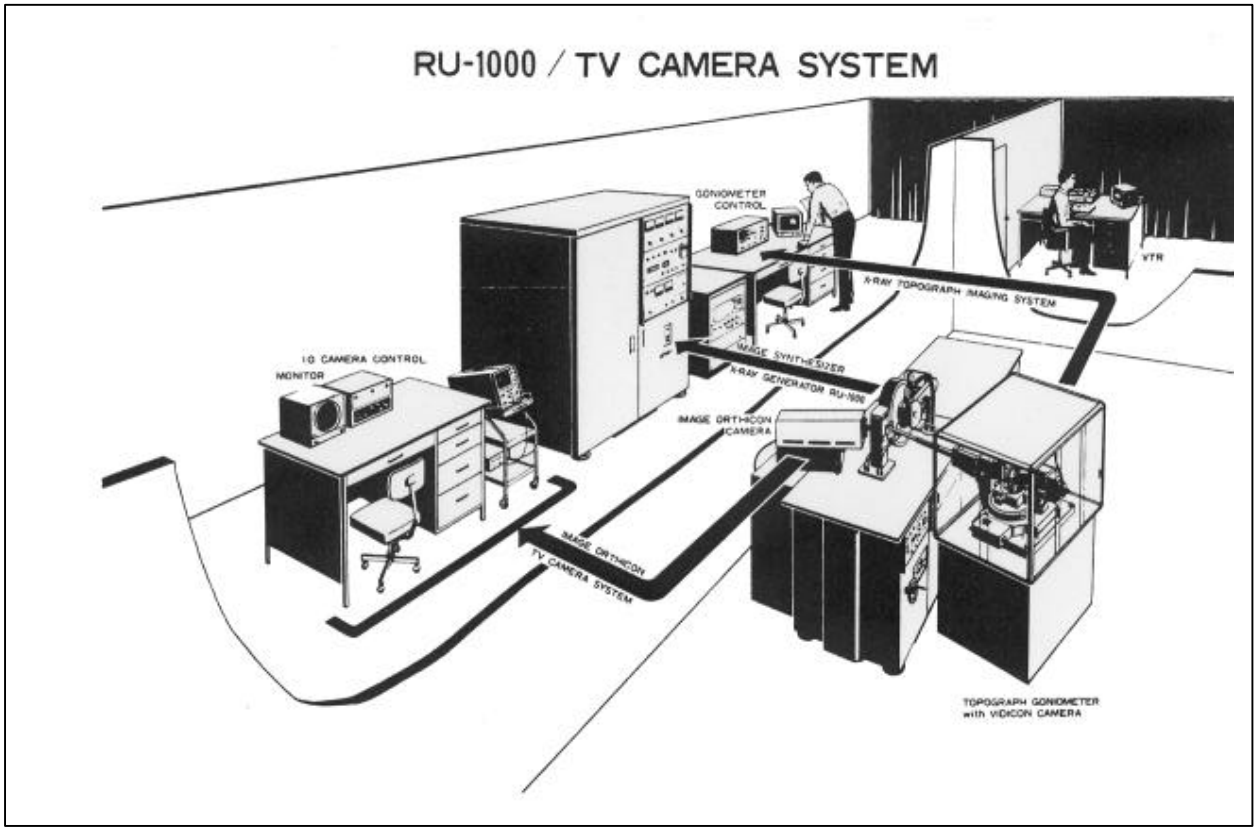
Product Information

ROTATING ANODE HIGH-POWER X-RAY GENERATOR RU-500~1500

1. Introduction

Ever since the first unit of RU-500 was installed at Technical Research Laboratories, NHK in 1968, Rigaku has produced as many as 30 units of RU-500 to 1500 for a variety of research work by its users. Thanks to valuable advices and suggestions given them during the course, this sophisticated equipment has become a more stable, easier-to-use safe X-ray source incorporating plentiful know-how and state-of-the-art technologies. It won the 20th Okochi Memorial Prize for Technique here in Japan. The X-ray output available from this line ranges from 60kV-500 mA (30 kW) to 60kV-1500 mA (90kW), the highest level in the world. This powerful X-ray source offers an optimum tool, for instance, for measurement of extremely weak diffracted rays and scattered rays as well as measurement of samples that will rapidly change with the lapse of time. The application to quality control of single crystals is now one of the most expected fields, as it may be done through a real-time observation system with X-ray diffraction images on the TV screen.

2. Outline of the System



3. State of Operation

Introduced here are some of the users' reports on operation of RU-1000 and RU-1500 owned by them. We at Rigaku wish to express our hearty thanks to those users who have given us a ready consent to our request for citing their reports in this journal.

3-1 The state of RU-1500 at Nagoya University

Introduced below is an excerpt of Prof. Harada's report on the running state of RU-1500 in-

stalled at Nagoya University in 1977. The report appeared in the Bulletin of the Japan Institute of Metals.

