TC-Chair Annual Report 2014 TC-Mass

General Assembly

June 2014
Cavtat, Croatia

1. General Aspects

The EURAMET Mass and Related Quantities Technical Committee, TC-M, is characterized by the number of related quantities and by the diversity of techniques employed in the realization of the corresponding units. Nevertheless, nowadays there are two dominant issues, one is the redefinition of the kilogram, which has definitely determined the activities of some NMIs and is reflected in EURAMET projects, and the other one is the EMRP, where many institutes are collaborating very actively.

2. Projects

In the period under review (May 2013 – May 2014) in TC Mass the number of proposed, agreed and completed projects in the various categories are shown in the table below. The previous year's numbers are shown in brackets.

	Comparison	**Research**	**Traceability**	**Consultation**	**Total**
Proposed	12 (6)	2 (2)	0(1)	1(1)	15 (10)
Agreed	19 (19)	5 (6)	3 (2)	0 (0)	27 (27)
Completed	54 (50)	40 (39)	7 (7)	15 (15)	116 (111)
Total	**85 (75)**	**47 (47)**	**10 (10)**	**16 (16)**	**158 (148)**

The projects can be broken down by technical area as follows:

	Proposed	**Agreed**	**Completed**	**Total**
Density	4 (2)	2 (2)	9 (9)	**15 (13)**
Force	2 (1)	6 (6)	7 (7)	**15 (14)**
Hardness	0 (0)	0 (0)	1 (1)	**1 (1)**
Mass	3 (1)	8 (8)	46 (45)	**57 (54)**
Pressure	3 (3)	9 (9)	46 (44)	**58 (56)**
Torque	2 (0)	1 (1)	2 (2)	**5 (3)**
Viscosity	0 (0)	0 (0)	5 (5)	**5 (5)**
Gravimetry	1 (1)	0 (0)	1 (1)	**2 (2)**

Three completed projects dealing with general issues were placed under mass for simplicity.

3. Comparisons

There are 34 registered European key comparisons in the area of Mass and Related Quantities, of which 14 are active, 4 have provisional equivalence, 15 have been approved for equivalence and 1 has been published. Two were bilateral key comparisons between PTB (EURAMET) and CENAM (SIM). Details are provided in Table 1. The situation is the same as in the last two years.

