King George's Medical University Uttar Pradesh
Lucknow - 226003
Finance & Account Office
Phone: 91-0522-2257540 Fax: 91-0522-2257539 Website: www.kgmu.org

No. 2159/PS/2026 Date: 03/11/2026

NOTICE

SUBJECT: PROCUREMENT OF FOLLOWING ITEM ON A PROPRIETARY/SINGLE SOURCE BASIS.

KGMU, Lucknow, intends to procure following item(s), manufactured as per details mentioned below, on a Proprietary/Single Source basis from their authorized importers/distributors/dealers, as per enclosed details:-

S.No	Equipment/Item Name	Deptt.	Name of OEM/Manufacturer
1	Accessories for Existing Surgical work stations, Electrosurgical units.	Equipment Maintenance and Upgradation Miscellaneous Accessories (Common Equipment)	M/s Erbe Elektromedizin GmbH
2	ICG video angiography system for existing Zeiss S-800 microscope	Neurosurgery	Carl Zeiss Meditec AG
3	Arthroscopy Trolley System	Orthopedic Surgery	Arthrex GmbH ("Arthrex")
4	Cryo System Work Station (1.1) Probe compatable with extra cylinder	Respiratory Medicine	M/s Erbe Elektromedizin GmbH
5	Integrated energy and vision systems	Common Equipment	M/s Erbe Elektromedizin GmbH
6	Surgical Workstations	Common Equipment	M/s Erbe Elektromedizin GmbH
7	Ligasure machines (buyback)	General Surgery	M/s Medtronics India Pvt. Ltd.

Proprietary Certificate and proposal/offer for above item, as submitted by manufacturer (OEM) or their authorized importer/distributor/dealer, are attached. These documents are being uploaded for open information to all manufacturers/suppliers to invite any objections, representations or comments on proprietary/single-source nature of procurement within 07 days of the date mentioned above.

Objections/Comments should be submitted to: Finance Officer, KGMU, Lucknow / Concerned Head of Department, KGMU, Lucknow

Failure to submit any objection within stipulated time will be construed as acceptance that no other supplier has objections or equivalent items to offer. The case will then proceed for procurement based on its merits.

Objections/representations should specifically address the following:

1. Whether mentioned equipment/item is manufactured by any other manufacturer besides OEM or its authorized sellers/distributors/dealers.
2. Whether equipment/item fulfills all parameters according to enclosed technical specifications.

Note: In case no objection is received within 07 days, procurement of said item will be carried out through bid on GEM portal.

Finance Officer,
KGMU UP, Lucknow

Accessories for Existing Surgical work stations, Electrosurgical units

101

King George's Medical University UP, Lucknow

Common Equipment Cell

Email: ce@kgmcindia.edu

Reference No. CE/2026/955 Date: 22/10/2026

PROPRIETARY/ SPECIFIC BRAND GOODS CERTIFICATE

1	Item/ Type/ Model No. required along with specification	Accessories for Existing Surgical Workstation / Energy Source
2	If the item a spare part attachment or accessory for an existing equipment **Yes / No (If yes, provide details)**	Yes, Details attached
3	Name of the manufacturers/supplier of the item proposed by the indenter	**M/S Erbe Elektromedizin GmbH**, Waldhorenlestrasse 17, D-72072, Tubingen, Germany **(OEM)** **M/S Pee Vee Enterprises** Lucknow – **Authorized Supplier**
4	Are they sole manufacturers/ sold distributors of the Item **Yes / No**	Yes, Sole Manufacturers & required accessories / instruments are Proprietary in Nature
5	If there any other item with similar/equivalent specification available in the market to meet the job requirement envisaged. Yes / No (If Yes, explain why those alternatives cannot be procured and provide a comparative analysis of the functional advantages/cost-effectiveness of the recommended item)	No
6	Efforts made to locate alternative sources of supply or use of substitutes	No alternative source available for availability of compatible accessories with existing Surgical Workstation & Energy Sources
7	Why open tender can't be resorted to, for locating alternative source.	Proprietary In Nature
8	Are the proprietary items certified to have reasonable rates? **Yes / No (Attach supporting documents, if applicable)**	Yes – Reasonable Rates Certificate in form of PO Copy
9	Any other justification for procuring the item from a single source	Existing Surgical Workstation consists of Vessel Fusion Source + Kinetic Energy Source + Hydrojet Source are covered under 9-10th year CMC

I hereby certify that the above item is required to be procured on a proprietary/single-source basis, as the specified brand is the only known source that meets our functional requirements. Given the unique advantages of this brand, an open tender process would not serve any meaningful purpose in this case and can justifiably be waived.

(Strike out whoever is not applicable)

30/9/26

Head of Department

King George's Medical University UP, Lucknow
Common Equipment Cell

Email: ce@kgmcindia.edu

Reference No. CE/2026/955 Date: 22/10/2026

Proprietary Article Certificate in the following form is to be provided by the Ministry/Department before procuring the goods from a single source under the provision of sub Rule 166 (i) and 1 66 (iii) as applicable.

(I) **The indented goods are manufactured by** M/s Erbe Elektromedizin GmbH, Waldhorenlestrasse 17, D-72072, Tubingen, Germany

Authorized Distributor: M/S Pee Vee Enterprises, 2137/M(8), Canal Road, Indralok Colony, Krishna Nagar, Lucknow

(II) **No other make or model is acceptable for the following reasons:**

King George Mediçal University has installation base of 15 Surgical Work Station, 01 EV Station, 02 Cryo Workstation & 296 Energy sources total = 364 units are functional at several departments & 90% are covered under CMC Contract rest covered under 05 Years warranty. The complete Surgical Workstation are Proprietary in nature with strong recommendation of usage of compatible accessories usage only to avoid patient burn and damage of mother chip boards. No other local accessories are compatible with these energy sources. Principal company Proprietary Certificate attached.

(III) **Concurrence of finance wing to the proposal vide: *Requested***

(IV) **Approval of the competent authority vide: *Requested***

30/9/26

(Signature with date and designation of the indenting officer)

King George's Medical University UP, Lucknow

Common Equipment Cell

Email: ce@kgmcindia.edu

Reference No. CE/2026/955 Date: 22/10/2026

Accessories for Existing Surgical Workstation/Electrosurgical Units		
SL No	**Description**	**Tender Qty**
1	20195-134/21195-134 Instrument Reuse BiClamp LAP forceps, Maryland, semi-deep ribbed, shaft ø 5 mm, non-adhesive coating, length 340 mm; with connecting cable 4 m and MF plug, complete instrument	37 Pcs.
2	20195-204 Instrument Reuse LAP BiSect Micro, shaft ø 5 mm, length 350 mm; complete instrument	40 Pcs.
3	20195-202//21195-202 Instrument Reuse, BiClamp 201 T, bent 18°, smooth, length 200 mm; with connecting cable 4 m and MF plug, with thermal insulation, for open surgical procedures, e.g. intestinal surgery- Intestinal Surgery	40 Pcs.
4	21195-400 Instrument S/U Tripolar Tissue Navigation Instrument for Open Surgery; TriSect rapide® 140, single-use, bent 17 mm, shaft length 140 mm; with connecting cable 4 m and MF-2 plug	38 Pcs.
5	21195-401 Instrument S/U Tripolar Tissue Navigation Instrument for Open Surgery; TriSect rapide® 200, single-use, bent 17 mm, shaft length 200 mm; with connecting cable 4 m and MF-2 plug	100 Pcs.
6	21195-402 Instrument S/U Tripolar Tissue Navigation Instrument for Bariatrc Surgery; TriSect rapide® 350, single-use, bent 17 mm, shaft length 350 mm; with connecting cable 4 m and MF-2 plug	125 Pcs.
7	Reusable Non Sticky Bipolar forceps, Premium, Straight	200 Pcs.
8	Reusable Non Sticky Bipolar forceps, Premium, Bayonet	170 Pcs.
9	20196-055 / 053 / 045 Reusable Bipolar connecting cable, Valleylab and non-Erbe units (2-Pin 28 mm), 4 m; for bipolar forceps with European flat plug	350 Pcs.
10	20192-113 / 117 Reusable Monopolar connecting cable, VIO, ICC, ACC, International ø 8 mm (Bovie Jack), 4 m; for CUT and COAG MIS instruments, with connection ø 4 mm	16 Pcs.
11	20191-179 / 184 Reusable Hook electrode, flat, Ø 5 mm, shaft insulated, length 350 mm; incl. electrosurgical pencil with 2 buttons with Reusable Monopolar Connecting Cable VIO for ESU Pencil Hook Electrode - (20192-110)	15 Pcs.
12	21191-153 S/U Spatula electrode, straight, 2.3 x 19 mm, length 120 mm;	10 Pcs.
13	21191-155 S/U Spatula electrode, straight, insulated, 2.3 x 19 mm, length 120 mm;	5 Pcs.
14	20189-351/20189-302 Reusable 100% Washable, ReMode two-pedal foot switch with bracket for VIO 3, VIO 3n and VIO seal, AP & IP X8 Equipment; with connecting cable 5 m	5 Pcs.
15	20188-300 Reusable 100% Washable, One-pedal foot switch for VIO D/S, AP & IP X8 equipment; with connecting cable 5 m	4 Pcs.
16	20195-221/21195-221 Instrument Reuse, Open Vessel Sealer BiClamp 150 C, bent 23°, smooth, length 150 mm; with connecting cable 4 m and MF plug, with ceramic coating, e.g. for thyroidectomy, ENT, Thoracic Surgery	8 Pcs.
17	20195-200/21195-200 Instrument Reuse, BiClamp 210, bent 25°, smooth, length 210 mm; with connecting cable 4 m and MF plug, with corrugated surfaces, e.g. for vaginal hysterectomy	8 Pcs.

King George's Medical University UP, Lucknow

Common Equipment Cell

98

Email: ce@kgmcindia.edu

Reference No. CE/2026/955 Date: 22/10/2026

18	20150-030/036 S/U Applicator, straight, ø 6 mm, length 65 mm; with suction, e.g. for liver surgery	5 Box. (Box of 5 Pcs.)
19	20150-301 S/U Pump cartridge plus for ERBEJET 2;	4 Box. (Box of 5 Pcs.)
20	20821-000 Reusable Fiberoptic cable, Ø 4.8 mm, length 3 m, high temperature resistant;	1 Pcs.
21	20132-250 S/U APC applicator, with filter, shaft 35 mm, rigid, spatula electrode; ReMode, with connecting cable 3 m	2 Box. (Box of 5 Pcs.)
22	20132-254 S/U APC applicator, with filter, shaft 350 mm, rigid, spatula electrode; ReMode, with connecting cable 3 m	1 Box. (Box of 5 Pcs.)
23	ERME MS Indigenous Cart	2 Pcs.

Dr. Brijesh Mishra
Incharge, Equipment Cell

Dr. Abhishek saini
Member, Equipment Cell

Dr A.A. Sonkar
Head, Surgery

Dr. Abhijeet chandra
Head, Surgical Gastro.

Dr. Anjoo Agarwal
Head, Obs & Gynae

Dr. Vijay Kumar
Head, Surgical Oncology

Dr. J.D. Rawat
Head, Ped. Surgery

Dr. Anand Mishra
Head, Endocrine

Dr. B.K. Ojha
Head, Neurosurgery

Dr. M.S. Ansari
External Member, SGPGI

Dr. Dugesh Kr. Pandey
External Member, KSSSCI

Dr. Sunil Gaba
External Member, PGI Chandigarh

King George's Medical University UP, Lucknow

Common Equipment Cell

97

Email: ce@kgmcindia.edu

Reference No. CE/2026/955

Date: 22/10/2026

Bidders Criteria for procurement of Reusable Instruments/accessories for Existing Energy Devices-Surgical Workstation make Erbe GmbH Germany **Offered Endomechanical Instruments should be compatible with our existing energy source supplied by European Manufacturer- Erbe GmbH**	
1	Offered Endomechanical instruments should be compatible with our existing USFDA & EUCE endorsed energy source installed by Erbe GmbH.
2	Offered reusable instruments/single use accessories should be endorsed with EUCE 4 digit notified/USFDA-510 K certification and CDSCO, should be compatible with existing energy sources.
3	Offered Endomechanical instruments should have declared shelf life by Original Medical Device Manufacturer.
4	Offered accessories/ Instruments should 100% comply with compatibility certificate or third party usage clearance certificate from European organisation Erbe GmbH.
5	The shelf life of reusable Endomechanical instruments should not be less than 50 to 100 applications.
6	Bidder should attach literature/brochure of offered Endomechanical instruments & accessories mentioning desired length & dia of instruments.
7	Bidder should provide training to staff as and when required for the offered Endomechanical instruments at medical university premises at their own cost & will do upgradation of software versions FOC time to time during warranty & CMC tenure.
8	Bidder or its O.E.M should have mandatory installation base/purchase order of energy source at King George Medical University for which Endomechanical instruments/ accessories prices are offered.
9	Offered accessories should have minimum 60% shelf life from date of supply on single use accessories.
10	Basic Prices of offered accessories should be freezed for next 02 Financial Years. GST would be applicable as per Govt. Norms.

King George's Medical University UP, Lucknow

Common Equipment Cell

96

Email: ce@kgmcindia.edu

Reference No. CE/2026/955

Date: 22/10/2026

Dr. Brijesh Mishra Incharge Equipment Cell	Dr. Abhishek Saini Member, Equipment Cell	Dr. A. A. Sonkar Prof. & Head General Surgery	Dr. Abhijeet Chandra Head Surgical Gastroenterology
Dr. Anjoo Agarwal Prof. & Head OBGYN	Dr. Vijay Kumar Prof. & Head Surgical Oncology	Dr. J. D. Rawat Prof. & Head Paediatric Surgery	Dr. Anand Mishra Prof. & Head Endocrine Surgery
Dr. B. K. Ojha Prof. & Head Neurosurgery	Dr. M. S. Ansari Prof. & Head Urology, SGPGIMS Lucknow, External Member	Dr. Durgesh Kumar Pandey HOD Onco Surgery, KSSSCI Lucknow, External Member	Dr. Sunil Gaba PGI Chandigarh, External Member

95

power your performance.

Proprietary Certificate

To whom it may concern

Erbe VIO® 3, APC 3, IES 3 & Instruments

This is to certify that the VIO® 3, APC 3 and IES 3 are proprietary products, manufactured by Erbe Elektromedizin GmbH, Waldhoernlestrasse 17, 72072 Tuebingen, Germany. We are the only manufacturer of this products and this is not manufactured by any other company elsewhere in the world.

The following technologies are proprietary for Erbe VIO®3 and APC 3:

Power electronics: Regulated power supply adapter improves power output especially with high and varying impedance loads, e.g. during bipolar resection.

Multiprocessor technology: 15 processors facilitates superior system performance

Latest digital signal processors: 25 million measurements per second improves reproducibility of the tissue effect.

Connection options: When using APC 3, you can extend your options and insert up to 6 instruments of your choice.

Our modes are regulated to a constant voltage level continually adapting output power to changing parameters to achieve reproducible tissue effects.

