

DEAR FRIENDS DEAR COLLEAGUES,

In this issue of June, it is great to be able to announce in-person events again. IMEKO is in preparation for the much anticipated General Council sessions. About this and the events organized by the Technical Committees, you can find an overview in this newsletter. From the industrial relations, meet Teledyne Hastings Instruments, USA, providing innovative measurement devices to monitor critical manufacturing processes, improve productivity, facilitate energy exploration, and protect the environment. As a continuation of the IMEKO introductions, meet the Secretary-General of IMEKO, Zoltan Zelenka. The Technical Committee 4, dedicated to the "Measurement of Electrical Quantities", allows a glance at its history of thirty-eight years of existence.



GENERAL COUNCIL SESSIONS 2022

The IMEKO 2022 General Council Sessions will take place on the 27th and 28th of August at PTB Physikalisch-Technische Bundesanstalt, Berlin, Germany. After these last two years of meeting restrictions, it is so good to meet again in person.

Naturally, online access is being arranged for those unable to make the trip.

IMEKO is growing. Since the last General Council Session, 2021 September, two new Institutes expressed their wish to join IMEKO; the Emirates Metrology Institute from the United Arab Emirates and the IMBIH-Institute of Metrology from Bosnia and Herzegovina. Sixty-one new applications were received to join the Technical Committees.

About the GC details :

The first day 27th is dedicated to the Technical Board meeting; the second, the 28th, starts with the summary of the first day, going over to voting on the IMEKO major issues. The agendas will be circulated soon. Please save the dates; we are looking forward to welcoming everyone!

RECENTLY: METROLOGY DAY, UN GOALS

Besides busy organizing conferences and other events, recently our Technical Committees contributed to two special issues. IMEKO celebrated Metrology Day 2022 with a special newsletter issue. This year's topic was Metrology in the Digital Era. In this newsletter, the IMEKO Technical Committees talk about how the digital era

influences their area of expertise.

Another significant topic is the UN Sustainable Development Goals. Again with the collaboration of the Technical Committees, IMEKO makes a statement of not only being conscious of the UN Goals but also with its activities complying with them.

MEET TELEDYNE HASTINGS INSTRUMENTS



Founded in 1944 as Hastings Instrument Company by Charles and Mary Hastings, Teledyne Hastings boasts a long history of success by providing excellent vacuum gauges, thermal mass flow meters, and thermal mass flow controllers. In the late 1940s, the company utilized thermocouple technology as the foundation for many of our early instruments, such as air velocity indicators, thermal mass flow meters, stack emission monitors and, of course, the thermopile vacuum sensor. By 1964, Hastings Instruments had grown into one of the leading vacuum, and thermal mass flow companies in America and in 1968, became part of Teledyne Incorporated. Today, the company operates within the Teledyne Instruments Group: a group of specialty instrumentation companies providing innovative measurement devices to monitor critical manufacturing processes, improve productivity, facilitate energy exploration, and protect the environment.



Located in Hampton Virginia, USA, Teledyne Hastings Instruments has earned ISO certification, along with CE Mark approval, confirming a long-standing commitment to internationally accepted standards of quality. We are compliant to ISO 17025, the international standard describing general requirements for the competence of testing and calibration laboratories.



Our vacuum gauges are used around the world in a wide variety of applications. From critical semiconductor processes to vacuum metallurgy and freeze drying, our vacuum products provide reliable metrology which in turn yields improved manufacturing control.



Our DV-6 Series of thermocouple gauge tubes (DV-6R shown here along with the handheld HPM-4/5/6) is trusted because of its ruggedness

and reliability in a wide variety of harsh environments. In fact, when NASA needed a reliable vacuum sensor to bring home lunar samples during the Apollo missions, Teledyne Hastings was selected for the mission.

In addition to our trusted line of vacuum instruments, Teledyne Hastings also designs and builds thermal mass flow products. Because of our experienced design team, thermal mass flow expertise, and global sales and service networks, we are able to provide both a broad selection of equipment and unrivalled customer support.

We supply reliable solutions for applications in laboratory and industrial environments, high and low flows, corrosive gases and very high temperatures.