Comparison ID	Project no.	Title/Range	Subfield	Pilot	Contact	Status	Years
EUROMET.M.M-K1	215	Kilogram	Mass	NPL	I. Severn	Approved for equivalence	1992-1999
EUROMET.M.M-K2	445	100 mg, to 10 kg	Mass	SP	M. Perkin	Approved for equivalence	2001-2003
EUROMET.M.M-K2.1	786	100 mg to 10 kg	Mass	SP	M. Perkin	Approved for equivalence	2004-2008
EURAMET.M.M-K2.2	1120	100 mg to 500 g	Mass	BEV	D. Steindl	Approved for equivalence	2009-2010
EURAMET.M.M-K2.3	1198	20 g, 500 g, 10 kg	Mass	EIM	C. Mitsas	Approved for equivalence	2011
EURAMET.M.M-K2.4	-	100 mg to 10 kg	Mass	DFM	L. Nielsen	Proposed	-
EURAMET.M.M-K2.5	1222	10 kg	Mass	BEV	Z. Zelenka	In progress	2012
EUROMET.M.M-K4	510	Kilogram	Mass	NPL	S. Davidson	Approved for equivalence	1999-2003
EUROMET.M.M-K4.1	1029	Kilogram	Mass	MIRS	M. Grum	Approved for equivalence	2007-2008
EURAMET.M.M-K4.2	1120	Kilogram	Mass	BEV	D. Steindl	Approved for equivalence	2009-2010
EUROMET.M.D-K1	339	Solid (3 Si spheres)	Density	METAS	P. Richard	Provisional equivalence	1998-1999
EURAMET.M.D-K1.1	1031	Solid (3 ceramic sph.)	Density	PTB	H. Bettin	In progress	2008-2010
EUROMET.M.D-K2	627	Liquid density	Density	PTB	H. Bettin	Report in progress, Draft B	2001-2002
EURAMET.M.D-K2	1019	Liquid density	Density	BEV	C. Buchner	In progress,Draft A	2007-
EUROMET.M.D-K4.Prev	236	Hydrometers	Density	IMGC	S. Lorefice	Provisional equivalence	1993-1994
EUROMET.M.D-K4	702	Hydrometers	Density	IMGC	S. Lorefice	Approved for equivalence	2003-2006
EUROMET.M.P-K1.a	442	0.1 Pa to 1000 Pa	Pressure	BNM-LNE	J.C. Legras	Approved for equivalence	1999-2002
EUROMET.M.P-K1.b	442	0.3 mPa to 9 Pa	Pressure	BNM-LNE	J.C. Legras	Approved for equivalence	2000-2002
EURAMET.M.P-K1.c	1179	0.7 MPa a 7 MPa	Pressure	FORCE	A. Altintas	In progress	2011-2013
EUROMET.M.P-K2	305	1 MPa to 4 MPa	Pressure	PTB	W. Sabuga	Approved for equivalence	1994-1995
EUROMET.M.P-K3.a	439	0.05 MPa to 1 MPa	Pressure	LNE/NPL	J.C. Legras	Approved for equivalence	1999-2001
EUROMET.M.P-K3.b	439	0.05 MPa to 1 MPa	Pressure	NPL	I. Severn	Approved for equivalence	1999-2001
EUROMET.M.P-K4	389	10 MPa to 100 MPa	Pressure	NPL	I. Severn	Approved for equivalence	1998-1999
EURAMET.M.P-K4 2010	1047	0.5 Pa to 15 kPa	Pressure	CMI	D. Prazak	Planned	2007
EUROMET.M.P-K5	045	50 MPa to 500 MPa	Pressure	BNM-LNE	J.C. Legras	Provisional equivalence	1993-1995
EUROMET.M.P-K6	110	100 MPa - 1000 MPa	Pressure	BNM-LNE	J.C. Legras	Provisional equivalence	1992-1994
EURAMET.M.P-K7	881	50 MPa to 500 MPa	Pressure	MIKES	M. Rantanen	Report in progress, Draft B	2005-2007
EURAMET.M.P-K8	1041	25 kPa to 200 kPa	Pressure	METAS	C. Wuethrich	In progress	2007-
EURAMET.M.P-K13	1091	50 MPa to 500 MPa	Pressure	UME	I. Kocas	In progress	2009-
EUROMET.M.F-K1	535	5 kN to 10 kN	Force	MIKES	A. Pusa	Report in progress, Draft B	2002-2004
EUROMET.M.F-K2	518	50 kN to 100 kN	Force	NPL	A. Knott	Report in progress, Draft B	2003-
EUROMET.M.F-K3	505	500 kN to 4 MN	Force	PTB	R. Kumme	In progress	2005-2007
EURAMET.M.G-K1	1186	Free fall acceleration	Gravimetry	METAS	H. Baumann	Approved for equivalence	2011
SIM-EUROMET.M.P-BK3		3 mPa to 0.9 Pa	Pressure	PTB/CENAM	K. Jousten	Approved for equivalence	2001-2002
SIM-EUROMET.M.P-BK4		10 MPa to 100 MPa	Pressure	PTB/CENAM	W. Sabuga	Approved and Published	2002

Table 1: Status of EURAMET Key Comparisons. In red, new entries. In bold, changes in status

There are also 35 supplementary comparisons (4 more than last year). Among these comparisons, 19 have been published and 16 are in progress.