Following modes are available with Erbe VIO®3 and APC 3:

CUT modes

- autoCUT
- highCUT
- dryCUT®
- autoCUT bipolar
- highCUT bipolar
- thermoSECT
- endoCUT® Q
- endoCUT® I
- endoCUT® U

COAG modes

- preciseSECT
- swiftCOAG®
- softCOAG®
- forcedCOAG®
- sprayCOAG®
- twinCOAG®
- softCOAG® bipolar
- forcedCOAG® bipolar
- thermoSEAL®
- biCLAMP
- forcedAPC
- pulsedAPC®
- preciseAPC®
- moveAPD®
- senseAPD®

The high-end electrosurgical device Erbe VIO® 3, with argon plasma coagulation system APC 3 and the smoke evacuation system IES 3 - in combination with the below listed instruments, form a proprietary system.

Instruments for VIO® 3 &APC 3

- BiClamp®
- Bipolar Forceps
- BiClamp® knife 220
- Electrosurgical Pencil
- FiAPC® probes
- FIAPC® plus probes
- APCapplicator
- TriSect rapide®

Instruments and Accessories for IES 3

- Smoke evacuation pencil
- Clip-On handle for smoke evacuation
- Main filter cartridge IES 3
- Prefilter for smoke evacuation
- Self-sealing water trap
- LAP tubing set for IES 3
- Smoke evacuation tubing for open surgical application

Date 2026-06-15

Maik Luz, Global Sales Support

93

Proprietary Certificate

To whom it may concern

Erbe Bipolar PREMIUM Forceps

This is to certify that the listed Bipolar PREMIUM Forceps are proprietary products, manufactured by Erbe Elektromedizin GmbH, Waldhoernlestrasse 17, 72072 Tuebingen, Germany and these product are not manufactured elsewhere.

Article No.	Catalogue Description
20195-501	Bipolar forceps PREMIUM, straight, tip 0.2 mm, pointed, length 120 mm
20195-502	Bipolar forceps PREMIUM, straight, tip 0.4 mm, very fine, length 120 mm
20195-503	Bipolar forceps PREMIUM, straight, tip 0.7 mm, fine, length 120 mm
20195-504	Bipolar forceps PREMIUM, straight, tip 0.7 mm, fine, angled, length 120 mm
20195-505	Bipolar forceps PREMIUM, straight, tip 0.2 mm, pointed, length 185 mm
20195-506	Bipolar forceps PREMIUM, straight, tip 0.4 mm, very fine, length 185 mm
20195-507	Bipolar forceps PREMIUM, straight, tip 0.7 mm, fine, length 185 mm
20195-508	Bipolar forceps PREMIUM, straight, tip 1 mm, blunt, length 185 mm
20195-509	Bipolar forceps PREMIUM, straight, tip 1 mm, blunt, angled, length 185 mm
20195-510	Bipolar forceps PREMIUM, straight, tip 0.2 mm, pointed, length 200 mm
20195-511	Bipolar forceps PREMIUM, straight, tip 0.4 mm, very fine, length 200 mm
20195-512	Bipolar forceps PREMIUM, straight, tip 1 mm, blunt, length 200 mm
20195-513	Bipolar forceps PREMIUM, straight, tip 1 mm, blunt, angled, length 200 mm
20195-514	Bipolar forceps PREMIUM, straight, tip 2 mm, blunt, angled, length 200 mm
20195-515	Bipolar forceps PREMIUM, straight, tip 2 mm, blunt, length 230 mm
20195-516	Bipolar forceps PREMIUM, straight, tip 1 mm, blunt, angled, length 260 mm
20195-517	Bipolar forceps PREMIUM, straight, tip 2 mm, angled, length 260 mm
20195-518	Bipolar forceps PREMIUM, straight, tip 2 mm, blunt, length 280 mm e.g. for urology
20195-531	Bipolar forceps PREMIUM, bayonet, tip 0.2 mm, pointed, length 155 mm
20195-532	Bipolar forceps PREMIUM, bayonet, tip 0.4 mm, very fine, length 155 mm
20195-533	Bipolar forceps PREMIUM, bayonet, tip 0.7 mm, fine, length 155 mm
20195-534	Bipolar forceps PREMIUM, bayonet, tip 0.2 mm, pointed, length 170 mm
20195-535	Bipolar forceps PREMIUM, bayonet, tip 1 mm, blunt, length 170 mm
20195-536	Bipolar forceps PREMIUM, bayonet, tip 0.4 mm, very fine, length 200 mm
20195-537	Bipolar forceps PREMIUM, bayonet, tip 0.7 mm, fine, length 200 mm
20195-538	Bipolar forceps PREMIUM, bayonet, tip 1 mm, blunt, length 200 mm
20195-539	Bipolar forceps PREMIUM, bayonet, tip 1.2 mm, blunt, length 200 mm
20195-540	Bipolar forceps PREMIUM, bayonet, tip 2 mm, blunt, length 200 mm
20195-541	Bipolar forceps PREMIUM, bayonet, tip 1.2 mm, blunt, length 200 mm angled downwards
20195-542	Bipolar forceps PREMIUM, bayonet, tip 1.2 mm, blunt, length 200 mm angled upwards

20195-543	Bipolar forceps PREMIUM, bayonet, tip 0.2 mm, pointed, length 230 mm
20195-544	Bipolar forceps PREMIUM, bayonet, tip 0.4 mm, very fine, length 230 mm
20195-545	Bipolar forceps PREMIUM, bayonet, tip 0.7 mm, fine, length 230 mm
20195-546	Bipolar forceps PREMIUM, bayonet, tip 1 mm, blunt, length 230 mm
20195-547	Bipolar forceps PREMIUM, bayonet, tip 1.2 mm, blunt, length 230 mm
20195-548	Bipolar forceps PREMIUM, bayonet, tip 0.7 mm, fine, length 230 mm angled upwards
20195-549	Bipolar forceps PREMIUM, bayonet, tip 1.2 mm, blunt, length 230 mm angled upwards
20195-550	Bipolar forceps PREMIUM, bayonet, tip 0.7 mm, fine, length 230 mm angled downwards
20195-551	Bipolar forceps PREMIUM, bayonet, tip 0.2 mm, pointed, length 250 mm
20195-552	Bipolar forceps PREMIUM, bayonet, tip 0.4 mm, very fine, length 250 mm
20195-553	Bipolar forceps PREMIUM, bayonet, tip 0.7 mm, fine, length 250 mm
20195-554	Bipolar forceps PREMIUM, bayonet, tip 1 mm, blunt, length 250 mm
20195-555	Bipolar forceps PREMIUM, bayonet, tip 1.2 mm, blunt, length 250 mm
20195-556	Bipolar forceps PREMIUM, bayonet, tip 0.7 mm, fine, length 250 mm angled upwards
20195-557	Bipolar forceps PREMIUM, bayonet, tip 0.7 mm, fine, length 170 mm
20195-558	Bipolar forceps PREMIUM, bayonet, tip 2 mm, blunt, length 250 mm
20195-559	Bipolar forceps PREMIUM, bayonet, tip 2mm, blunt, length 170 mm
20195-560	Bipolar forceps PREMIUM, bayonet, tip 0.2 mm, pointed, length 200 mm
20195-561	Bipolar forceps PREMIUM, bayonet, tip 2 mm, blunt, length 230 mm

erbe

Erbe Elektromedizin GmbH
Waldhoernlestrasse 17
72072 Tuebingen, Germany

Date 2021-02-16

Natalie Zierfuß, Business Manager Asia Pacific

Erbe Elektromedizin GmbH Waldhoernlestrasse 17 72072 Tuebingen Germany

Phone +49 7071 755-0
Fax +49 7071 755-179
info@erbe-med.com
erbe-med.com

CEO and President: Christian O. Erbe
Commercial Register Court Stuttgart
HRB 380137
VAT ID (USt-IdNr.): DE 146863422

Baden-Württembergische Bank
IBAN: DE27 6005 0101 7477 5011 95
BIC: SOLADEST600

Kreissparkasse Tübingen
IBAN: DE54 6415 0020 0000 0001 41
BIC: SOLADES1TUB

erbe
power your performance

Proprietary Certificate

To whom it may concern

This is to certify that the listed instruments are proprietary products, manufactured by Erbe Elektromedizin GmbH, Waldhoernlestrasse 17, 72072 Tuebingen, Germany and these product are not manufactured elsewhere.

Article No.	Catalogue Description
20195-221	BiClamp 150 C, bent 23°, smooth, length 150 mm; with connecting cable 4 m and MF plug, with ceramic coating, e.g. for thyroidectomy
20195-134	BiClamp LAP forceps, Maryland, semi-deep ribbed, shaft ø 5 mm, non-adhesive coating, length 340 mm; with connecting cable 4 m and MF plug, complete instrument
20195-202	BiClamp 201 T, bent 18°, smooth, length 200 mm; with connecting cable 4 m and MF plug, with thermal insulation, for open surgical procedures, e.g. intestinal surgery
20195-200	BiClamp 210, bent 25°, smooth, length 210 mm; with connecting cable 4 m and MF plug, with corrugated surfaces, e.g. for vaginal hysterectomy
20195-311	BiCision M, ø 5 mm, shaft length 350 mm; for open and laparoscopic procedures
20195-204	LAP BiSect Micro, shaft ø 5 mm, length 350 mm; complete instrument
20195-150	Bipolar irrigation forceps, straight, tip 1.5 mm, blunt, length 200 mm;
20195-152	Bipolar irrigation forceps, bayonet, tip 1 mm, blunt, length 200 mm;

erbe

Manuel Neuburger

Manuel Neuburger, Product Specialist International Sales Support

Date 2022-11-21

90

erbe
power your performance

Proprietary Certificate

To whom it may concern

Erbe VIO® 3 & Instruments

This is to certify that the devices Erbe VIO® 3 in combination with the instruments listed below is a proprietary set of products, manufactured by Erbe Elektromedizin GmbH, Waldhoernlestrasse 17, 72072 Tuebingen, Germany. We are the only manufacturer of this set of product and it is not manufactured by any other company elsewhere in the world.

10160-000	Erbe VIO® 3
20195-200	BiClamp® 210
20195-202	BiClamp® 201 T
20195-203	BiClamp® 271 T
20195-204	BiClamp® LAP BiSect Micro
20195-221	BiClamp® 150 C
20195-280	BiClamp® 280
20195-299	BiClamp® 260 C
20195-134	BiClamp® LAP forceps Maryland

erbe

Natalie Zierhut, Business Manager APAC & Spain

Date: 2022-06-15

Erbe Elektromedizin GmbH · Waldhoernlestraße 17 · 72072 Tuebingen · Germany

99

erbe
power your performance

Proprietary Certificate

To whom it may concern

Nessy® Omega

This is to certify that the following products :

20193-082 Nessy Omega, split patient plate
20193-083 Nessy Omega, split patient plate

are specially designed

- with a split-pad effective contact surface 85 cm² [illegible]
- and can be applied irrespective of the direction [illegible]

These are proprietary products, marketed exclusively by [illegible]
Waldhoernlestrasse 17, 72072 Tuebingen, Germany.

April 4, 2018 Michael Beck, Director Business Management

King George's Medical University, UP, Lucknow

Common Equipment Cell

Email: ce@kgmcindia.edu

Reference No.

Date:

Department			2024-25-26 PO Qty			2027		Latest Banchmark Per Unit Excl. GST	GST Value @ 5%	Latest Banchmark Per Unit Incl. GST	Total Value Incl. GST
SL No	Description	Pack Size	2024 Qty	2025 Qty	2026 Qty	Indented Qty	Proposed Qty				
1	20195-134//21195-134 Instrument Reuse BiClamp LAP forceps, Maryland, semi-deep ribbed, shaft ø 5 mm, non-adhesive coating, length 340 mm; with connecting cable 4 m and MF plug, complete instrument	1	10	30	30	59	37	306291	15314.55	321605.55	11899405.35
2	20195-204 Instrument Reuse LAP BiSect Micro, shaft ø 5 mm, length 350 mm; complete instrument	1	10	15	30	54	40	306291	15314.55	321605.55	12864222
3	20195-202//21195-202 Instrument Reuse, BiClamp 201 T, bent 18°, smooth, length 200 mm; with connecting cable 4 m and MF plug, with thermal insulation, for open surgical procedures, e.g. intestinal surgerys- Intestinal Surgery	1	10	15	25	77	40	179550	8977.5	188527.5	7541100
4	21195-400 Instrument S/U Tripolar Tissue Navigation Instrument for Open Surgery; TriSect rapide® 140, single-use, bent 17 mm, shaft length 140 mm; with connecting cable 4 m and MF-2 plug	1	15	30	55	38	80350	4017.5	84367.5	3205965	
5	21195-401 Instrument S/U Tripolar Tissue Navigation Instrument for Open Surgery; TriSect rapide® 200, single-use, bent 17 mm, shaft length 200 mm; with connecting cable 4 m and MF-2 plug	1	75	100	115	100	80350	4017.5	84367.5	8436750	
6	21195-402 Instrument S/U Tripolar Tissue Navigation Instrument for Bariatrc Surgery; TriSect rapide® 350, single-use, bent 17 mm, shaft length 350 mm; with connecting cable 4 m and MF-2 plug	1	75	125	175	125	80350	4017.5	84367.5	10545937.5	
7	Reusable Non Sticky Bipolar forceps, Premium, Straight	1	50	25	65	225	200	67522	3376.1	70898.1	14179620
8	Reusable Non Sticky Bipolar forceps, Premium, Bayonet	1	50	50	217	172	170	103445	5172.25	108617.25	18464932.5

King George's Medical University UP, Lucknow

Common Equipment Cell

Email: ce@kgmcindia.edu

Reference No.

Date:

Department			2024-25-26 PO Qty			2027		Latest Banchmark Per Unit Excl. GST	GST Value @ 5%	Latest Banchmark Per Unit Incl. GST	Total Value Incl. GST
SL No	Description	Pack Size	2024 Qty	2025 Qty	2026 Qty	Indented Qty	Proposed Qty				
9	20196-055 / 053 / 045 Reusable Bipolar connecting cable, Valleylab and non-Erbe units (2-Pin 28 mm), 4 m; for bipolar forceps with european flat plug	1	120	100	200	522	350	16337	816.85	17153.85	6003847.5
10	20192-113 / 117 Reusable Monopolar connecting cable, VIO, ICC, ACC, International ø 8 mm (Bovie Jack), 4 m; for CUT and COAG MIS instruments, with connection ø 4 mm	1	20	10	45	16		16337	816.85	17153.85	274461.6
11	20191-179 / 184 Reusable Hook electrode, flat, Ø 5 mm, shaft insulated, length 350 mm; incl. electrosurgical pencil with 2 buttons with Reusable Monopolar Connecting Cable VIO for ESU Pencil Hook Electrode - (20192-110)	1	5	18	21	15		65000	3250	68250	1023750
12	21191-153 S/U Spatula electrode, straight, 2.3 x 19 mm, length 120 mm;	1	50		10	10		9135	456.75	9591.75	95917.5
13	21191-155 S/U Spatula electrode, straight, insulated, 2.3 x 19 mm, length 120 mm;	1	50		5	5		9135	456.75	9591.75	47958.75
14	20189-351/20189-302 Reusable 100% Washable, ReMode two-pedal foot switch with bracket for VIO 3, VIO 3n and VIO seal, AP & IP X8 Equipment; with connecting cable 5 m	1	5	10	7	13	5	130000	6500	136500	682500
15	20188-300 Reusable 100% Washable, One-pedal foot switch for VIO D/S, AP & IP X8 equipment; with connecting cable 5 m	1	5	10	6	7	4	90000	4500	94500	378000
16	20195-221/21195-221 Instrument Reuse, Open Vessel Sealer BiClamp 150 C, bent 23°, smooth, length 150 mm; with connecting cable 4 m and MF plug, with ceramic coating, e.g. for thyroidectomy, ENT, Thoracic Surgery	1	10	5	5	9	8	179550	8977.5	188527.5	1508220

King George's Medical University, UP, Lucknow

Common Equipment Cell

Email: ce@kgmcindia.edu

Reference No.