The Digital 300 Series of thermal mass flow meters and controllers from Teledyne are designed to accurately measure mass flow without corrections or compensations for gas pressure and temperature. They are accurate to better than $\pm(0.5\%$ of reading + 0.2% of full scale) for full scale flow rates from 0-5 sccm to 0-10,000 slm. The Digital 300 Series uses a thermal-based mass flow sensor. This sensor is designed to provide exceptional linear response to changing flow rates. In addition, the electronics associated with each sensor are precisely tuned to give fast response times. The HFC-D-302A & B flow controllers feature a precision solenoid proportional control valve. Teledyne configures and tests each individual valve based on the users flow rate, gas, and pressure conditions.



The B Series, shown here, features an optional touch-screen display which allows the user to view and control the flow rate directly from

the flow controller. The main screen displays the flow rate, the flow setpoint (in the case of a flow controller), the units of measure, and the valve mode (Auto, Open, Closed). The user also has access to menus that allow quick configuration of the flow instrument for changing requirements. The display can also graphically display changes in flow over time.

The B Series also features a USB port which is standard on all meters and controllers. Both the A & B Series are compatible with Teledyne's data logging software and certified drivers for LabVIEW are available.

We also provide calibration services. We have teams located in Europe, Asia, and the USA dedicated to provide calibration of both our vacuum and flow products. In many cases, expedited service is available. To find the service center closest to you, visit our website or contact us directly.

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Written by Douglas Baker, Director of Sales & Business Development, Teledyne Hastings Instruments

"For over 25 years, I have enjoyed helping people with vacuum technology as well as mass flow measurement and control challenges.

As a past chair of the Vacuum Technology Division of the American Vacuum Society, I am very interested in new technology, especially when that technology is used to address the larger problems facing our world."

INTRODUCING THE SECRETARY-GENERAL OF IMEKO, ZOLTAN ZELENKA



How did you come to know about IMEKO?

I worked in the Hungarian National Metrology Institute and was already a member of the Hungarian Member Organization of IMEKO (MATE) for several years when I came in direct contact with IMEKO. The Hungarian IMEKO, alias HUNMEKO, was a division of the society I knew about and its ties to the international organization.

In 2000, Tamás Boromisza, the Hungarian delegate to the GC, was about to retire. I was asked to travel with him to Vienna, the scene of the World Conference, and observe how IMEKO and its General Council work. Upon his retirement, I took over, and during my first years, I attended the World Congresses and General Council Sessions.

When did you get involved in the TCs?

I worked as an expert and head of my institute's mechanical department. It was straightforward to join TC3, Measurement of Force, Mass, Torque (at that time without Gravity). For some years, though, I still had to wait because of the policy of one country-one expert back then. I actively participated in the work of the TC and lobbied for my membership. Finally, it was approved by the TC. Still, it was just after a World Congress, so I had to wait an additional year until the next Technical Board Session approved it. I could hardly wait for the time to join this TC.

In the pioneer years of working out the "modern" traceability, I made several presentations and educated experts.

Due to its importance, IMEKO transformed TC8 into a TC for Traceability which I joined immediately.

The next thing was that digitalization had become a vital topic everywhere. The Austrian Metrology Institute, BEV, asked me to participate in several EURAMET digitalization projects. I have not mentioned it yet, but BEV offered me an expert position in the area of mass measurements, which I happily accepted in 2008.

Back to digitalization, it was logical for IMEKO to respond to this challenge by establishing a TC (TC6 Digitalisation) in 2020. I was one of the founding members and became the TC's Scientific Secretary.

Besides being involved in the TCs, you have another vital role in IMEKO, don't you?

Yes, I am the Secretary-General.

I take my task, leading the Secretariat's work, very seriously, so it takes a fair bit of my free time. It is like a hobby, at least; I always like to think about it like that.

During the first years, I spent a lot of time studying everything and working out guidelines on the existing functions of IMEKO. This was all more theoretical. One of the most influential works was the creation of the Strategy Plan of IMEKO in 2013, based on extensive analysis. Nowadays, my work is extended with the much more active IMEKO, like the monthly Presidential Board meetings and many events.

I would like to say to our community that IMEKO has made pretty big steps since 2019. Thank you all for that! There were many reasons for this new IMEKO era. Our President, Professor Frank Härtig, suggested and initiated a social media presence more extensive than just our webpage.

The other factor was the COVID.

I dare to say that COVID did not stop the organization; on the contrary. We work in a larger area and more efficiently than before. It is a pleasure and inspiring to see so many colleagues joining in this effort for IMEKO. The third piece of success is the devotion of the Presidency of IMEKO.