Comparison ID	Project no.	Title/Range	Subfield	Pilot	Contact	Status	Years
EUROMET.M.V-S1	273	(0.989-4600) mm_2/s	Viscosity	PTB	H. Wolf	Published	1992-1993
EUROMET.M.V-S2	303	(0.4- 67743 mm_2/s	Viscosity	PTB	H. Wolf	Published	1993-1996
EUROMET.M.V-S3	415	(190- 774000 mm_2/s	Viscosity	PTB	H. Wolf	Published	1997-2000
EUROMET.M.V-S4	415	(0.33-144000) mm_2/s	Viscosity	PTB	H. Wolf	Published	1997
EUROMET.M.M-S1	461	500 kg	Mass	CMI	I. Kriz	Report in progress, Draft B	2001-2005
EURAMET.M.M-S2	1054	0.1 mg to 100 g	Mass	NPL	S.Davidson	Approved and Published	2008-
EURAMET.M.M-S3	-	100 mg to 50 kg	Mass	UME	U. Y. Akcadag	In progress	2011-2012
EURAMET.M.M-S4	1232	2mg to 50 kg	Mass	INRIM	W. Bich	Approved and Published	2012
EURAMET.M.M-S5	-	100 mg to 1 kg	Mass	NSAI	P. Turner	Planned	2012-2013
EURAMET.M.M-S6	-	20 kg	Mass	DMDM	B. Ramac	Approved and Published	2012
EURAMET.M.M-S7	-	500 kg	Mass	CMI	I. Kriz	In progress	
EURAMET.M.D-S1	1240	Liquid density	Density	BEV	C. Buchner	In progress	2012-2013
EUROMET.M.P-S1	788	0.05 MPa to 1 MPa	Pressure	METAS	C. Wuethrich	Approved and Published	2004-2006
EUROMET.M.P-S2	922	30 Pa to 7 kPa	Pressure	PTB	K. Jousten	Approved and Published	2006-2007
EUROMET.M.P-S3	884	80 kPa to 110 kPa	Pressure	LNE	P. Otal	Approved and Published	2006-2008
EUROMET.M.P-S4	861	40 kPa to 1.75 MPa	Pressure	UME	I. Kokas	Approved and Published	2005-2006
EURAMET.M.P-S5	931	50 MPa to 500 MPa	Pressure	PTB	W. Sabuga	Report in progress, Draft B	2007-2008
EURAMET.M.P-S6	-	1.5 kPa to 300 kPa	Pressure	PTB	W. Sabuga	Approved and Published	2007-2008
EURAMET.M.P-S7	1040	0.1 mPa to 1 Pa	Pressure	METAS	C. Wuethrich	In progress	2007-
EURAMET.M.P-S8	1131	-100 kPa to +100 kP	Pressure	MIKES	S. Saxholm	Approved and Published	2009-2010
EURAMET.M.P-S9	1170	-950 hPa to 0 hPa	Pressure	LNE	I. Morgado	In progress	2011
EURAMET.M.P-S10	-	0.005 Pa a 100 Pa	Pressure	CEM	N. Medina	Approved and Published	2010-2011
EURAMET.M.P-S11	-	0 MPa a 50 MPa	Pressure	UME	I. Kocas	Approved and Published	2011
EURAMET.M.P-S12	-	0,3 kPa to 15 kPa	Pressure	CMI	D. Prazak	**Report in progress Draft B**	2012
EURAMET.M.P-S13	1252	10 MPa to 100 MPa	Pressure	UME	Y. Durgut	In progress	2014-2015
EURAMET.M.P-S14	1306	50 MPa to 1GPa	Pressure	PTB	J. Koneman	In progress	2014
EURAMET.M.T-S1	1055	1 N.m to 1000 N.m	Torque	PTB	D. Roeske	Approved and Published	2008-2010
EURAMET.M.T-S2	1141	100 N m	Torque	PTB	D. Roeske	Rep. in progress, Draft A	2008-
EURAMET.M.T-S3	-	10 N.m to 1 kN.m	Torque	CEM	N. Medina	Approved and Published	2010
EURAMET.M.G-S1	1093	*g*	Gravimetry	METAS	H. Baumann	Approved and Published	2008-2009
EURAMET.M.F-S1	-	5 kN to 5 MN	Force	NPL	A. Knott	Approved and Published	2005-2006
EURAMET.M.F-S2	1262	5 N to 250 kN	Force	BEV	C. Buchner	In progress	2012-2013
EURAMET.M.F-S3	-	1 kN to10 kN	Force	NPL	A. Knott	Planned	2014
EURAMET.M.F-S4	1311	10 kN and 20 kN	Force	LNE	P. Averlant	Planned	2014