Date:

Department			2024-25-26 PO Qty			2027		Latest Banchmark Per Unit Excl. GST	GST Value @ 5%	Latest Banchmark Per Unit Incl. GST	Total Value Incl. GST
Sl. No	Description	Pack Size	2024 Qty	2025 Qty	2026 Qty	Indented Qty	Proposed Qty				
17	20195-200/21195-200 Instrument Reuse, BiClamp 210, bent 25°, smooth, length 210 mm; with connecting cable 4 m and MF plug, with corrugated surfaces, e.g. for vaginal hysterectomy	1	5		8	8	8	179550	8977.5	188527.5	1508220
18	20150-030/036 S/U Applicator, straight, ø 6 mm, length 65 mm; with suction, e.g. for liver surgery	5		10	5	8	5	113620	5681	119301	596505
19	20150-301 S/U Pump cartridge plus for ERBEJET 2;	5		5	8	8	4	51188	2559.4	53747.4	214989.6
20	20821-000 Reusable Fiberoptic cable, Ø 4.8 mm, length 3 m, high temperature resistant;	1				1	1	49619	2480.95	52099.95	52099.95
21	20132-250 S/U APC applicator, with filter, shaft 35 mm, rigid, spatula electrode; ReMode, with	5			8	12	2	113620	5681	119301	238602
22	20132-254 S/U APC applicator, with filter, shaft 350 mm, rigid, spatula electrode; ReMode, with connecting cable 3 m	5			4	2	1	135565	6778.25	142343.25	142343.25
23	ERME MS Indgeneous Cart	1		7		6	2	35000	1750	36750	73500
24	20132-221/224 FiAPC Probe 2200 A/ FiAPC Probe 2200 SC	1	140	10	40						
25	20132-225 FiAPC Probe 2200 C	1	40								
26	20150-050/060/061 Watrjet Hybrid Knife	1	3	8							
27	20183-053 Reusable Bipolar Adapter	1	4								
										Total	9,99,78,847.50

PO 2026

85

अनुबंध क्रमांक | Contract No: GEMC-511687721206726

अनुबंध तिथि | Generated Date : 19-Mar-2026

बोली/आरए/पीबीपी संख्या | Bid/RA/PBP No.: GEM/2025/B/7006767

खरीद का प्रकार | Procurement Mode: Bid

संगठन विवरण | Organisation Details

प्रकार | Type :	State Autonomous
मंत्रालय | Ministry :	-
विभाग | Department :	Medical Education Department Uttar Pradesh
कार्यालय का नाम | Organisation Name :	NA
कार्यालय क्षेत्र | Office Zone :	Lucknow

खरीदार विवरण | Buyer Details

पद | Designation :	Junior Administrative Officer Procurement Cell
संपर्क संख्या | Contact No :	0522-2258845
ईमेल आईडी | Email ID :	rajeshkumar0607@kgmcuniv.ac.in
जीएसटीआईएन | GSTIN :	
पता | Address :	King George Medical University, Shahnajaf Road, Dharm... Lucknow LUCKNOW, UTTAR PRADESH-226003, India

वित्तीय स्वीकृति विवरण | Financial Approval Detail

आईएफडी सहमति | IFD Concurrence :	NA
प्रशासनिक अनुमोदन का पदनाम | Designation of Administrative Approval :	VC Lucknu
वित्तीय अनुमोदन का पदनाम | Designation of Financial Approval :	VC Lucknu

भुगतान प्राधिकरण विवरण | Paying Authority Details

रोल | Role :	DDO
भुगतान का मोड | Payment Mode :	Online
पद | Designation :	FO
ईमेल आईडी | Email ID :	fo3@kgmcuniv.ac.in
जीएसटीआईएन | GSTIN :	N
पता | Address :	King George Medical University, Shahnajaf Road, Dharm... Lucknow LUCKNOW, UTTAR PRADESH-226003, India

विक्रेता विवरण | Seller Details

जेम विक्रेता आईडी | GeM Seller ID :	2202166000118141
कंपनी का नाम | Company Name :	M/S PSE PRIVATE LIMITED
संपर्क नंबर | Contact No :	9935020996
ईमेल आईडी | Email ID :	pseweb123@gmail.com
पता | Address :	40,Vishnu Marg,Lalbagh,Hazratganj, Lucknow, UTTAR PRADESH-226001, ...
एमएसएमई पंजीकरण संख्या/उद्यम पंजीकरण संख्या | MSME Registration number/ Udyam Registration number :	UDYAM-UP-32-0014228
जीएसटी आईएन | GSTIN :	09ADWPA7911B1ZD (R) - (M)
एमएसई श्रेणी | MSE Social Category :	General
एमएसई लिंग श्रेणी | MSE Gender :	Male

*जिसके नाम के पक्ष में GST/TAX इनवॉइस पेश किया जाएगा | GST / Tax invoice to be raised in the name of - Buyer

वितरण निर्देश | Delivery Instructions : NA

उत्पाद विवरण | Product Details

क्र.	आइटम विवरण | Item Description	आइटम [विवरण] Ordered Quantity	इकाई | Unit	इकाई मूल्य (INR) | Unit Price (INR)	कर विभाजन (INR) | Tax Bifurcation (INR)	मूल्य (INR में सभी शुल्क और कर सहित) | Price (Inclusive of all Duties and Taxes in INR)
1	उत्पाद का नाम | Product Name : Accessories for Existing Surgical Work Station - Electrosurgical Units ब्रांड | Brand : Erbe ब्रांड प्रकार | Brand Type : NA कैटलॉग की स्थिति | Catalogue Status : NA जैसे बेचा जा रहा है | Selling As : NA श्रेणी का नाम और मात्रांक | Category Name & Quantity : NA, 1 मॉडल | Model : ERBE एचएसएन कोड | HSN Code : HSN not given And by seller मूल देश | Country Of Origin : Germany	1	pieces	69,992.627	NA	69,992.627
कुल ऑर्डर मूल्य | Total Order Value in INR :						69,992.627

परेषिती विवरण | Consignee Detail

क्र.सं. | S.No	परेषिती | Consignee	वस्तु | Item	लॉट नंबर | Lot No.	मात्रा | Quantity	डिलीवरी शुरू करना है | Delivery Start After	डिलीवरी पूरा करना है | Delivery To Be Completed By
	पद | Designation :					

1	ईमेल आईडी	Accessories for Existing Surgical Work Station Electrosurgical Units		1	19-Mar-2024	17-Jun-2029

Product Specification for accessories for Existing Surgical Work Station Electrosurgical Units

विशिष्टि | Specification	उप-विशिष्टि | Sub-Spec.	मूल्य | Value
Custom Specification	Custom Specification	Yes

विक्रेता विशिष्टता दस्तावेज़ | Seller Specification Document:

1. Specification Document	http://gem-gov-in-s3-public-buyer_catalog_document_upload_bucket.s3.ap-south-1.amazonaws.com/2026/12/17/20251212_12_31_14_11_44_specification_2025-12-17-12-32-23_1041e1254aa7dc57b7b4b7f6e0f4.pdf?X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=AKIA2YVNBAIVTJV3TC5C%2F20260317%2Fap-south-1%2Fs3%2Faws4_request&X-Amz-Date=20260317T060000Z&X-Amz-Expires=86400&X-Amz-SignedHeaders=host&X-Amz-Signature=3a7ab8

खरीदार विशिष्टता दस्तावेज़ | Buyer Specification Document:

1. Specification Document	http://gem-gov-in-s3-public-buyer_catalog_document_upload_bucket.s3.ap-south-1.amazonaws.com/2025/12/15/20251215_12_31_14_11_44_specification_2025-12-15-12-32-28_b5b7e1d9f7524c79af1a1c2fe4e3ddd7.pdf?X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=AKIA2YVNBAIVTJV3TC5C%2F20260317%2Fap-south-1%2Fs3%2Faws4_request&X-Amz-Date=20260317T060000Z&X-Amz-Expires=86400&X-Amz-SignedHeaders=host&X-Amz-Signature=3a

मूल्य द्विभाजन एक्सेल फ़ाइल विवरण | Price Bifurcation Excel File details: Price Details

ईपीबीजी विवरण | ePBG Detail

सलाहकार बैंक	Advisory Bank :	State Bank of India
ईपीबीजी प्रतिशत (%)	ePBG Percentage(%)	3.00

बोली लागू करें तो बोली के नियमों और शर्तों के अनुसार लागू ईपीबीजी प्रस्तुत करना होगा | The bidder shall furnish ePBG as applicable as per bid's terms and conditions

नियम और शर्तें | Terms and Conditions

1. General Terms and Conditions:

1.1 This contract is governed by the General Terms and Conditions, conditions stipulated to this Product/Service as provided in the Marketplace.

1.2 This Contract between the Seller and the Buyer, is for the supply of the Goods and/ or Services, detailed in the schedule above, in accordance with the General Terms and Conditions (GTC) unless otherwise superseded by Goods / Services specific Special Terms and Conditions (STC) and/ or Bid/Reverse Auction Additional Terms and Conditions (ATC), as applicable.

1.3 All GeM Sellers / Service Providers are mandated to ensure compliance with all the applicable laws / acts / rules including but not limited to all Labour Laws such as The Minimum Wages Act, 1948, The Payment of Wages Act, 1936, The Payment of Bonus Act, 1965, The Equal Remuneration Act, 1976, The Payment of Gratuity Act, 1972 etc. Any non-compliance will be treated as breach of contract and Buyer may take suitable actions as per GeM Contract.

2. Buyer Added Bid Specific Terms and Conditions-

2.1 Generic:
OPTION CLAUSE: The Purchaser reserves the right to increase or decrease the quantity to be ordered up to 25 percent of bid quantity at the time of placement of contract. The purchaser also reserves the right to increase the ordered quantity up to 25% of the contracted quantity during the currency of the contract at the contracted rates. The delivery period of quantity shall commence from the last date of original delivery order and in cases where option clause is exercised during the extended delivery period the additional time shall commence from the last date of extended delivery period. The additional delivery time shall be (Increased quantity - Original quantity) x Original delivery period (in days), subject to minimum of 30 days. If the original delivery period is less than 30 days, the additional time equals the original delivery period. The Purchaser may extend this calculated delivery duration up to the original delivery period while exercising the option clause. Bidders must comply with these terms.

2.2 Buyer Added Bid Specific ATC:
Buyer uploaded ATC document Click here to view the file.

पूर्ती / सहायक सामग्रियों के लिए प्रस्तावित मूल्य | Price Offered for Spares / Consumables:

पूर्ती / सहायक सामग्रियों के दस्तावेज़ लिंक के लिए प्रस्तावित मूल्य | Price Offered for Spares / Consumables Document link :

Note: Sellers are required to raise invoices online as per the contract terms on GeM portal. Timely invoice submission is mandatory for compliances, smooth payment processing and will also contribute to improving their ratings.

नोट: यह विक्रेता द्वारा उत्पन्न की गई फ़ाइल की आवश्यकता नहीं है। इस दस्तावेज़ का कोई भी मुद्रण/हस्ताक्षर सौदा के लिए मान्य नहीं है।

Note: This is system generated file. No signature is required. Print out of this document is not valid for payment/ transaction purpose.

ANNEXURE

KGMU- Accessories for Existing Surgical Work Station/Electrosurgical Units as per GeM Bid No. GEM/2025/B/7006757 Dated: 30-12-2025.

Sl. No	Item Name	Qty	Baisc Rate per Unit	GST @ 5%	Rate per Unit Incl 05 % GST	Total Value
1	20195-134 Instrument Reuse LAP forceps, Maryland.	30	2,52,000.00	12,600.00	2,64,600.00	79,38,000.00
2	20195-204 Instrument Reuse Instrument Reuse LAP BiSect Micro, shaft ø 5 mm, length 350 mm; complete instrument.	30	2,52,000.00	12,600.00	2,64,600.00	79,38,000.00
3	20195-202 Instrument Reuse, Open Vessel Sealer Biclamp 201 T, eg, intestinal surgery.	25	1,42,939.29	7,146.96	1,50,086.25	37,52,156.25
4	21195-400 Instrument S/U Tripolar Tissue Navigation Instrument for Open Surgery Surgery Trisect Rapid Trisect Rapid 200, Bent 17 mm shaft L-140 mm with connectingcable L-4 m.	30	61,370.54	3,068.53	64,439.06	19,33,171.88
5	21195-401 Instrument S/U Tripolar Tissue Navigation Instrument for Open Surgery Surgery Trisect Rapid Trisect Rapid 200, Bent 17 mm shaft L-200 mm with connectingcable L-4 m.	100	61,370.54	3,068.53	64,439.06	64,43,906.25
6	21195-402 Instrument S/U Tripolar Tissue Navigation Instrument for Bariatrc Surgery Surgery Trisect Rapid 350, Bent 17 mm shaft L-350 mm with connectingcable L-4 m.	125	61,370.54	3,068.53	64,439.06	80,54,882.81
7	20195-501/502/503/504/505/506/507/508/509/510/511/512/513/514/515/516/517/518 Reusable Non Sticky Bipolar forceps, straight.	65	67,522.32	3,376.12	70,898.44	46,08,398.44
8	20195-531/532/533/534/535/536/537/538/539/541/542/547/546/550/554/556/558 Reusable Non Sticky Bipolar forceps, bayonet.	217	67,522.32	3,376.12	70,898.44	1,53,84,960.94
9	20196-045/053/055 Reusable Bipolar connecting cable.	200	16,336.61	816.83	17,153.44	34,30,687.50
10	20192-113/117 Reusable Monopolar Cable.	10	16,336.61	816.83	17,153.44	1,71,534.38
11	20191-179/184 Reusable Hook electrode, flat, 5 mm, shaft insulated, length 350 mm; incl. electrosurgical pencil with 2 buttons with Reusable Monopolar Connecting Cable V10 for ESU Pencil Hook 11 Electrode (20192-110)	18	72,450.00	3,622.50	76,072.50	13,69,305.00
12	20132-221/222/223/224/321/323/324/325 FIAPC probe 1500 A, d 1.5 mm, flexible, length 1.5 m; with instrument recognition and integrated filter for 12 Bronchoscopy.	4	17,550.00	877.50	18,427.50	73,710.00
13	20132-254/255 Single Use APC Applicator Lap Surgery with filter shaft 350 min rigid needle/Spatulla electrode remode with connecting cable 3 m.	4	5,73,299.11	28,664.96	6,01,964.06	24,07,856.25
14	20123-250/251 Single Use APC Applicator Open Surgery with filter shaft 35 mm Tigid needle/Spatulla electrode: remode with 14 connecting cable 3 m.	8	4,80,375.00	24,018.75	5,04,393.75	40,35,150.00
15	20189-302 100% Washable, remode Monopolar (Two) foot switch 15 V103.	7	73,013.39	3,650.67	76,664.06	5,36,648.44
16	20150-301 Pump Cartedge for water jet.	8	51,187.50	2,559.38	53,746.88	4,29,975.00
17	20150-036 Applicator, straight, with monopolar electrosurgical 17 function, 6 mm, length 80 mm; with suction, e g. for liver surgery.	3	1,00,012.50	5,000.63	1,05,013.13	3,15,039.38
18	20188-300 100% Washable, Bipolar (One) foot switch V10D/5/3	6	51,628.57	2,581.43	54,210.00	3,25,260.00
19	20195-221 Instrument Reuse, Open vessel sealer Biclamp 150 e.g Thyroidectomy.	5	1,42,939.29	7,146.96	1,50,086.25	7,50,431.25
20	20150-030 Jet applicator/Probe Lao Open Surgery.	2	1,00,012.50	5,000.63	1,05,013.13	2,10,026.25
					Total	**7,01,09,100.00**