They have monthly meetings and initiated several projects to improve the activity of IMEKO, like establishing four working groups to strengthen IMEKO technical work in various areas.

Are there any particular current activities and plans you envision for the future?

With the increased support of the Presidency, the Secretariat can also achieve more. The regular board meetings help and encourage the Secretariat. Recent developments and plans are based on the realization of the strategy. Some of you might recall that the IMEKO strategy was made in 2013. Strategic planning will continue to put into practice long-planned procedures.

We are continuing the digitalization of IMEKO's history. The important documents and available paper-based proceedings of the IMEKO office are now scanned. We are currently cataloguing them. The next project undertaken is the digitalization of the photos of old events. It is important to get this done. The Secretariat has moved from its physical place to the "clouds" -a virtual office. We cleaned up the IMEKO office (thousands of documents and notes) to make things run more efficiently.

We are looking at extending our services, such as sharing workspaces and documents to work on together and developing more of the Secretariats supporting page with additional features. These are just some of the things set into motion or soon under realization. We are hosting virtual meetings with Zoom, and

many new activities take place with the help of this tool.

I think it is vital to follow times and go with the changes required to stay up to date. In this area, there is plenty of room for development. I believe it's not enough to find how to do things but to keep looking for new solutions as well. To me, this means never stopping learning.

Turning back to the strategy, IMEKO should start working on its new strategy for the next decade. The Secretariat will support by any means the heterogeneous group of people who will do this work. As our Constitution states, this is part of the Advisory Board's activities; still, the more diverse and more extensive the group, the best could be the output.

May I ask what work you do in your daily life?

I worked for 17 years in length metrology and mass laboratory at the OMH, the Hungarian Metrology Institute. I led there the department of applied mechanical quantities. In 2008, as mentioned before, a colleague invited me to work at BEV in Vienna, Austria, where I still am a mass metrology expert. There is a lot to do, especially since, besides my daily tasks, much international project work has been developed during the last three years. I got involved in digitalization, and recently I am also the EURAMET Technical Committee Chair for Mass and Related Quantities. My work is very versatile, and I do enjoy informatics, such as programming, another hobby of mine to aid my daily work.

Quite serious hobbies there, I would think.

Well, first of all, I love challenges and problem-solving and learning; that's basically the essence of it. Less related to professional life are the hobbies of playing tennis, cycling and hiking whenever I have free time.

TECHNICAL COMMITTEE EVENTS 2022



TC1-"Education and Training in Measurement and Instrumentation", TC7-"Measurement Science", T13-"Measurements in Biology and Medicine" and TC18- "Measurement of Human Functions" organizes with MATHMET: Cutting Edge Measurement Science for the Future: the 31 August-01 September, Porto Portugal 2022
<https://www2.isep.ipp.pt/imekotc7-mathmet-2022/>



TC4 Measurement of Electrical Quantities; International Workshop on ADC and Dac Modeling and Testing, Brescia, Italy: 12-14 September 2022

<https://www.imeko-tc4-2022.org/>



TC6 Digitalization; M4Dconf2022: First International Conference on Metrology and Digital Transformation Berlin Germany: 19-21 September 2022
<https://www.m4dconf2022.ptb.de/home>



TC10- "Measurement for Diagnostics, Optimization & Control":

Conference on Measurement for Diagnostics, Optimization and Control to Support

Sustainability and Resilience: 26-27 September Warsaw, Poland 2022.
www.imekotc10-2022.ire.pw.edu.pl



TC17- "Measurement in Robotics": ISMCR 26-30 September 2022
<http://ismcr.org/2022-ismcr/>



TC3-Measurement of Force, Mass and Torque" TC5 "Measurement of Hardness", TC16-"Pressure and Vacuum Measurement", and TC22- "Vibration Measurement" International Joint Conference 11-13 October 2022 in Dubrovnik, Croatia

<https://www.imeko.org/index.php/tc3-homepage/tc3-events/tc3-2022>



TC11-"Measurement in Testing, Inspection and Certification" and TC24-"Chemical Measurements" organizes: Measurement for a Better Life" and " Chemical Measurements Towards a Sustainable Future
16-20 October, Dubrovnik Croatia

www.imekotc11-2022.com

www.imekotc24-2022.com



TC9 WGFF FLOMEKO Meeting Chongqing, China:17th-18th October 2022,
Flomeko Meeting:19-21 October Chongqing, China 2022.