A most easygoing idea to obtain powerful X-rays (if a considerable difficulty in implementation is set aside) is to make out a larger-scale rotating anode. As far as I know at this moment, the X-ray generator that yields the highest output is a 100 kW unit developed by a certain research institute at Ulich, West Germany. I do not know if the unit is still being operated. Excepting that unit, the highest-output unit currently available is a 90 kW ultrahigh-power X-ray generator that was installed at Nagoya University in February 1978. It is still at work at the operation rate of approximately 90 percent. It was developed jointly by Rigaku Corporation and our group at Nagoya University, and it goes by the name of 'HIX-RU-1500' among us. The diameter of this rotating anode is 250 mm, the rotational frequency is 10,000 rpm, and the quantity of water required for cooling is 80 liter/minute. Moreover, the beam size is 1 x 10 mm^2 and the virtual beam size is 1 x 1 mm^2. Regarding a comparison between this unit and a 12 kW output generator (60 kV, 200 mA) which has become popular recently, readers may refer to my comments made with Ohshima. As improved points of this ultrahigh-power unit since that time, we may cite easier handling and extended durability at one-time operation, recorded as approximately 1600 h with the Ag target. There remain some points to be improved, however, including a demerit of causing a noise of 80 phons or so.

Jimpei Harada
Professor of Applied Physics, Faculty of Engineering, Nagoya University
Bulletin of the Japan Institute of Metals, Vol. 24, No. 11 (1985), pp.873 ~ 874

3-2 The state of RU-1000 at Tokyo University

The following is an excerpt of a report on the running state of RU-1000 installed at Tokyo University in 1978. It may be learned that the operation rate of this RU-1000 serving as an ultrahigh-power X-ray source is about 90 percent. The report describes the actual operating state of RU-1000 aged three years after installation. Its operation rate is roughly the same as that of RU-1500 at Nagoya University.

Status of Operation of High-output X-ray Generator (Apr. 1, 1981 ~ Mar. 31, 1983)

	Cu target (H)	Mo target (H)	Total time (H)	Remarks
Standard focus	966	1,987	2,953	
Fine-focus	39	87	126	
Aging	158	184	342	For target replacement and servicing
Total time	1,163	2,258	3,421	

Katsuo Ono
High Intensity X-ray Facilities, Engineering Research Institute, Faculty of Engineering, Tokyo University
High Intensity X-ray Facilities, Report, No.2 (1981-1982), p. 32

3-3 The state of RU-l000 at Hokkaido University

Excerpt of a report on the running state of RU-1000 installed at Hokkaido University in 1981.

There was only one occasion of faulty vacuum due to mixing of cooling water with vacuum oil. But operation was restored to normal by just replacing the water seal and vacuum oil, respectively. It appears that this trouble was caused by either a bruise made on the water seal during assembling or the use of an originally bruised seal. Except for that case, no failure has taken place at all since then. Even the Mo target, which was initially somewhat unstable, is now running at full power (60kV-1A), to say nothing of the Cu target.
Kazusuke Kobayashi

Life of Oil Seal

No.	Target	Operating Time (H)
1	Cu	1847
2	Cu	1100.9
3	Mo	1210.0
4	Cu	1480.0
5	Cu	643.9
6	Mo	583.5
7	Cu	276.8*
8	Cu	602.3
	Average	968.1

* Warranty period: (500h)

Applied Physics, Faculty of Engineering, Hokkaido University
Annual Report of the High Brilliance X-ray Laboratory, No.2, July, 1985, p, 2

3-4 The state of RU-1000 at Kyoto University

RU-1000 installed at Kyoto University in 1984 was brought under control from 1986 as a facility to be commonly used by the university as a whole.

The following is an excerpt of a report distributed on the occasion of the inauguration ceremony.

X-ray diffraction techniques are now widespread as an indispensable tool of experiments for physical properties research, and as such, a number of X-ray generators are at work at Kyoto University as well. Meanwhile, with the progress in research, there had been a strong demand for more powerful X-ray sources. To meet the requirement a photon factory (PF) was set up at National Laboratory for High Energy Physics (in Tsukuba) after taking 10 long years to open the way for experiments by communal use in 1982. Unfortunately, however, because of a remote location of the facility and a limited machine time, it has not offered opportunities to make the most of it for researchers at our university.

During that period, on the other hand, an ultrahigh-power X-ray unit of a 1A beam current was developed by Rigaku Corporation. The first unit was installed at Nagoya University, followed by installations at Tokyo University and Hokkaido University. By and by its value as a handy powerful X-ray source which comes between the conventional unit and the huge system like PF was recognized. Then there was a move at Kyoto University, too, to install one as a facility for common use by the university as a whole. After a certain preparatory time, a two-year plan of installation was approved to a fund request for 1983. As a result, the X-ray source basic unit was delivered in fiscal 1983 with the subsequent delivery of a Miller system small angle scattering goniometer (including a two-dimensional PSPC) and an EXAFS system in fiscal 1984. We arranged things in the above way by deciding that both the basic unit and accessory units are high-performance equipment which one laboratory alone cannot afford to install for its own use, and that they were systems taking full advantage of the characteristics of the ultrahigh-power X-ray source, suitable enough as the object for all-campus use.

Yoji Nakamura

Professor of Metal Science and Technology,
Faculty of Engineering, Kyoto University
Steering Committee Chairman
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