We offer a special discount of Rs. 1,16,473.00. Hence, the final offer is Rs. 6,99,92,627.00

Erbe Accessories		Remarks
Surgical Workstation/ Vessel Sealer/Vessel Sealers with Argon Coagulation		
SL No	Description	
1	20195-134 Instrument Reuse LAP forceps, Maryland	30 pcs.
2	20195-204 Instrument Reuse Instrument Reuse LAP BiSect Micro, shaft ø 5 mm, length 350 mm; complete instrument	30 pcs.
3	20195-202 Instrument Reuse,Open Vessel Sealer Biclamp 201 T , e.g. intestinal surgery .	25 pcs.
4	21195-400 Instrument S/U Tripolar Tissue Navigation Instrument for Open Surgery Surgery Trisect Rapid Trisect Rapid 200, Bent 17 mm shaft L-140 mm with connectingcable L- 4 m	6 box (1X5) = 30 pcs.
5	21195-401 Instrument S/U Tripolar Tissue Navigation Instrument for Open Surgery Surgery Trisect Rapid Trisect Rapid 200, Bent 17 mm shaft L-200 mm with connectingcable L- 4 m	20 box (1X5) = 100 pcs.
6	21195-402 Instrument S/U Tripolar Tissue Navigation Instrument for Bariatrc Surgery Surgery Trisect Rapid 350, Bent 17 mm shaft L-350 mm with connectingcable L- 4 m	25 box (1X5) = 125 pcs.
7	20195-501 / 502 / 503 / 504 / 505 / 506 / 507 / 508 / 509 / 510 / 511 / 512 / 513 / 514 /515/516/517/518 Reusable Non Sticky Bipolar forceps, straight	65 pcs.
8	20195-531/ 532 / 533 / 534 / 535 / 536 / 537 / 538 / 539 / 541 / 542 / 547 / 546 / 550 /554 / 556 / 558 Reusable Non Sticky Bipolar forceps, bayonet	217 pcs.
9	20196- 055 /053 / 045 Reusable Bipolar connecting cable	200 pcs.
10	20192-113 / 117 Reusable Monopolar Cable	10 pcs.
11	20191-179 / 184 Reusable Hook electrode, flat, Ø 5 mm, shaft insulated, length 350 mm; incl. electrosurgical pencil with 2 buttons with Reusable Monopolar Connecting Cable VIO for ESU Pencil Hook Electrode - (20192-110)	18 pcs.
12	20132-221 / 222 / 223 / 224 FiAPC probe 1500 A, ø 1.5 mm, flexible, length 1.5 m; with instrument recognition and integrated filter for Bronchoscopy	4 box (1X10) = 40 pcs.
13	20132-254 /255 Single Use APC Applicator Lap Surgery with filter shaft 350 mm rigid needle / Spatulla electrode : remode with connecting cable 3 m	4 box (1X5) = 20 pcs.
14	20123-250 / 251 Single Use APC Applicator Open Surgery with filter shaft 35 mm rigid needle / Spatulla electrode : remode with connecting cable 3 m	8 box (1X5) = 40 pcs.
15	20189-302 100% Washable, remode Monopolar (Two) foot switch VIO3	7 pcs.
16	20150-301 Pump Cartedge for water jet	8 box (1X5) = 40 pcs.
17	20150-036 Applicator, straight, with monopolar electrosurgical function, ø 6 mm, length 80 mm; with suction, e.g. for liver surgery	3 box (1X5) = 15 pcs.
18	20188-300 100% Washable, Bipolar (One) foot switch VIO D / S / 3	6 pcs.
19	20195-221 Instrument Reuse, Open vessel sealer Biclamp 150 C e.g. Thyroidectomy.	5 pcs.
20	20150-030 Jet applicator / Probe Lao Open Surgery	2 box (1X5) = 10 pcs.

King George's Medical University UP, Lucknow

Common Equipment Cell

Email: ce@kgmcindia.edu

Reference No: CE/2025/801 Date: 25/10/2025

PROPRIETARY/ SPECIFIC BRAND GOODS CERTIFICATE

1	Item/ Type/ Model No. required along with specification	Accessories for Existing Surgical Workstation & Energy Source
2	If the item a spare part attachment or accessory for an existing equipment **Yes / No (If yes, provide details)**	Yes, Details attached
3	Name of the manufacturers/supplier of the item proposed by the indenter	M/s Erbe Elektromedizin GmbH, Waldhorenlestrasse 17, D-72072, Tubingen, Germany M/S Pee Vee Enterprises Lucknow – Authorized Supplier
4	Are they sole manufacturers/ sold distributors of the Item **Yes / No**	Yes, Sole Manufacturers & required accessory / instruments are Proprietary In Nature
5	If there any other item with similar/equivalent specification available in the market to meet the job requirement envisaged. Yes / No (If Yes, explain why those alternatives cannot be procured and provide a comparative analysis of the functional advantages/cost-effectiveness of the recommended item)	No
6	Efforts made to locate alternative sources of supply or use of substitutes	No alternative source available for availability of compatible accessories with existing Surgical Workstation & Energy Sources
7	Why open tender can't be resorted to, for locating, alternative source.	Proprietary In Nature
8	Are the proprietary items certified to have reasonable rates? **Yes / No (Attach supporting documents, if applicable)**	Yes – Reasonable Rates Certificate in form of KGMU PO copy PO Copy Attached
9	Any other justification for procuring the item from a single source	Existing Surgical Workstation consists of Vessel Fusion Source + Kinetic Energy Source + Hydrojet Source are covered under 8-9 th year CMC Contract

I hereby certify that the above item is required to be procured on a proprietary/single-source basis, as the specified brand is the only known source that meets our functional requirements. Given the unique advantages of this brand, an open tender process would not serve any meaningful purpose in this case and can justifiably be waived.

(Strike out whoever is not applicable)

Yours Sincerely,

Faculty Incharge/Co-incharge
Equipment Cell KGMU

King George's Medical University UP, Lucknow
Common Equipment Cell

Email: ce@kgmcindia.edu

Reference No.- CE/2025/801 Date: 25/10/2025

Proprietary Article Certificate in the following form is to be provided by the Ministry/Department before procuring the goods from a single source under the provision of sub Rule 166 (i) and 1 66 (iii) as applicable.

(I) **The indented goods are manufactured by** M/s Erbe Elektromedizin GmbH, Waldhorenlestrasse 17, D-72072, Tubingen, Germany
Authorized Distributor: M/S Pee Vee Enterprises, Lucknow

(II) **No other make or model is acceptable for the following reasons:**

King George Medical University has installation base of 15 Surgical Work Station & 290 Energy sources total = 355 units are functional at several departments & 90% are covered under CMC Contract rest covered under 05 Years warranty. The complete Surgical Workstation are Proprietary in nature with strong recommendation of usage of compatible accessories usage only to avoid patient burn and damage of mother chip boards . No other local accessories are compatible with these energy sources.

(III) **Concurrence of finance wing to the proposal vide:** Requested

(IV) **Approval of the competent authority vide:** Requested

(Signature with date and designation of the indenting officer)

HOD Surgery | HOD Neurosurgery | HOD Urology | HOD OBS & GYNAE

HOD ENDOCRINE | HOD Surgical Oncology | HOD Ped. Surgery

King George's Medical University, Lucknow

Common Equipment Cell

Ref No. CE/2025/801

Date: 25/10/2025

Bidders Criteria for procurement of Reusable Instruments/accessories for existing Energy Devices-Surgical Workstation make Erbe GmbH Germany
1.Offered Endomechanical instruments should be compatible with our existing energy source supplied by European Manufacturer- Erbe GmbH

1.Offered Endomechanical instruments should be compatible with our existing USFDA & EUCE endorsed energy source supplied by Erbe GmbH
2.Offered reusable instruments/single use accessories should be endorsed with EUCE 4 digit notified/USFDA -510 K certification and CDSCO, should be compatible with existing energy source
3.Offered Endomechanical instruments should have declared shelf life by Original Medical Device Manufacturer
4. Offered accessories/ instruments should 100%comply with compatibility certificate or third party usage clearance certificate from European organisation Erbe GmbH
5. The shelf life of reusable Endomechanical instruments should not be less than 50 to 100 applications
6. Bidder should submit original literature/brochure of offered Endomechanical instruments & accessories mentioning desired length & dia of instruments
7. Bidder should provide training to staff as and when required for the offered Endomechanical instruments at medical university premises at their own cost & will do upgradation of software versions time to time during warranty & CMC tenure
8. Bidder or its O.E.M should have mandatory installation base/purchase order of energy source at King George Medical University for which Endomechanical instruments/ accessories prices are offered.
9. Offered accessories should have minimum 70% shelf life from date of supply on single use accessories.

Prof. Brijesh Mishra Faculty Ic Equipment Cell	Dr. A.A. Sonkar Prof and Head General Surgery	Dr. B.K. Ojha Prof and Head Neurosurgery	Dr. Apul Goel Prof and Head Urology
Dr. Anjoo Agarwal Prof and Head OBGYN	Dr. Anand Mishra Prof and Head Endocrine Surgery	Dr. Vijay Kumar Prof and Head Surgical Oncology	Dr. J.D. Rawat Prof and Head Pediatric Surgery
Dr. Abhishek Saini Assistant Professor Sports Medicine	Dr. Akshay Anand Add. Professor General Surgery	Dr. Sunil Gaba Professor(PlasticSurgery) PGIMER, Chandigarh	Dr. Rohit Srivastava Professor RMLIMS, Lucknow
Dr. Vikas Singh Professor RMLIMS, Lucknow			

PO 2025

70

King George's Medical University U.P.,
Lucknow-226003 (U.P.) INDIA

Ph. 91-0522-2257540 Fax :91-0522-2257539 Website : www. kgmu.org

Ref. A744.../F&AO/MM/2025 Date: 31./03./2025

To,

M/s Pee Vee Enterprises,
2137 Canal Road, Krishan Nagar,
Lucknow - 226023
Contact No. 8853530595
Email ID: vijaylko8@gmail.com

Sir,

We are pleased to inform you that in reference to E-tender Notice No. 2025_KGMUL_1018427_1 dt. 18.03.2025, the rate quoted by you towards the supply of **Item Accessories for Existing Surgical Work Stations, Electrosurgical Units on Proprietary Basis** for **Department of Common Equipment** as per quoted specifications, have been approved by the Hon'ble Vice Chancellor, as per the details given below:-

Item Name/Full Specification	Qty	Order Value (Incl. of GST) with 5 yr. warranty
Accessories for Existing Surgical Work Stations, Electrosurgical Units (as per tender specifications)	Set (As per Annexure-1	Rs. 4,97,45,019/-
Rupees Four Crore Ninety Seven Lac Forty Five Thousand Nineteen only		
Note: 1. Prices are on FOR destination basis, with no scope of escalation. 2. Warranty for a period of 60 months will be count from the date of satisfactory installation.		

Therefore, as per direction you are requested to supply the above item in Department of Common Equipment, as per terms and conditions of the tender quoted in your referenced tender as above.

Following terms and conditions will be applied: —

1. The confirmation of the receipt of the purchase order should reach within seven days of date of dispatch of order.
2. Security money equivalent to 5% of ordered value must be submitted to the Finance Officer, King George's Medical University U.P., Lucknow only in shape of **FDR/BG of Nationalized/Scheduled Bank for 63 months** (payable at Lucknow) in favour of Finance Officer, King George's Medical University, U.P., Lucknow within fifteen days from the date of dispatch of this order.
3. The supply of the equipment/instruments should be performed within 90 days for inland items and 120 days for imported items from the date of issue of this order in Department of Common Equipment, KGMU, Lucknow. The equipment has to be installed at such a place as may be identified and instructed by the I/c, Equipment Cell. The installation shall be at your cost.
4. The supplied item shall be inspected and accepted only after successful installation, commissioning, and performance verification by the concerned department.
5. Supplier shall provide on-site installation, demonstration and training at no additional cost (if applicable).
6. 100% payment will be released upon successful delivery , installation, and commissioning as per the terms of the tender.
7. Delay in supply beyond the stipulated period will attract a penalty as per tender terms and may forfeit security/EMD.
8. **Fall Clause:** The prices charged for the equipment/instruments supplied under this Purchase Order shall in no case exceed the lowest price at which the supplier sells or offers to sell equipment of the

CamScanner

same or similar description to any other organization, institution or government department during the currency of this order. If, at any time during the said period, the supplier reduces the sale price of such equipment or sells or offers to sell such equipment to any other buyer at a price lower than that charged to KGMU, Lucknow, the supplier shall immediately inform KGMU authorities of such reduction. The price payable under this Purchase Order shall be correspondingly reduced with effect from the date of such lower sale. Any excess amount paid, if found, shall be recoverable by KGMU, Lucknow from pending bills or through any other lawful means.

9. In addition to those mentioned in this order, all the terms and conditions of the tender documents referred and technical specification shall be applicable and are deemed to be integral part of this Purchase Order.

Yours sincerely,

(Amit Kumar Singh)
Joint Director (MM)

Ref. ...../F&AO/MM/2025 **Date: / /2025**

Copy to. :

1. The ***Head/In-charge,*** **Equipment Cell** with the request to kindly make it convenient to receive the supply of the above ordered equipment(s), issue instructions for installation and verify the satisfactory commissioning of the equipment along with:
   a. Proper verification of the goods as per tender specifications.
   b. Installation verification certificate to your satisfaction.
   c. Commissioning/Functioning report to your satisfaction to be provided.
2. Finance Officer, KGMU, Lucknow.
3. P.S. to Vice Chancellor for kind perusal to Hon'ble Vice Chancellor.