Table 2: Status of EURAMET Supplementary Comparisons. In red, new entries. In bold, changes in status

4. Participation EMRP

TC Mass members are actively involved in EMRP call 2010 (area Industry) taking part in the following projects:

Number	Short name	Full Name
IND03	HIGHpress	High Pressure Metrology for Industrial Applications
IND09	Dynamic	Traceable Dynamic Measurement of Mechanical Quantities
IND12	Vacuum	Vacuum metrology for production environments

These projects started in the last term of 2011 and are finishing this year.

TC Mass members are actively involved in EMRP call 2011 (area SI Broader Scope taking part in the following projects:

Number	Short name	Full Name
SIB03	KNOW	Realisation of the awaited definition of the kilogram - resolving the discrepancies
SIB05	NewKILO	Developing a practical means of disseminating the new kilogram

These new projects will provide very important results for the “new definition of the kilogram” and its practical realization. These projects started in the last term of 2012.

For EMRP call 2012 (area SI Broader Scope) the following JRP has been selected:

Number	Short name	Full Name
SIB63	Force	Force traceability within the meganewton range

It can be concluded that the participation at EMRP is rather successful because, although there are not many proposals, most proposals are always selected.

6. Meetings

The 2013 Mass and related quantities TC Contact Persons meeting was held in Brno, Czech Republic on 11th April and, as usual, will be preceded by technical meetings for the various subfields to review progress in projects in mass, force, pressure, density and viscosity. We had more than 80 attendees to the meetings.

There were also other meetings related to EMRP projects in progress (SIB05 and SIB63) and specific meetings for EURAMET projects (1205 “Review of EURAMET cg 18”).

During the meeting the Strategic Research Agenda for TC Mass was discussed and we also had very interesting external contributions. From BIPM (Michael Stock) we enjoyed a presentation of the work they have done related to the new definition of the kilogram. From EURAMET (Tanasko Tasic) we had an interesting presentation about EMPIR, especially focused on capacity building. From GULFMET (Chris Mitsas) a presentation about the metrology works in this organization was given.

7. Issues

7.1 EURAMET Calibration Guidance Documents

The EURAMET Calibration Guide 18 “Guidelines on the Calibration of Non-Automatic Weighing Instruments” is under revision. This work is under EURAMET project 1205.

Two special meetings about this project were held in 2013: in Dubrovnik, Croatia on 19th March and in Göttingen, Germany, on 26th - 27th November. Another meeting was held in Brno, Czech Republic on 7th - 8th April 2014.
In these meetings there were participants not only from NMIs but from the industry which manufactures non automatic weighing instruments. They all have been very successful and a draft revision of the guide has already been sent to all the TC Mass contact persons for comments and approval.

It is expected that the new version of the guide will be finally published in 2014.

The EURAMET Calibration Guide 17 “Guidelines on the Calibration of Electromechanical Manometers” is also under revision. It is also expected that the new version of the guide will be finally published in 2014.

8. Outlook for 2014/2015

Next year’s activity will be largely dominated by work on the kilogram redefinition, especially concerning its *mise en pratique*, and by EMRP-EMPIR-related work. We are especially enthusiastic about the results of projects IND03, IND09 and IND12, which will finish this year. On the other hand, works in other non classical fields such as liquid surface tension, negative pressure, microforces (bending stiffness), microweights and magnetic properties of weights are becoming relevant in the TC.

Nieves Medina, CEM,
TC-M Chair
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