<http://flomeko2022.msmk.tech/c/index.html>

SAVE THE DATE

IMEKO International Measurement Confederation

1 day workshop: "Traceability the backbone of metrology"

8 November 2022 12:00 - 15:00 (CET, UTC +1)

- organized by IMEKO TC 8 "Traceability in Metrology"
- free of charge but full of new ideas and challenges
- chance for ACTA IMEKO publication
- registration starts on 1 July 2022

Presentations and discussions in the fields of:

- classic traceability and its application today
- traceability in digitalization
- special topics
- interdisciplinary traceability
- followed by an open discussion

IMEKO TC 8 Traceability in Metrology

TC 8 - Traceability in Metrology

TC 5 - Traceability by Metrology

TC 4 - Measurement of Electrical Quantities

traceability – the backbone of metrology!

TC8 Traceability in Metrology; "Traceability is the Backbone of Metrology". Traceability in Metrology workshop on the 8th of November 2022.

(Registrations will start on the 1st of July 2022.)

THE HISTORY OF TC4, MEASUREMENT OF ELECTRICAL QUANTITIES,

In the last years, measurements of electrical quantities have had a noticeable trend, especially toward a wider range of frequencies. Understanding this trend may be helpful to know the history of a Technical Committee on "Measurement of Electrical Quantities", the IMEKO TC4, which is also a significant part of my life. I hope the reader will learn not only of the sequence of dates but also of the humanity and commitment of the founding members, of the joys and difficulties that arise within a Technical Committee, and finally of the friendship among people from the entire world. This is the TC4's life from 1979 to 2002, on the Symposiums, Workshops and the Round Tables organized in that period. The most important events are mentioned with special reference to the historical context relevant to the measurement of electrical quantities.

That period was crucial for the TC4 activities in the following years.

1. Introduction

The main interest of TC4 is emphasizing theoretical and practical aspects of research in electrical and electronic measurements. Officially established in 1984, the activities of TC4 allowed many researchers to become familiar with the development and use of electrical and electronic instruments for measuring, monitoring and recording electrical signals. TC4 contributed to the considerable progress achieved in the fields of both electronic technology and digital signal processing. Nowadays, considering an instrument as a device for the measurement of a single quantity is inadequate because there are very complex automated measurement systems realized

by interfacing cheap digital instruments, analogue-to-digital conversion boards, and personal computers.

There is a great deal of merit in what TC4 has achieved by bringing together the experts from eastern and western countries to discuss a wide array of fine papers essentially directed at improving the efficiency of sensors and measuring instruments. In my official capacity as the Honorary Chairman of TC4, I am sure that this history will allow readers to reconnect the past to the present, thus creating the necessary continuity that helps to build the future. Nowadays, the world is changing faster than ever, and sometimes we forget our origin, as well as our history. We live day by day without knowing what the context of anything is. The exponential growth of information and communication nets induces most people to read much more news, several times unimportant stuff, rather than history. I think history could help people reinforce the experience of their individual, social and cultural identity. Considering the origin of the TC4 community, it is a journey into the past contributing to informal learning in measurement science. I hope in particular; this history would help young people concerned with electrical measurements achieve their cultural identity because they usually go through the exploration of different identities before they commit to one of them. The earlier they commit, the sooner they will be happier and healthier than those who do not.

It seems rather natural to try to expand the historical dimensions of TC4, starting by concentrating on one of the most important periods, which is the beginning before its foundation. In Section 2, with that in mind, I focus on the years of founding from 1979 to 1984 so that all of us will know the TC4 founders and the framework of their commitment. In the second part, I present TC4 events not only as a list or as a clean straight path to the obvious, but through the

scientific research seen as an inviting road toward the future, that is, where measurement researchers want to go and may go on.

2. The beginning

In May 1979, Giuseppe Zingales, (in the picture) the Italian delegate to IMEKO General Council, organized a journey for all Italian participants attending the 8th World Congress on "Measurement for Progress in Science and Technology", held in Moscow, USSR back then. Unfortunately, the flight from Rome to Frankfurt airport was delayed, and we missed the connection to Moscow.

The following flight to Moscow left the day after; therefore, we had much time to discuss the Congress. Many of us were experts in the field of electrical and electronic measurements, and we asked Zingales why there was no TC relevant to electrical measurements in the list of IMEKO TCs. He answered that two committees, TC2 on "Photon Detectors" (now "Photonics") and TC4 on "Microwave Measurements", existed in the field of electronic measurements. The scope of TC2 was essentially the conversion of optical images in electrical signals for applications in photometry, radiometry, optoelectronics, optical communications and astronomy. At that time TC2 had organized regular Symposia with a good number of participants. The same thing did not happen for TC4 it was unfortunately inactive.