Joint Director (MM)

CamScanner

Annexure-1

Accessories for existing Surgical Workstation, electrosurgical Units

SL	Art	Description	Qty	Value Incl GST Per Pcs	Total Value Incl GST
1	20195-134	Instrument Reuse LAP forceps, Maryland	10	282240	2822400
2	20195-224	Instrument Reuse Bipolar E LAP forceps, fenestrated, deep ribbed, shaft ø 5 mm, length 340 mm;Pack of 01 Pcs	10	282240	2822400
3	20195-229	Instrument Reuse BiClamp E LAP forceps, Kelly, semi-deep, shaft Ø 5 mm, length 340 mm; with connecting cable 4 m and MF plug Pack of 01 Pcs	5	282240	1411200
4	20195-246	Instrument Reuse BiClamp E LAP forceps, Maryland, semi-deep, shaft ø 5 mm, length 340 mm; with connecting cable 4 m and MF plug Pack of 01 Pcs	5	282240	1411200
5	20195-204	20195-204 Instrument Reuse Instrument Reuse LAP BiSect Micro, shaft ø 5 mm, length 350 mm; complete instrument Pack of 01 Pcs	15	282240	4233600
6	20195-202	Instrument Reuse,Open Vessel Sealer Biclamp 201 T / 271 T, e.g. intestinal surgery . Pack of 01 Pcs	15	160092	2401380
7	20195-221	Instrument Reuse,Open Vessel Sealer Biclamp 150 C e.g. Thyroidectomy. Pack of 01 Pcs	5	160092	800460
8	21195-400	Instrument S/U Tripolar Tissue Navigation Instrument for Open Surgery Surgery Trisect Rapid Trisect Rapid 200, Bent 17 mm shaft L-140 mm with connectingcable L- 4 m Pack of 01 Pcs	15	68735	1031025
9	21195-401	Instrument S/U Tripolar Tissue Navigation Instrument for Open Surgery Surgery Trisect Rapid Trisect Rapid 200, Bent 17 mm shaft L-200 mm with connectingcable L- 4 m Pack of 01 Pcs	75	68735	5155125
10	21195-402	Instrument S/U Tripolar Tissue Navigation Instrument for Bariatrc Surgery Surgery Trisect Rapid 350, Bent 17 mm shaft L-350 mm with connectingcable L- 4 m Pack of 01 Pcs	75	56500	4237500
11	20195-512 / 507 / 509	Reusable Non Sticky Bipolar forceps, straight Box of 01 Pcs Shelf Life 50-100 Procedures	25	75625	1890625
12	20195-537/ 538 / 540 / 545 / 553	Reusable Non Sticky Bipolar forceps, bayonet Pack of 02 Pcs Shelf Life 50-100 Procedures	50	136143	6807150
13	20196-053 / 055	Reusable Bipolar connecting cable Shelf Life 50-100 Procedures	100	18297	1829700
14	21191-361	Spatula electrode, straight, insulated, 2.3 x 19 mm, length 45 mm; Pack of 20 Pcs Single use	50	10231	511550
15	21191-461	Coated spatula electrode, straight, isolated, 2.3 x 19 mm, length 50 mm; Pack of 10 Pcs Single use	50	10231	511550
16	21191-455	Coated spatula electrode, straight, isolated, 2.3 x 19 mm, length 83 mm; Pack of 10 Pcs Single use	10	10231	102310
17	20191-179	Reusable Hook electrode, flat, Ø 5 mm, shaft insulated, length 350 mm; incl. electrosurgical pencil with 2 buttons with Reusable Monopolar Connecting Cable VIO for ESU Pencil Hook Electrode with Monopolar Cable (20192-110) - Shelf Life 50-100 Procedures	5	81144	405720
18	20150-060	HybridKnife, T-type, full-stream, ø 2.3 mm,length 1.9 m; with connecting plug international (3-Pin) Per Pcs	4	50098	200392
19	20150-061	HybridKnife, I-type, full-stream, ø 2.3 mm,length 1.9 m; with connecting plug international (3-Pin) Per Pcs	4	50098	200392
20	20132-221	FiAPC probe 2200 A, ø 2.3 mm, flexible, length 2.2 m; with instrument recognition and integrated filter Per Pcs	5	19656	98280
21	20132-224	FiAPC probe 2200 SC, ø 2.3 mm, flexible, length 2.2 m; with instrument recognition and integrated filter Per Pcs	5	19656	98280
22	20150-036	Applicator, straight, with monopolar electrosurgical function, ø 6 mm, length 80 mm; with suction, e.g. for liver surgery Box of 04 Pcs Single Use	10	112014	1120140
23	20150-301	Pump Cartedge for water jet Box of 05 Pcs Single Use	5	57330	286650
24	800000-001	Diverse VIO + Jet Cart - Shelf Life 12 months from date of Installation	7	80000	560000

CamScanner

25	10160-003 + 10135-000	Argon plasma coagulator with tripolar tissue navigation software ,RF energy source ;- 10160-000 - Vio3 with Trisect Software + Two Peddal Footswitch & One Peddal Footswitch + 10135-000 - APC 3 with Pressure Reducer + Argon Gas Cylinder Imported & 800000-001 Vio3 + APC3 Cart	2	3700000	7400000
26	20189-302	100% Washable, remode Monopolar (Two) foot switch VIO D / S - Shelf Life 500 Procedures or 12 months from date of Installation - Per Pcs	10	81775	817750
27	20188-300	100% Washable, Bipolar (One) foot switch VIO D / S - Shelf Life 500 Procedures or 12 months from date of Installation - Per Pcs	10	57824	578240
				Total	49745019

Joint Director (MM)
King George's Medical University U.P.,
Lucknow

CamScanner

PO 2024

74

अनुबंध | Contract

अनुबंध क्रमांक | Contract No: GEMC-511687794111318
अनुबंध तिथि | Generated Date : 20-Jun-2024
बोली/आरए/पीबीपी संख्या | Bid/RA/PBP No.: GEM/2023/B/3893041

संगठन विवरण | Organisation Details

प्ररूप | Type :	State Autonomous
मंत्रालय | Ministry :	-
विभाग | Department :	Medical Education Department Uttar Pradesh
संगठन का नाम | Organisation Name :	N/A
कार्यालय क्षेत्र | Office Zone:	Lucknow

खरीदार विवरण | Buyer Details

पद | Designation :	Incharge Common Equipment
संपर्क नंबर | Contact No. :	0522-2258880-
ईमेल आईडी | Email ID :	buyer22.medup.up@gembuyer.in
जीएसटीआईएन | GSTIN :	-
पता | Address :	King George Medical University, Shahmina Road, Chowk, Lucknow, LUCKNOW, UTTAR PRADESH-226003, India

वित्तीय स्वीकृति विवरण | Financial Approval Detail

आईएफडी सहमति | IFD Concurrence :	No
प्रशासनिक अनुमोदन का पदनाम | Designation of Administrative Approval:	VC kgmu
वित्तीय अनुमोदन का पदनाम | Designation of Financial Approval :	VC kgmu

भुगतान प्राधिकरण विवरण | Paying Authority Details

Role:	PAO
भुगतान का तरीका | Payment Mode:	Offline
पद | Designation :	FO
ईमेल आईडी | Email ID :	vinai.77354@gov.in
जीएसटीआईएन | GSTIN :	N
पता | Address:	King George Medical University, Shahmina Road, Chowk, Lucknow, LUCKNOW, UTTAR PRADESH-226003, India

विक्रेता विवरण | Seller Details

जेम विक्रेता आईडी | GeM Seller ID :	22C2180000116141
कंपनी का नाम | Company Name :	M/S PEE VEE ENTERPRISES
संपर्क नंबर | Contact No. :	09415020996
ईमेल आईडी | Email ID :	peevee132@gmail.com
पता | Address :	42,Valmiki Marg,Lalbagh,Hazratganj, Lucknow, UTTAR PRADESH-226001, -
एमएसएमई पंजीकरण संख्या | MSME Registration number :	UDYAM-UP-50-0014276
एमएसई सामाजिक श्रेणी | MSE Social Category :	General
एमएसई लिंग श्रेणी | MSE Gender :	Male
जीएसटीआईएन | GSTIN:	09ADWPA7911R1ZO (R) , (M)

*जिसके नाम के पक्ष में GST/TAX इनवॉइस पेश किया जाएगा | GST / Tax invoice to be raised in the name of - Buyer

वितरण निर्देश | Delivery Instructions : NA

उत्पाद विवरण | Product Details

#	आइटम विवरण | Item Description	आइटम विवरण | Ordered Quantity	इकाई | Unit	इकाई मूल्य (INR) | Unit Price (INR)	कर विभाजन (INR) | Tax Bifurcation (INR)	मूल्य (INR में सभी शुल्क और कर सहित) | Price (Inclusive of all Duties and Taxes in INR)
1	उत्पाद का नाम | Product Name : Accessories for Erbe Machine (Department of Common Equipment Cell) ब्रांड | Brand : Erbe Medical India Pvt. Ltd. ब्रांड प्रकार | Brand Type : Unbranded कैटलॉग की स्थिति | Catalogue Status: Catalogue not verified by OEM कैसे बेचा जा रहा है | Selling As : Reseller not verified by OEM श्रेणी का नाम और चतुर्थांश | Category Name & Quadrant : Accessories for Erbe Machine (Department of Common Equipment Cell) (Q3) मॉडल | Model: ERBE एचएसएन कोड | HSN Code: HSN not specified by seller	1	pieces	29,316,489	NA	29,316,489
कुल ऑर्डर मूल्य | Total Order Value (in INR)						29,316,489

परेषिती विवरण | Consignee Detail

क्र.सं. | S.No	परेषिती | Consignee	वस्तु | Item	लॉट नंबर | Lot No.	मात्रा | Quantity	दिनांक के बाद डिलीवरी शुरू करना है | Delivery Start After	वितरण पूरा कब तक करना है | Delivery To Be Completed By

1	पद | Designation : - ईमेल आईडी | Email ID : buyer22.medup.up@gembuyer.in संपर्क | Contact : 0522-2258880- जीएसटीआईएन | GSTIN : - पता | Address : King George Medical University, Shahmina Road, Chowk, Lucknow, LUCKNOW, UTTAR PRADESH-226003, India	Accessories for Erbe Machine (Department of Common Equipment Cell)	-	1	20-Jun-2024	18-Sep-2024

Product Specification for Accessories for Erbe Machine (Department of Common Equipment Cell)

विनिर्देश | Specification	उप-विनिर्देश | Sub-Spec	मूल्य | Value
Custom Specification	Custom Specification	Yes

व्यापक रखरखाव के लिए शुल्क \| Comprehensive maintenance charges for Accessories for Erbe Machine (Department of Common Equipment Cell)

सेवा वर्ष | Service Year	सीएमसी प्रतिशत | CMC Percentage	कर द्विभाजन | Tax Bifurcation
CMC charges for 1 st year after warranty period in % of cost of equipment	3%	NA
CMC charges for 2 nd year after warranty period in % of cost of equipment	3%	
CMC charges for 3 rd year after warranty period in % of cost of equipment	3%	
CMC charges for 4 th year after warranty period in % of cost of equipment	3%	
CMC charges for 5 th year after warranty period in % of cost of equipment	3%	

विक्रेता विशिष्टता दस्तावेज़ \| Seller Specification Document:

1. SpecificationDocument1	mkp.gem.gov.in/catalog_data/catalog_support_document/13/45/664/CatalogAttrs/SpecificationDocument/2023/9/14/2023_09_14_10_01_44_specs-3893041_2023-09-14-10-01-45_fc17c98dd34e1fab887d2d9e5f65dc63.pdf

खरीदार विशिष्टता दस्तावेज़ \| Buyer Specification Document:

1. SpecificationDocument	mkp.gem.gov.in/catalog_data/catalog_support_document/buyer_documents/558974/54/78/703/CatalogAttrs/SpecificationDocument/2023/8/30/specification_compressed_2023-08-30-11-29-14_ba58a83b153bc8df13288a06aef02998.pdf

सीएमसी के लिए अतिरिक्त खंड \| Additional Clauses for CMC

1.CMC shall include preventive maintenance including calibration as per technical/ service /operational manual of the manufacturer, service charges and spares, after satisfactory completion of Warranty. During the CMC period commencing from date of the successful completion of warranty period, Service personnel shall visit each consignee site as recommended in the manufacturer's technical/ service /operational manual, at least once in six months or as per user requirement. Cost of consumables shall not be included in CMC.Further there will be 98% uptime warranty during CMC period on 24 (hrs) X 7 (days) X 365 (days) basis, with penalty, to extend CMC period by double the downtime period.
2.CMC charges to be indicated as percentage of cost of equipment quoted for each year after the warranty period.
3.GST shall be included in the CMC Charges quoted.
4.Cost of CMC will be added for Ranking/Evaluation purpose with depreciation formula.A 10% discounting rate per year shall be applied on CMC Charges for price evaluation on Net Present Value.
5.The payment of CMC will be made on quarterly basis after satisfactory completion of said period, duly certified by end user.
6.While creating a bid or RA, buyers shall indicate whether CMC is required against Yes/No" options. If CMC Charges are included, an option for number of years for CMC required after the warranty period shall be available.Under this option up to 10 years can be chosen for CMC charges beyond warranty period.
7.In case the bid has a provision for CMC, the warranty of the product will also be deemed to have been converted into Comprehensive warranty including preventive maintenance and calibration as per technical/ service /operational manual of the manufacturer, service charges and spares, during the Warranty Period also. Sellers are therefore advised to include the cost of Comprehensive Warranty including spares (excluding consumables) also in product Cost.
8.The CMC functionality shall be available in bid only and no direct RA shall be applicable.In case of bid to R/A decrement rules shall be applicable on total price inclusive of CMC charges. Bunching of products shall not be available while creating bids with CMC charges.

8.1.Buyer shall indicate number of years of warranty by selecting different options available in the field depending on warranty parameter applicable in category parameters for the equipment. No. of years of warranty indicated here shall supersede the warranty period indicated elsewhere in bid or product specifications. The Seller while participating in Bid/RA will get fields to indicate CMC charges as percentage depending on number of years of CMC selected by Buyer. The following shall be applicable, if 5 year CMC selected:

CMC charges for 1st year after warranty period– Percentage to be indicated- A1
CMC charges for 2nd year after warranty period– Percentage to be indicated- A2
CMC charges for 3rd year after warranty period – Percentage to be indicated- A3
CMC charges for 4th year after warranty period – Percentage to be indicated- A4
CMC charges for 5th year after warranty period – Percentage to be indicated- A5

Similarly, A6 to A10 are to be indicated for 6th to 10th year of CMC if applicable.

