology institutes are appointed by the Danish Safety Technology Authority (www.sik.dk). In the list below, each appointed metrology institute is identified by the acronym used in the BIPM database for Calibration and Measurement Capabilities. The fields covered by the appointments are indicated in the table on the next page.

DFM

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BKSV-DPLA

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jorsch@dtu.dk

THE 12 SUBJECT FIELDS OF METROLOGY

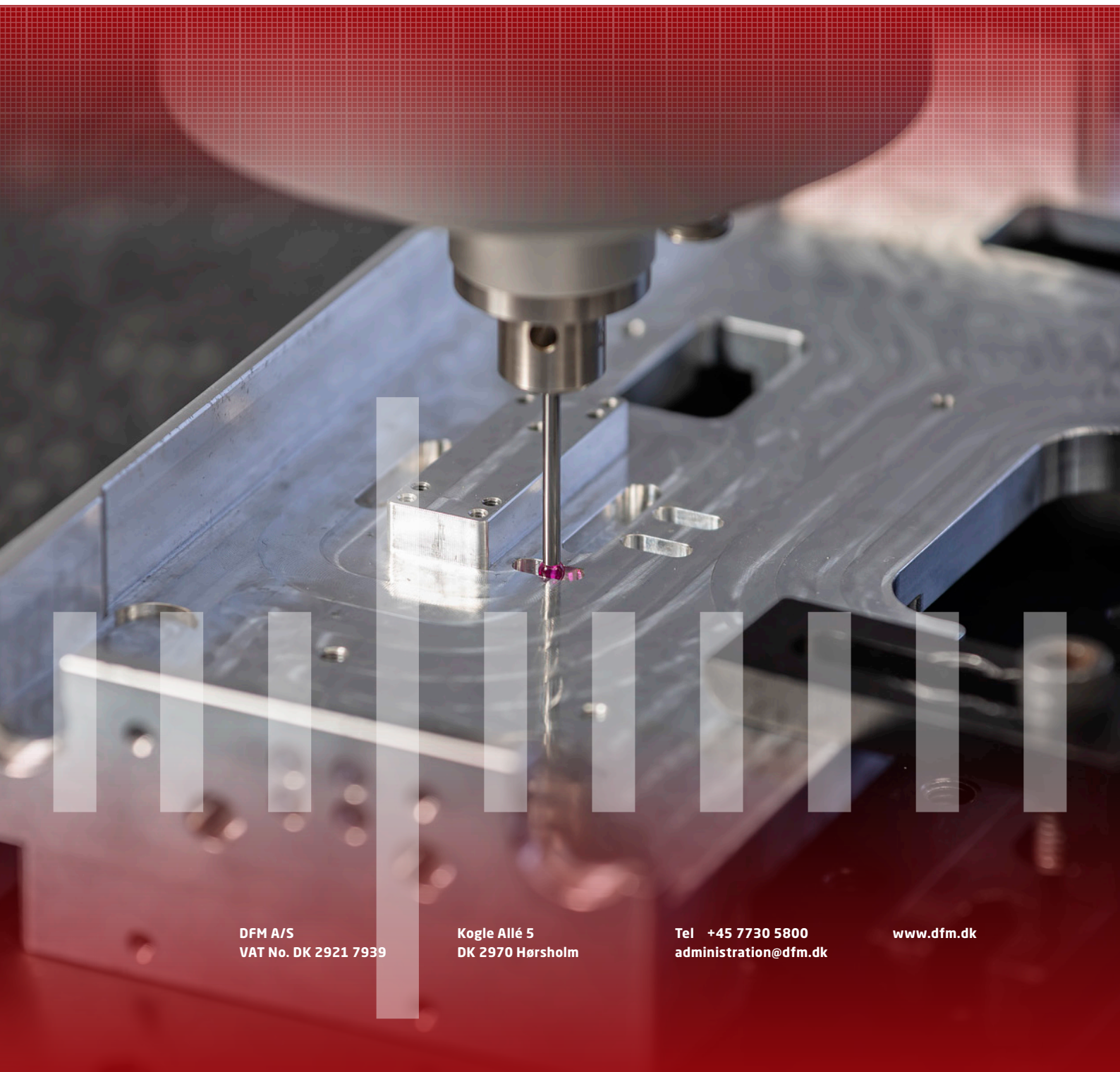
Fundamental metrology in Denmark follows the EURAMET division into 12 subject fields, while the subfields reflect a Danish subdivision of metrological activities.

SUBJECT FIELD	CONTACT PERSON	SUBFIELDS	METROLOGY INSTITUTE
MASS AND RELATED QUANTITIES	Lars Nielsen, DFM	Mass measurement	DFM
	ln@dfm.dk	Force and Pressure	FORCE
		Volume and Density	FORCE
ELECTRICITY AND MAGNETISM	Carsten Thirstrup, DFM	DC electricity	DFM
	cth@dfm.dk	AC electricity	TRESCAL
		HF electricity	TRESCAL
LENGTH	Jan Hald, DFM	Basic length measurements	DFM
	jha@dfm.dk	Dimensional metrology	DFM & DTI
		Micro/Nano	DFM
TIME AND FREQUENCY	Jan Hald, DFM	Time measurement	
	jha@dfm.dk	Frequency	
THERMOMETRY	Jan Nielsen, DTI	Temperature measurement by contact	DTI
	jnn@teknologisk.dk	Non-contact temperature measurement	DFM
		Humidity	FORCE
		Moisture in materials	DTI
IONISING RADIATION	Arne Miller, DTU	Absorbed radiation dose - Industrial products	DTU
	armi@dtu.dk	Absorbed radiation dose - Medical products	
		Radiation protection	
		Radioactivity	
PHOTOMETRY AND RADIOMETRY	Anders Brusch, DFM	Optical radiometry	DFM
	ab@dfm.dk	Photometry	
		Colorimetry	
		Optical fibres	
FLOW	Jesper Busk, FORCE	Gaseous flow (volume)	FORCE
	jrb@force.dk	Water flow (volume, mass and energy)	DTI
		Flow of liquids other than water	FORCE
		Anemometry	DTI
ACOUSTICS, ULTRASOUND AND VIBRATION	Salvador Barrera-Figueroa, DFM	Acoustical measurements in gases	DFM & BKSV-DPLA
	sbfd@dfm.dk	Acoustical measurements in solids	BKSV-DPLA
		Acoustical measurements in liquids	
METROLOGY IN CHEMISTRY	Lisa Carol DeLeebeeck	Electrochemistry	DFM
	ldl@dfm.dk	Laboratory medicine	
		Products and materials	
		Food chemistry	
		Pharmaceutical chemistry	
		Microbiology	
INTERDISCIPLINARY METROLOGY	David Balslev-Harder	Environmental chemistry	
	dbh@dfm.dk	No subdivisions	
QUALITY	Kai Dirscherl, DFM	No subdivisions	
	kdi@dfm.dk		



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