Zingales had to admit the absence of a committee relevant to electrical measurements in spite of the presence of many experts in that field at IMEKO Symposia and Congresses. The main reason was that the General Council wanted to avoid competition with the IEEE, Institute of Electrical and Electronics Engineers, an association that was and still is the largest technical professional society in the world and that counts an Instrumentation and Measurement among its Societies.

The main reason was that the General Council wanted to avoid competition with the IEEE, Institute of Electrical and Electronics Engineers, an association that was and still is the largest technical professional society in the world and that counts an Instrumentation and Measurement among its Societies. Because many of us were involved in some activities of IEEE, we thought there was no need for competition between these two institutions, whereas cooperation was possible. After this discussion Zingales promised he would verify the possibility of creating a committee on electrical measurements within IMEKO. During that Congress I met for the first time Italo Gorini, who was to become one of my best friends and to whom I will always be grateful.

He was a professor of "Politecnico di Torino" and the presentation at the Congress of his paper on sensors and transducers was very much appreciated, not only by me. In those years were the beginning of a remarkable technological advance in sensors with an increasing improvement in their reliability, accuracy, performance, and safety for many applications. Italo underlined the importance of the calibration of the sensors inserted in measurement instruments. He was a very generous man as well as an excellent scientist. I remember when at the Moscow airport, while we were coming back to Italy, he friendly assisted Athos Bray, who felt a little ill due to the stressful travel. Athos was another Italian colleague who had presented at the Congress an interesting survey lecture.

In May 1982 during the 9th IMEKO World Congress, held in West Berlin, Germany, the basic idea of creating a Technical Committee on Electrical Measurements was shared by a group of colleagues, Adam Fiok, Wladimir Kneller, Giuseppe Zingales and in particular Jean Weiler, at that time Treasurer of the Confederation.



In the picture at the Conference gala dinner from left to right, Tilo Pfeifer, who just passed on his presidency to Wladimir Kneller, György Striker, the Secretary-General of and Jean Weiler the treasurer of IMEKO.

I think Jean Weiler could be considered the "Father" of TC4; his memory is dear to me. The aim of this group was that IMEKO, the most important Confederation of Measurement in the world, had to consider the creation of a committee on electrical measurements, a topic of great significance and absent from the list of TCs.

As I wrote above, the TC4 concerning microwave measurements had operated until 1984 when it was dissolved as the result of inactivity. There were several reasons for this inactivity. We have to consider that in the era of the Cold War, after the Second World War, both America and the Soviet Union used all kinds of propaganda in order to ensure that their populations would consider "the others" as enemies and support their government. At the same time, the advances in microwave techniques were treated as top secret.

The proposal of changing the name of TC4 from "Microwave Measurements" to "Electrical Measurements" was officially presented by Adam Fiok on behalf of the Polish Member Organisation in May 1983 during the 26th session of IMEKO General

Council Sessions in Prague, Czech Republic. It was then also planned to celebrate IMEKO's 25th anniversary by a two-day festive session in Budapest, the birthplace of Confederation. The General Council created an ad hoc commission composed of the same members who had shared the idea in Berlin, with the task of preparing a detailed proposal dealing with the new TC. Zingales kept the promise made during the Congress in Moscow and in May 1984, he organized a TC7 Symposium "Measurement and Estimation" in Bressanone, the university town for summer courses of the "Università di Padova", with in mind to gather all the members of the commission together to hold a decisive meeting and write the scope of the new committee. Unfortunately Kneller was absent and Zingales proposed to ask Italo Gorini to join the group, what was done. Italo willingly accepted the invitation to become a member of the group. The commission had a long meeting during the Symposium. At the end of this meeting, the text containing the TC4 topics was approved, and only minor changes were made by the General Council in the version published in the IMEKO Address Book. Therefore, we can consider Adam Fiok, Italo Gorini, Wladimir Kneller, Jean Weiler and Giuseppe Zingales the founding members of TC4.



Adam Fiok

Italo Gorini

Wladimir Kneller



Jean Weiler

Giuseppe Zingales

In 1984 the IMEKO General Council, in the resolution concerning the foundation of the new TC4 and its scope, also approved its membership.