8.2.The calculation of CMC Charges shall take into account the number of years of warranty and duration of CMC as specified while creating bid.
8.3.In the price evaluation, the system shall provide function to calculate the cost of each equipment by formula indicated below includingCMC and then show the inter-se-ranking of the bidders. The following are the variables

(i) Number of years for which CMC required.
(ii) Number of years of product warranty

The formula for calculating total cost including CMC charges shall be as under:
Total Cost for evaluation=
C+C*((A1/100)/(1.10^n)+(A2/100)/(1.10^n+1)+(A3/100)/(1.10^n+2)+(A4/100)/(1.10^n+3)+(A5/100)/(1.10^n+4)) and so on

C – Cost for equipment quoted and n shall be number of years of product warranty specified.
If 2 year warranty specified, n shall be2 and if 5 year warranty specified, n shall be 5. A1,A2, A3, A4& A5shall depend on how many years CMC selected. For3 yearCMC. only A1,A2 and A3 factors are to be taken into account and A4 and A5 will not be applicable.
8.4.CMC charges offered for each subsequent year should be same or higher than preceding year.
8.5.The CMC charges shall be offered within range of 3 to 10% of cost of equipment.

9.Since CMC charges are to be paid only later for each year during CMC period,applicable performance guarantee amount after placement of contract shall be based on the cost of equipment excluding the cost of CMC Charges.
10.Performance bank guarantee applicable for CMC is to be submitted at start of the CMC and shall be applicable between 2.5% to 10% as specified in bid on total CMC Charges.The PBG submitted after award of contract shall be released only after new PBG for the CMC period is submitted and accepted by buyer/consignee after due verification.Bank guarantee for CMC is to remain valid till completion of CMC period plus one year. The bank guarantee for CMC shall be submitted to buyer directly. In case, seller fails to submit the PBG or does not provide services for the CMC contract after expiry of warranty period then PBG of equipment shall be forfeited.
11.In case of splitting of order quantity, equipment cost and CMC charges offered by L1 bidder shall be matched by higher quoting eligible bidders on one-to-one basis.The equipment cost and CMC charges (year to year) shall be matched individually.
12.The CMC Contract shall be an offline contract to be handled by buyer.The payment of CMC will be made on quarterly basis after satisfactory completion of said period, duly certified by end user and scope of CMC will be as per para 1 above.

मूल्य द्विभाजन एक्सेल फ़ाइल विवरण|Price Bifurcation Excel File details: PRICE DETAILS

ईपीबीजी विवरण | ePBG Detail

सलाहकार बैंक | Advisory Bank :	State Bank of India
ईपीबीजी प्रतिशत (%) | ePBG Percentage(%):	10.00

बोली लगाने वाले को बोली के नियमों और शर्तों के अनुसार लागू ईपीबीजी प्रस्तुत करना होगा |The bidder shall furnish ePBG as applicable as per bid's terms and conditions

नियम और शर्तें|Terms and Conditions

1. General Terms and Conditions-

1.1 This contract is governed by the General Terms and Conditions, conditions stipulated to this Product/Service as provided in the Marketplace.
1.2 This Contract between the Seller and the Buyer, is for the supply of the Goods and/ or Services, detailed in the schedule above, in accordance with the General Terms and Conditions (GTC) unless otherwise superseded by Goods / Services specific Special Terms and Conditions (STC) and/ or BID/Reverse Auction Additional Terms and Conditions (ATC), as applicable

2. Buyer Added Bid Specific Terms and Conditions-

2.1 *Generic*
OPTION CLAUSE: The Purchaser reserves the right to increase or decrease the quantity to be ordered up to 25 percent of bid quantity at the time of placement of contract. The purchaser also reserves the right to increase the ordered quantity by up to 25% of the contracted quantity during the currency of the contract at the contracted rates. Bidders are bound to accept the orders accordingly.

2.2 *Buyer Added Bid Specific ATC*:
Buyer uploaded ATC document Click here to view the file .

पुर्जों / उपभोग्य सामग्रियों के लिए प्रस्तावित मूल्य|Price Offered for Spares / Consumables:

पुर्जों / उपभोग्य सामग्रियों के दस्तावेज़ लिंक के लिए प्रस्तावित मूल्य|Price Offered for Spares / Consumables Document link

नोट: यह सिस्टम जनरेटेड फाइल है। कोई हस्ताक्षर की आवश्यकता नहीं है। इस दस्तावेज़ का प्रिंट आउट भुगतान/लेनदेन उद्देश्य के लिए मान्य नहीं है।

Note: This is system generated file. No signature is required. Print out of this document is not valid for payment/ transaction purpose.

KGMU U.P., Lucknow

Scope of Supply

Annexure-1

Ref-: Order/contract no. GEMC-511687794111318 dt. 20.06.2024 for supply of Accessories for Erbe Machines for Department of Common Equipment.

S.I.	Item Code	Description	Quoted Qty	Current Rates Per Unit (Incl. GST)	Total Value	Modified Qty	Total Modified Value
1	20195-134	**LAP forceps, Marytand,** semi-deep ribbed, shaft ø 5 mm, non-adhesive coating, length 340 mm; with connecting cable 4 m and MF plug, complete instrument . Per Pcs	10	282240.00	2822400	10	2822400
2	20195-204	**Lap Vessel Sealer LAP BiSect** Micro, shaft ø 5 mm, length 350 mm, complete instrument Per Pcs	10	282240.00	2822400	5	1411200
3	20195-202	**Open Vessel Sealer Biclamp 201 T** bent 18°, smooth, length 200 mm; with connecting cable 4 m and MF plug, with thermal insulation, **for open surgical procedures, e.g. intestinal surgery** . Per Pcs	10	160091.96	1600919.6	10	1600919.6
4	20195-221	**Open Vessel Sealer Biclamp 150 C** bent 23°, smooth, length 150 mm; with connecting cable 4 m and MF plug, with thermal insulation, **for open surgical procedures, e.g. thyroidectomy surgery** . Per Pcs	10	160091.96	1600919.6	5	800459.8
5	20195-200	**Open Vessel Sealer Biclamp 210** bent 25°, smooth, length 210 mm; with connecting cable 4 m and MF plug, with thermal insulation, **for open surgical procedures, e.g. Vaginal Hysterectomy surgery** . Per Pcs	5	160091.96	800459.8	5	800459.8
6	20132-221	**FIAPC Probe 2200 A,** Dia 2.3 mm, Flexible L- 2.2 m with instrument recognition & integrated Filter - Per Pcs	100	19656.00	1965600	100	1965600
7	20132-224	**FIAPC Probe 2200 SC,** Dia 2.3 mm, Flexible L- 2.2 m with instrument recognition & integrated Filter - Per Pcs	40	19656.00	786240	40	786240
8	20132-225	**FIAPC Probe 2200 C,** Dia 2.3 mm, Flexible L- 2.2 m with instrument recognition & integrated Filter - Per Pcs	40	19656.00	786240	40	786240
9	**20195-505 / 506 / 507**	**Reusable Non Sticky** Bipolar forceps, straight, tip Pointed 0.2 mm / Very Fine 0.4 mm / 0.7 mm, **fine /length 185 mm** Per Pcs	50	75625.00	3781250	50	3781250
10	**20195-536/ 537/ 538/ 539 540 / 541**	**Reusable Non Sticky** Bipolar forceps, bayonet, tip very fine 0.4 mm /fine 0.7 mm,/Blunt 1.0 mm / blunt 1.2 mm / blunt 2.0 mm / blunt 1.2 mm Angled upward - downward, **length 200 mm** Per Pcs	50	136142.89	6807144.5	50	6807144.5
11	**20196-055 / 053**	**Reusable** Bipolar connecting cable, Valleylab and non-Erbe units (2-Pin 28 mm), 4 m; for bipolar forceps with european flat plug .	120	18297.30	2195676	120	2195676
12	20183-053	**Reusable,** Bipolar adaptor, VIO, BI 8 / 4 mm,2- Pin 22 mm for Karl Sorz Instruments	4	18297.30	73189.2	4	73189.2
13	20192-113 / 117	**Reusable,** Monopolar connecting cable, VIO, ø 8 mm (Bovie Jack), 4 m; for CUT and COAG MIS instruments, with connection ø 4 mm .	20	18297.30	365946	20	365946
14	20150-050	**Water Jet** HybridKnife, T-type, full-stream, ø 2.3 mm, length 1.9 m; with connecting plug international (3-Pin) for Gastro procedures (Box of 05 Pcs)	3	250488.00	751464	3	751464
15	20189-302	100% Washable, remode bipolar foot switch vio	5	81774.99	408874.95	5	408874.95
16	20188-300	100% Washable, remode Monopolar foot switch vio	5	57823.99	289119.95	5	289119.95
17	GIA80MTC	Open Stapling Cartridge (60 mm Tri-stapler technology)	300	8519.28	2555784	250	2129820
18	EGIA60AMT	Laproscopic Stapling Cartridges (60 mm Tri-staple technology)	100	15404.85	1540485	100	1540485
						Total =	29316488.80 R/o 29316489

Finance Officer,
KGMU, Lucknow

किंग जार्ज चिकित्सा विश्वविद्यालय उ0प्र0, लखनऊ

शल्य चिकित्सा विभाग(जन0)

सं0 158 दि0: 24/09/2026

सेवा में,

प्रभारी
कामन इक्यूपमेंट सेल
किंग जार्ज चिकित्सा विश्वविद्यालय उ0प्र0
लखनऊ

विषय : वर्ष 2026–27 के लिए आपरेशन कक्षो मे स्थापित उपकरणो (Make-ERBE) के लिए सहायक उपकरणो/औजारोकी वार्षिक आवश्कता के सम्बन्ध में ।

महोदय,

अवगत कराना है कि आपके कार्यालय पत्र सं0 सी0ई0/2026/860 दिनांक 16.09.2026 के सन्दर्भ में सर्जरी विभाग(जन0) के आपरेशन कक्षो में स्थापित उपकरणो (Makde-ERBE) में प्रयोग होने वाले सहायक उपकरणो/औजारो की वार्षिक आवश्कता की सूची संलग्न कर आपको सूचर्ना एवं आवश्यक कार्यवाही हेतु प्रेषित की जा रही है।

सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित ।

संलग्नकः–उपरोक्तानुसार

भ व दी य

24/9/2026

विभागाध्यक्ष, सर्जरी विभाग(जन0)
किंग जार्ज चिकित्सा विश्वविद्यालय, उ0प्र0 लखनऊ

Department of Surgery
KGMU Lucknow

Sl	Description	Demanded Qty
1.	20150-030 Erbe Jet Probe / Applicator for Open Surgery, Straight L-65 mm with Suction for Liver Surgery	40
2.	20150-301 Erbe Jet Pump Cartridge for Liver resection	40
3.	20132-250 Erbe APC3 Open Applicator with filter shaft 35 mm rigid Spatula Electrode with connecting cable 3m	10
4.	20191-184 Erbe Reusable Hook Electrode round Dia 5 mm, shaft insulated L- 320 MM, Incl electro surgical pencil with two buttons	10
5.	Monopolar Connecting Cable – 20192-110	10
6.	20193-083 Erbe Cautery Pad (for performing approx. 8000 - 10000 plus major / minor cases annually for operational total 08 OT Tables in dept.)	8000
7.	20190-106 Erbe Electro Cautery Pencil – (for performing approx. 8000 - 10000 plus major / minor cases annually for operational total 08 OT Tables in dept.)	8000
8.	20196-055 Erbe Reusable Bipolar Lead / Cables for reusable bipolar forceps – (for performing approx. 8000 - 10000 plus major / minor cases annually for operational total 08 OT Tables in dept.)	15
9.	20195-537 Erbe Reusable Bipolar Forceps Bayonet tip fine – (for performing approx. 8000 - 10000 plus major / minor cases annually for operational total 08 OT Tables in dept.)	10
10.	20195-134 Erbe Reusable Lap Surgery Dissector Lap Maryland (for performing approx. 5000 plus Major cases annually for 08 OT Tables – 02 Instrument Per OT Table)	16
11.	20195-204 Erbe Reusable Lap Surgery Dissector Lap Bisect (for performing approx. 5000 plus Major cases annually for 08 OT Tables – 02 Instrument Per OT Table)	16
12.	20195-200 Erbe Reusable Open Surgery Vessel Sealer Biclamp 210 for Vaginal Hysterectomy (for performing approx. 5000 plus Major cases annually for 03 OT Tables – 02 Instrument Per OT Table)	04
13.	21195-401 Erbe Tripolar Instrument – Dissector, Coagulator, Sealer & Cutter for open Surgery – Trisect Rapid 200	30
14.	21195-400 Erbe Tripolar Instrument – Dissector, Coagulator, Sealer & Cutter for Open Surgery – Trisect Rapid 180	30
15.	21195-402 Erbe Tripolar Instrument – Dissector, Coagulator, Sealer & Cutter for Lap Surgery – Trisect Rapid 350	50
16.	20188-303 Erbe Two Pedal Vio3 Foot Switch for CMC covered Energy Source shelf life 500 – 1000 procedures	04
17.	Erbe Reusable Bipolar Forceps Straight	10

Head of Department of Surgery (Gen.)
K.G.'s Medical University U.P., Lucknow

Phone office: 0522-2256543

King George's Medical University, U.P., Lucknow-226003
DEPARTMENT OF UROLOGY

Ref....877/URO

Date: 23/09/26

सेवा में,

प्रभारी,
कॉमन इक्यूपमेंट सेल,
के0जी0एम0यू0, लखनऊ।

महोदय,

कृपया आपके पत्र संख्या-CE/2026/860 दिनांक 16.09.2026 का संदर्भ ग्रहण करें, जिसके अन्तर्गत यूरोलॉजी विभाग से Erbe/Harmonic Scalpal Accessories से सम्बंधित मांगी गयी सूचना निर्धारित प्रारुप पर अंकित कर आपके समक्ष अग्रिम आवश्यक कार्यवाही हेतु प्रेषित।

धन्यवाद।

भवदीय,

(विभागाध्यक्ष)
यूरोलोजी विभाग,
के0जी0एम0यू0, लखनऊ।

King George's Medical University, Lucknow

Common Equipment Cell

64

Ref No. CE/2026/860 Date: 16/09/2026

To,

The Head,

1. Department of Neurosurgery,
2. Department of ENT,
3. Department of General Surgery,
4. Department of Obstetrics & Gynae,
5. Department of Pediatric Surgery
6. Department of Thoracic Surgery
7. Department of Plastic Surgery
8. Department of Urology
9. Department of Medicine(Endoscopy)
10. Department of DPMR
11. Department of Endocrine Surgery
12. Department of Surgical Oncology
13. Department of Surgical Gastroentrology
14. Department of PCCM
15. Department of Medical Gastroentrology
16. Department of Orthopedic Surgery
17. Department of Sports Medicine
18. Department of Pediatric Orthopedic
19. Department of Gynae Oncology
20. Department of Vascular Surgery
21. Department of Nephrology
22. Department of OMFS

King George's Medical University,
Lucknow.

Subject: Annual requirement of Essential accessories for installed Energy sources-[Erbe] for Financial Year 2026-27.

Respected Sir/Ma'am,

This is to inform you that Equipment Cell is compiling the requirement of essential accessories for installed **Energy platform- Erbe .** for Financial Year 2026-27.

Kindly provide the details in given format within 7 working days.

BASIC INFORMATION FOR INSTALLED ENERGY SOURCE- ERBE IN DEPARTMENTS.

	EQUIPMENT	MAKE/MODEL	TOTAL QUANTITY	NO. OF UNITS IN WARRANTY	NO. OF UNITS IN CMC CONTRACT.
1-	Courtesy Pad	ERBE 20193-083	1000 Pics (one thousand)	03	03
2-	Electro Courtesy Pencil	ERBE 20190-106	1000 Pics (one thousand)	"	"
3-	Reusable Bipolar Cable for Bipolar forceps	ERBE 20196-055	10 Pics	"	"
4-	Reusable Bipolar open vessel sealer Biclamp	ERBE 201 T	02 Pics	"	"

King George's Medical University, Lucknow

Common Equipment Cell

64

Ref No. Date:

5-	Vio-3 Remote Two Peddal foot switch	ERBE 20189-351	02 Pics	03	03
6-	APC applicator OPEN 100 mm	ERBE 20132-250	02 Pics	02	02
7-	APC applicator LAP 350mm	ERBE 20132-254	02 Pics	02	02
8-	Spatula Eelctrode Straight, 2.3X 19mm, lenght 120mm	ERBE 21191-153	10 Pics	03	03
9-	"	ERBE 21191-155	05 Pics	03	03
10-	Trisect Rapide(LAP)	ERBE 21195-402	20 Pics (5 Box)	02	02

Thanks and kind regards,

Incharge/ Co- Incharge
Common Equipment Cell
KGMU, Lucknow.

Nishant 21/09/26

Store/ Dr. Bhupendra Sister Bharati Nishad

OT

Sd → 4 Sep 16/9/26

63

King George's Medical University U.P., Lucknow

DEPARTMENT OF THORACIC SURGERY

Website: www.kgmcindia.edu

Ref No: 419/TH/26 Date: 19/09/2026

To,

Incharge
Common Equipment
King George's Medical University,
Lucknow

Subject Requirement of Essential capital Equipment for the department of Thoracic Surgery.

Sir ,

Refer to our letter no CE/2026/860 dated 16-09-2026. In this regard we require below mentioned Essential capital equipment for the Thoracic Surgery we seek your support towards availability of below mentioned single use/reusable accessories required for installed Energy source -Erbe in our operation Theatre.

SL	Art. No.	Description	Qty
1	21195-134	Re-usable- BiClamp LAP forceps, Maryland, MF-2, semi-deep ribbed, shaft Ø 5 mm, non-adhesive coating, length 340 mm; with connecting cable 4 m and MF-2 plug, complete instrument	2
2	20195-204	Re-usable- LAP BiSect Micro, shaft ø 5 mm, length 350 mm; complete instrument	4
3	21195-202	Re-usable- BiClamp 201 T, MF-2, bent 18°, smooth, length 200 mm; with connecting cable 4 m and MF-2 plug, with thermal insulation, for open surgical procedures, e.g. intestinal surgery	4
4	21195-221	Re-usable- BiClamp 150 C, MF-2, bent 23°, smooth, length 150 mm; with connecting cable 4 m and MF-2 plug, with ceramic coating, e.g. for thyroidectomy	4
5	21195-200	Re-usable- BiClamp 210, MF-2, bent 25°, corrugated, length 210 mm; with connecting cable 4 m and MF-2 plug, with corrugated surfaces, e.g. for vaginal hysterectomy	4
6	20191-184	Re-usable- Hook electrode, round, Ø 5 mm, shaft insulated, length 320 mm; incl. electrosurgical pencil with 2 buttons with Moniopolar connecting cable (20192-110)	2
7	20192-113	Re-usable- Monopolar connecting cable, VIO, ICC, ACC, International ø 8 mm (Bovie Jack), 4 m; for CUT and COAG MIS instruments, with connection ø 4 mm	10
8	20193-083	Single Use- Erbe NESSY Ω, split, VIO, ICC, ACC, non-ERBE units, International; contact surface 85 cm^2, equiptential ring 23 cm^2, with connecting cable 4 m	1000
9	20190-106	Single Use- Electrosurgical pencil with 2 buttons, VIO, ICC, ACC, non-Erbe units, International; with connecting cable 3 m, with spatula electrode without protective holster	1000
10	20189-302	Re-usable- Two-pedal foot switch for VIO D/S, AP & IP X8 equipment; with connecting cable 5m	4
11	20188-300	Re-usable- One-pedal foot switch for VIO D/S, AP & IP X8 equipment; with connecting cable 5m	4
12	21195-402	Instrument S/U Tripolar Tissue nevigation instrument for Laproscpic surgery Trisect rapid -350	4

You are requested to please in corporate our requirement in interest of providing safest & advanced patient care by the department in future.

Thanks & Regards

(Dr. Anurag Rai)
Head
Department of Thoracic Surgery

Dr. Anurag Rai
Head
Department of Thoracic Surgery
KGMU, Lucknow

KING GEORGE'S MEDICAL UNIVERSITY
Department of Obstetrics and Gynaecology
Lucknow-226003

किंग जार्ज चिकित्सा विश्वविद्यालय
प्रसूति एवं स्त्री रोग विभाग
लखनऊ–226003

NAAC A++ accredited

Website: www.kgmu.org | Email: qmhoffice@kgmcindia.edu

Ref. No.- OG/3790/25

Dated: 24/09/26

To,

The Faculty Incharge
Common Equipment Cell
King George's Medical University,
Uttar Pradesh, Lucknow.

Dear Sir,

In reference to your letter no CE/2026/860 dt. 16.09.2026, the annual requirement of essential accessories for installed Energy sources [Erbe] for financial Year 2026-27 for this department. is mentioned as under:-

Sl	Description	Quantity	
		Elective OT	Emergency OT
1	20193-083 Cautery Pad	4000	6000
2	20190-106 Electro Cautery Pencil	4000	6000
3	20196-055 Reusable Bipolar Lead / Cable for reusable bipolar forceps	0	2
4	20195-134 Instrument Reuse LAP forceps, Maryland	20	0
5	20195-204 Instrument Reuse Instrument Reuse LAP BiSect Micro, shaft 5 ø mm, length 350mm; complete instrument	15	0
6	20195-202 Instrument Reuse, Open Vessel Selaer Biclamp 201 T, e.g. intestinal surgery	10	0
7	21195-400 Instrument S/U Tripolar Tissue Navigational Instrument for Open Surgery Trisect Rapid Trisect Rapid 200, Bent 17 mm shaft L-140 mm with connecting cable L-4 m	5	0
8	21195-401 Instrument S/U Tripolar Tissue Navigation Instrument for Open Surgery Trisect Rapid Trisect Rapid 200, Bent 17 mm shaft L-200 mm with connecting cable L-4 m	5	0
9	21195-402 Instrument S/U Tripolar Tissue Navigation Instrument for Open Surgery Trisect Rapid Trisect Rapid 350, Bent 17 mm shaft L-350 mm with connecting cable L-4 m	30	0
10	Reusable Non Sticky Bipolar forceps, straight	5	0
11	Reusable Non Sticky Bipolar forceps, bayonet	5	0
12	20196-055 / 053 /045 Reusable Bipolar connecting cable	5	0
13	20192-113 / 117 Reusable Monopolar Cable	5	0
14	20191-179 / 184 Reusable Hook electrode, flat, ø 5 mm, shaft insulated, length 350 mm; incl. Electrosurgical pencil with 2 butons with Reusable Monopolar Connecting Cable VIO for ESU Pencil Hook Electrode - (20192-110)	1	0

Department has below mentioned energy sources [Erbe]-

Sl. No.	Equipment	Make &Model	Total Qty	Units in Warranty	Units in CMC	Remarks
1	Vessel Sealer + Argon Plasma	Erbe Vio 3 + APC3 with Trisect Software	02	01	01	--
2	Vessel Sealer	Erbe Vio 3	01	01	--	--
3	Diathermy	Erbe Vio 300S	01	--	01	--
4	Vessel sealing	VIO SEAL	01		01	Donation

Kind regards,

Anjoo 24/9/26
(Prof. Anjoo Agarwal)
Head of the Department

किंग जार्ज चिकित्सा विश्वविद्यालय

गायनिकोलोजिकल ऑन्कोलॉजी विभाग

लखनऊ 226003

पत्रांकः जी0ओ0 / 290 / 2026 दिनांक 24 / 09 / 2026

सेवा में,

इंचार्ज / को–इंचार्ज
कामन इक्यूपमेन्ट सेल
किंग जार्ज चिकित्सा विश्वविद्यालय,
उत्तर प्रदेश, लखनऊ

विषयः– वित्तीय वर्ष 2026–27 हेतु स्थापित ERBE उर्जा स्त्रोत की आवश्यक जानकारी प्रस्तुत करने के संबंध।

महोदय,

आपके पत्र संख्या CE/2026/860 दिनांक 16/09/2026 के संदर्भ में गायनिकोलोजिकल ऑन्कोलॉजी विभाग मे स्थापित ERBE उपकरणों की एसेसरीज से संबंधित मांगी गई सूचना निर्धारित प्रारूप में निम्नवत् हैः–

BASIC INFROMATION FOR INSTALLED ENERGY SOURCE- ERBE IN DEPARTMENTS.					
Sr. No	**EQUIPMENT**	**MAKE/MODEL**	**TOTAL QUANTITY**	**NO. OF UNITS IN WARRANTY**	**NO. OF UNITS IN CMC CONTRACT**
1.	Cautery Machine	Erbe Vio 300s	02	Yes	NO
2.	VIO- Seal	Erbe	01	Yes	No

ACCESSORIES OF CAUTERY MACHINE ERBE VIO 300S		
Sr. No	**CAUTERY MACHINE ERBE VIO 300S**	**Qty.**
1.	20193-083- Cautery Pad -	500
2.	20190-106- Cautery Pencil	500
ACCESSORIES OF VIO-SEAL ERBE		
Sr. No	**VIO-SEAL ERBE**	**Qty.**
1.	21195-400- Trisect Rapid L-140	20
2.	21195-401- Trisect Rapid L-200	20
3.	21195-402- Trisect Rapid L-350	15
4.	20195-204-Lap Bisect	10
5.	20195-134-Lap Maryland	10
6.	20195-202/22- Open Bio-clamp	10
7.	Two Pedal Monopole Foot Pedal	02
8.	One Pedal Bipolar Foot Pedal	02
9.	20196-053/055/045/ Bioplar Cable	05

अतः उपरोक्त सूचना को अभिलेख मे लेते हुए आवश्यक कार्यवाही करने का कष्ट करें।
सधन्यवाद।

भवदीया,

24/9/26.

(प्रो0 निशा सिंह)
विभागाध्यक्ष
गायनिकोलॉजिकल ऑन्कोलॉजी विभाग
के0जी0एम0यू0, लखनऊ, उ0प्र0

60

King George's Medical University, Lucknow
DEPARTMENT OF PEDIATRIC SURGERY
Lucknow – 226 003, India

Ref No:- 1045/Ped.sy/2026

Date:- 23/09/2026

प्रभारी/सह–प्रभारी
कॉमन इक्यूपमेंट सेल
किंग जॉर्ज चिकित्सा विश्वविद्यालय, उ0प्र0,
लखनऊ।

Subject- Annual Requirement of Essential accessories for installed Energe sources- (Erbe) for financial year-2026-27.

महोदय,

कृपया अपने कार्यालय पत्रांक संख्याः CE/2026/860 Date: 16-09-2026 (छायाप्रति संलग्न) का सन्दर्भ ग्रहण करने का कष्ट करें, जिसमें आपके द्वारा पीडियाट्रिक सर्जरी विभाग से वर्ष 2026–27 हेतु Energe Source- Erbe में उपयोग होने वाली accessories की मांग की गयी है। जो कि निम्नलिखित है।

S.N.	Equipment	Quantity
1	Cautery Pad	500
2	Cautery pencil	500
3	Byonet Forcep	05
4	Byonet cable	05
5	Fiber optic cable	01
6	Lap vessel sealer	02
7	Open vesselsealer	01

धन्यवाद।

भवदीय

Rawat

(डा0 जे0डी0 रावत)
प्रोफेसर एवं विभागाध्यक्ष,
पीडियाट्रिक सर्जरी विभाग, के0जी0एम0यू0,
उ0प्र0,लखनऊ।

59

Mob. 8004336235

King George's Medical University U.P, Lucknow-226003
Department of Surgical Oncology

Ref. No. SONC/2725/26

Date: September 17, 2026

To
The Incharge/ Co-Incharge
Common Equipment Cell
K.G.'s Medical University,
Lucknow

Subject: Annual requirement of essential accessories for installed energy sources (Erbe) for Financial Year 2026-2027.

Dear Sir,

Reference to your letter No. CE/2026/860 dated 16.09.2026 regarding the above-mentioned subject, we are sending the desired information in given format for further necessary action. The Department of Surgical Oncology have 04 Operation Theatre & 04 Operative Tables in OT and performing approx. 3000 - 5000 plus Major /Minor cases annually in the department

BASIC INFORMATION FOR INSTALLED ENERGY SOURCE – ERBE IN DEPARTMENT OF SURGICLA ONCOLOGY					
SL. NO.	**EQUIPMENT**	**MAKE/MODEL**	**TOTAL QUANTITY**	**NO. OF UNITS IN WARRANTY**	**NO. OF UNITS IN CMC**
1	Vessel Sealer	Erbe Vio 300D /3 with Trisect Software	02	01	01
2	Surgical Workstation	Erbe Vio 300D / 3 + APC2/3 + Jet2 + IES3	03	01	01
3	Diathermy	Erbe VIO 300S	01	-	01
4	Electro Cautery Vessel Sealer	Erbe VIO 3	01	01	-

Accessories Annual Requirement for Financial Year 2026-27 for ENERGY SOURCE – ERBE		
SL NO.	**DESCRIPTION**	**QUANTITY**
1	20195-134 Instrument Reuse LAP forceps, Maryland	05
2	20195-204 Instrument Reuse Instrument Reuse LAP BiSect Micro, shaft ø 5 mm, length 350 mm; complete instrument	05
3	20195-202 Instrument Reuse, Open Vessel Sealer Biclamp 201 T, e.g. intestinal surgery.	10
4	21195-401 Instrument S/U Tripolar Tissue Navigation Instrument for Open Surgery Surgery Trisect Rapid Trisect Rapid 200, Bent 17 mm shaft L-200 mm with connectingcable L- 4 m	20
5	21195-402 Instrument S/U Tripolar Tissue Navigation Instrument for Bariatrc Surgery Surgery Trisect Rapid 350, Bent 17 mm shaft L-350 mm with connectingcable L- 4 m	20
6	Reusable Non Sticky Bipolar forceps, straight	30
7	Reusable Non Sticky Bipolar forceps, bayonet	20

8	20196-055 / 053 / 045 Reusable Bipolar connecting cable	50
9	20192-113 / 117 Reusable Monopolar Cable	10
10	20191-179 / 184 Reusable Hook electrode, flat, Ø 5 mm, shaft insulated, length 350 mm; incl. electrosurgical pencil with 2 buttons with Reusable Monopolar Connecting Cable VIO for ESU Pencil Hook Electrode - (20192-110)	04

Thanking you,

Yours sincerely,

Head of the Department of Surgical Oncology
K.G.'s Medical University UP, Lucknow

King George's Medical University, U.P.,

Department of Endocrine Surgery

Lucknow-226003

Ref. No.- ENDOSURG/2026/ 738 Date: 16-09-2026

To
The Faculty Inchange
Equipment Cell
KGMU

Dear Sir,

With Reference to letter no. CE/2026/860 Date 16.09.2026 Kindly find below mentioned information subject to current installation base of energy source in Endocrine Surgery department.