Jean Weiler (Switzerland) the first Chairman
Adam Fiok (Poland) the Scientific Secretary
I. Adarski (Bulgaria)
A. Braun (Federal Republic of Germany),
J. Chaloupka (Czecho-Slovak Socialist Republic),
L. Erard (France),
U. Fruhauf (DDR, Democratic Republic of Germany),
I. Gorini (Italy)
W. Kneller (Union of Soviet Socialist Republics)
H.G. Meyer (Federal Republic of Germany)
A. Ohte (Japan)
J. Schoukens (Belgium)
A. Sowinski (Poland),
W. Wehrmann (Austria)
G. Zingales (Italy)
I. Zoltan (Hungary)

The most important changes made by the General Council to the original text concerned the title from "Electrical Measurements" replaced by "Measurement of Electrical Quantities" and the introduction into the text of the phrase "excluding the microwave field" The aim of the General Council was clearly to limit the frequency range of the new TC 4. This limitation was the result of both the bad experience with the old TC4 and the aim to avoid interference with TC2 on photon-detectors. Whereas Weiler was a supporter of this limitation, Fiok strongly criticized it immediately after the publication of the IMEKO address book. He first expressed his strong dissent in 1985 at the 10th World Congress in Prague during the first TC4 round table and subsequently made further harsh criticisms. I had to act as a mediator between Jean and Adam in the following years. Among my memories of the Symposium in Bressanone I would like to recall the interesting, invited lecture by Mariano Cunietti .He was behind the Italian "Measurement Day", an annual meeting previously held in Como and now in Rome, where engineers, metrologists, philosophers, statisticians and natural scientists come together to discuss logical fundamentals of measurement science.

By a lucky coincidence, Jean Weiler, Johan Schoukens and I happened to be together in the same small but beautiful hotel, while the majority of participants were at the Hotel Elephant in Bressanone. In the evenings after the Symposium and in the mornings during breakfast we had the opportunity to talk about our research. Schoukens and I realized we had the same interest in the field of spectral analysis. We discussed our papers and exchanged ideas, for example I suggested him the use of special windows that might simplify his mathematical process. Weiler appreciated our research and publicly expressed this appreciation after my presentation. From that moment on my academic career took off. Jean was very famous and considered one of the greatest experts in the field of electrical measurements: he was a visionary man, and for this reason I followed him and I shared all his ideas.

3. The first Symposia

The venue for the 1st Symposium on "Noise in Electrical Measurement" was Villa Olmo in Como, a beautiful town on the lake with the same name in North Italy. Giuseppe Zingales asked Arnaldo Brandolini from the "Politecnico di Milano" to organize the conference in the same place as the Italian "Day of Measurement". The date, 19-21 June 1986, also coincided with the period in which the day was usually held. The Symposium was a success. Several topics concerned the noise not only from the point of view of characterization, measurement, and reduction techniques in analogue and digital signal processing but also considering the noise as a signal for diagnostics by noise. Also, electromagnetic compatibility in measurements was inserted between the

topics. During the presentation of my paper many participants intervened in what was not simply a discussion, but rather a dispute. One colleague was especially vehemently insisting I check my results. At another Symposium, he approached me and apologized for this. I answered him: "There is no need to apologize. If no one questioned my papers I would worry that they were of no interest, while heated discussion forces me to think about how I can improve my work". During the TC meeting in Como, Jean Weiler announced his intention to leave the Chairmanship after three years, although the IMEKO "Constitution and bylaws" allow the Chairman to be reappointed.

The 2nd Symposium was held in Warsaw, Poland, May 26-28, 1987, on the topic of "Industrial Measurement of Electrical and Electronic Component and Equipment". Adam Fiok, the TC4 Scientific Secretary, was the organizer. The topics of the Symposium were the measurement of materials and components, networks and equipment; electrical machines; power and signal parameters. As is clear from the Symposium topics, TC4 was oriented toward low-frequency measurements, although Adam Fiok presented a paper on microwave measurements. It is noteworthy that for the first time, a paper on analogue to digital converters (ADC) was presented by Linus Michaeli. From that time, there was a rapid growth in the use of ADC in microcomputer-based measurement instruments and an increasing interest in it within TC4.

This article was written by Mario Savino, Honorary Chairman of TC4 active member since 1984. The second part of this story will continue in the next newsletter.