SL	Equipment	Make & Model	Total QTY	No of unit in Warranty	No of unit in CMC
1.	Surgical Work Station	Erbe Vio 300 D + JET	01		01
2.	Basic Cautery	Erbe Vio 300S	02		02
3.	Vessel Sealer + Argon Plasama	Erbe Vio D + APC 2	01		01
4.	Ultrasonic Generator	Johnson - Harmonic	01	01	

S.no	Description	QTY
1.	Cautery Pencil	500
2.	Patient Omega Plate	500
3.	Biclamp 150^{O}C	05
4.	Biclamp 201 T	10
5.	Bipolar Cable	10
6.	Bipolar Forcep	10
7.	Bipolar Foot Padel	01
8.	Biclamp Foot Padel	10

Thanking You

With Regards

Prof Anand Kumar Mishra
Professor & Head

56

KING GEORGE'S MEDICAL UNIVERSITY, (U.P.) LUCKNOW

Gandhi Memorial & Associated Hospital

DEPARTMENT OF SURGICAL GASTROENTEROLOGY

Lucknow - 226 003 (U.P.) India Ph. : +91 522-2258660 Fax : +91 522-2256116

Ref SG-1537/26 Date 21/9/26

To,
The Incharge,
Dept. of Equipment Cell,
King George's Medical University UP,
Lucknow, Uttar Pradesh

Subject: Regarding Annual requirements of Essential Accessories for installed Energy Sources ERBE for FY 2026-27

Dear Sir,

We required below mentioned accessories for our functional Operation Theatres:

SL	Description	Qty
1	20195-134 Instrument Reuse LAP forceps, Maryland – Make Erbe	5
2	20195-204 Instrument Reuse Instrument Reuse LAP BiSect MIcro, shaft ø 5 mm, length 350 mm; complete instrument - Make Erbe	5
3	20195-202 Instrument Reuse,Open Vessel Sealer Biclamp 201 T , e.g. intestinal surgery . Make - Erbe	10
4	21195-401 Instrument S/U Tripolar Tissue Navigation Instrument for Open Surgery Surgery Trisect Rapid Trisect Rapid 200, Bent 17 mm shaft L-200 mm with connecting cable L- 4 m – Make Erbe	40
5	21195-402 Instrument S/U Tripolar Tissue Navigation Instrument for Bariatrc Surgery Surgery Trisect Rapid 350, Bent 17 mm shaft L-350 mm with connectingcable L- 4 m Make Erbe	40
6	Reusable Non Sticky Bipolar forceps, straight – Make Erbe	30
7	20195- 537 / 538 Reusable Non Sticky Bipolar forceps, bayonet – Make Erbe	20
8	20196-055 / 053 / 045 Reusable Bipolar connecting cable	50
9	20192-113 Reusable Monopolar Cable	10
10	20191-179 / 184 Reusable Hook electrode, flat, Ø 5 mm, shaft insulated, length 350 mm; incl. electrosurgical pencil with 2 buttons with Reusable Monopolar Connecting Cable VIO for ESU Pencil Hook Electrode - (20192-110)	4
11	20190-106 Single Use Electrosurgical Cautery Pencil- Make: Erbe	1000
12	20193-083 Single Use Diathermy Neutral Pad- Make: Erbe	1000

Looking forward for your valuable support.

Head of the Department

Dr. Abhijit Chandra
Professor & Head
Department of Surgical Gastroenterology
KGMU Lucknow

Department of Surgical Gastroenterology, KGMU Lucknow

R. Swain
RUPASHREE SWAIN
ANS/SISTER INCHARGE
SGE/OT/HOT OT
KGMU, LKO.

King George Medical University, U.P.

Department of Plastic & Reconstructive Surgery
Lucknow - 226 003
Ph. 91-0522-2257446
website : www.kgmuplasticsurgery.edu.in, Email : kgmuplasticsurgery@gmail.com

55

दिनॉक : ...../...../2026

Dispatch No. 1164
Date 21/9/26
Department of Plastic Surgery
K.G.Medical University, Lucknow,

सेवा में,
इंचार्ज
कॉमन एक्यूपमेंट विभाग
किंग जार्ज चिकित्सा विश्वविद्यालय,उ0प्र0
लखनऊ।

महोदय,

कृप्या आप अपने पत्र संख्या सी0ई0/2026/860 दिनॉक 09.0.2025 का संदर्भ ग्रहण करे। जों वित्तीय वर्श 2026–27 में ओ0टी0 में स्थापित Diathermy Machine -04 के कंन्जुमेंबल सामान के संबंध में है। उक्त Diathermy Machine में मरीजों के इलाज में वित्तीय वर्श 2026–27 का निम्न कंन्जुमेंबल सामान की अति आवश्यकता है। विवरण निम्नवत् है:

S. No.	Equipment Name	Make & Model	Total Qty	No of Unit in Warranty	No of Unit in CMC	Required accessories	Qty
01.	Diathermy Machine	Make-Erbe/VI0300S	04	00	04	01. Disposable Diathermy Pad (20193-083)-	1500 Pcs
						02. Disposable Electro Surgical Pencil (20193-106)-	1000 Pcs 100 Pcs
						03. Reuseble bipolar Cable (20196-055)	30 Pcs
02	Vessele Sealer	Make-Erbe/VI0300D	01	00	01	04. Reuseble bipolar Forceps (20195-501) 05. Reuseble bipolar Forceps (20195-512) 06. Reuseble bipolar Forceps (20195-504) 07. Reuseble bipolar Forceps (20195-507) 08. Bi Clamp 201 T	30 Pcs 30 Pcs 30 Pcs 20 PCs
02	Harmonic Scalpal	ESG-400 USG-400	01	00	01	01. Thunderbeat 20 cm TB0520FCS	10 PCs

अतः उक्त के संबंध में आप से निवेदन है कि मरीजों के इलाज हेतु उक्त कंजुमेंबल सामान विभाग को उपलब्ध कराने का कश्ट करे।

धन्यवाद,
भवदीय,

Head
Plastic & Reconstructive Surgery
K.G. Medical University, Lucknow

विभागाध्यक्ष

54

King George's Medical University, Lucknow, U.P

Department of Neurosurgery

Shatabdi Hospital Phase 2 Building, 5th Floor
Phone No. 0522-2258880 Ext:- 4550,4574, E-mail:neurosurgery@kgmcindia.edu

Ref. No. NS/1698, Dated. 21/9/26

To,

The In charge/Co Incharge,
Department of Common Equipment Cell,
King George's Medical University
Lucknow

Subject: Annual requirement of Essential accessores for installed Energy source (ERBE) for Financial Year 2026-2027

Dear Sir,

Please refer to your letter No.CE/2026/860, dated. 16/09/2026 for Equipment Cell is compling the requirement of essential accessories for installed Energy Platform-Erbe, for financial 2026-27.

In this connection we would like to inform you that we are sending the above information (Both O.T's Neurosurgery Shatabdi O.T. & Neurosurgery Trauma O.T.) as required by you for the necessary action.

BASIC INFORMATION FOR INSTALLED ENERGY SOURCE:- ERBE IN DEPARTMENTS.

SR. NO.	EQUIPMENT	NAME / MODEL	TOTAL QUANTITY (Total of the Trauma O.T. & Shatabdi O.T.	NO. OF UNITS IN WARANTY	NO. OF UNITS IN CMC CONTRACT.	NEUROSURGERY O.T. SHATABDI PHASE-1, 1ST FLOOR, TOTAL	NEUROSURGERY O.T. TRAUMA CENTER, 1ST FLOOR, TOTAL
1-	Monopolar Pencil Disposable		1200Nos.			600Nos	600Nos.
2-	Cautery pad (Disposable)		.1300Nos			700Nos	600Nos.
3-	Reusable Bipolar Lead		200Nos.			100Nos	100Nos.
4-	Premium Bayonet Bipolar Forcep 23cm Fine - 0.2mm		17Nos.			05Nos.	12Nos.
5-	Premium Bayonet Bipolar forcep 20 cm blunt - 1.0mm		20Nos.			10Nos.	10Nos.
6-	Premium Bayonet Forceps 15cm Fine 0.2 mm		10Nos.			05mm	05Nos.
7-	Premium Bayonet Bipolar Forceps 15cm Blunt 1.0mm		15Nos.			10Nos.	05Nos.
8-	Erbe Indian Viocart		04Nos.			04Nos.	

Thanking you,

Your Sincerely,

Dr. B K Ojha,
Prof & Head,
Deptt. of Neurosurgery,
K.G's Medical University,
Lucknow

Department of Paediatric Orthopaedics

King George's Medical University, Lucknow

Ref.No...4855...Paed. Ortho/26 Dated: ..23/9/2026..

To

The Incharge,
Common Equipment Cell
King George Medical University, U.P.

Respected Sir,

With reference to letter no. Ref. No. CE/2026/860 dated 16/09/2026, regarding the submission of details about annual requirement of essential accessories for installed energy source- [Erbe] For Financial year 2026-27.

Please find attached information subject to current installation base of Energy source at Paediatric Orthopedics Surgery department existing Operation Theatre.

OT	Equipment	Make & Model	Total Qty.	No. of Units in Warranty	No. of Units Units in CMC Contract
OT	Cautery Machine	Erbe VIO 300 S	03	03	01

We required below mentioned accessories for our functional Operation Theatres

S.No	Description	Qty.
1.	20193-083 Erbe Cautery Pad for Annual Consumption	300
2.	20190-106 Erbe Electro Cautery Pencil for Annual Consumption	300
3.	20196-055 Erbe Reusable Bipolar Lead / Cable for reusable bipolar forceps	20
4.	20195-512 Erbe Reusable Bipolar Forceps Straight tip fine	10
5.	Resable Non Sticky Bipolar forceps,bayonet-Make Erbe	20

Looking forward for valuable support

Thanking you,

Regards

(Dr. Vikas Verma)
Additional Professor & HEAD
Dept. of Paediatric Orthopaedics

KGMU LKO

Depart of Pedia Ortho Elective OT

Previous Year Demanded Stock from Common Equipment			Previous Year Received Stock from Common Equipment		Current Inventory in OT Store	Current Year Demand from Common Equipment
SL	Description	Qty	Description	Qty	Qty	Qty
1	Courtery Pad	300	Reusable Non Sticky Bipolar forceps, straight- Make Erbe	5	1	10
2	Courtery Pencil	300	Reusable Non Sticky Bipolar forceps, bayonet- Make Erbe	10	2	20
3			Reusable Bipolar connecting cable- Make Erbe	10	2	20

(ANS)
OT Incharge

Ajay Singh
Assistant Nursing Superintendent
Paediatric Orthopaedics
KGMU, Lko

Scanned with OKEN Scanner

सेवा में

R.No- 2104/05/2026
Date- 21-09-26

प्रभारी
Common Equipment Cell
के०जी० एम०यू०
लखनऊ

दिनाँक. 21.9.2026

द्वारा उचित माध्यम-

महोदय,

आपके कार्यालय पत्रांक संख्या CE/2026/860 दिनाँक 16/9/2026 के अनुसार आर्थोपेडिक ओ०टी० ट्रामा (आर० ए० स्ल० सी० परिसर) में Installed Energy Source (Erbe) की सूची तथा accessories की Requirment की सूची आपके सूचनार्थ हेतु प्रेषित की जा रही है।

धन्यवाद

भवदीय
रत्नेश सिंह बघेल
(ANS)
Assistant Nursing Superintendent
Ortho Trauma O.T. RALC
K.G.M.U., Lucknow

Dr. Devarshi Rastogi
21/09/2026
Additional Professor
Department of Orthopaedic Surgery
King George's Medical University U.P
Lucknow

Forwarded

Dr. Ashish Kumar
21/09/2026
Professor & Head
Department of Orthopaedic Surgery
King George's Medical University U.P
Lucknow

G.A ORTHO O.T OSSB. (19/9/26)

50

S.No.	DESCRIPTION	QUANTITY
01-	20193-083 Cautery Pad for Annual Consumption	2000
02-	20190-106 Electro Cautery Pencil for Annual Consumption	2000
03-	20196-055 Erbe Reusable Bipolar lead/ Cable for reusable Bipolar	50
04-	20195-512 Erbe Reusable Bipolar forceps Straight tip fine	20
05-	20195-537 Erbe Reusable Bipolar forceps Bayonet tip fins.	20

Sister Incharge (ANS) Orthopedic Surgery Dept. G.A OT's K.G.M.U
Pooja Singh
89547

52

KGMU LKO

Depart of Pedia Ortho Elective O.T

Previous Year Demanded Stock from Common Equipment			Previous Year Received Stock from Common Equipment		Current Inventory in OT Store	Current Year Demand from Common Equipment
SL	Description	Qty	Description	Qty	Qty	Qty
1	Cautery Pad	300	Reusable Non Sticky Bipolar forceps, straight- Make Erbe	5	1	10
2	Cautery Pencil	300	Reusable Non Sticky Bipolar forceps, bayonet- Make Erbe	10	2	20
3			Reusable Bipolar connecting cable- Make Erbe	10	2	20

(ANS)
OT Incharge

Ajay Singh
Assistant Nursing Superintendent
Paediatric Orthopaedics
KGMU. Lko

Scanned with OKEN Scanner

Common Equipment Cell

Ref No. Orthopedic Trauma OT. RALC KGMU **Date:** 21/9/2026

20193 - 083	Cautery Pad for Annual Consumption			1000/
20190 - 106	Electro Cautery Pencil for Annual Consumption			1000/

Patel
21/09/2026
Assistant Professor/Superintendent
Ortho Trauma O.T. RALC
K.G.M.U., Lucknow

Scanned with OKEN

King George's Medical University, Lucknow

Common Equipment Cell

Ref No. CE/2026/860 Date: 16/09/2026

To,

The Head,

1. Department of Neurosurgery,
2. Department of ENT,
3. Department of General Surgery,
4. Department of Obstetrics & Gynae,
5. Department of Pediatric Surgery
6. Department of Thoracic Surgery
7. Department of Plastic Surgery
8. Department of Urology
9. Department of Medicine(Endoscopy)
10. Department of DPMR
11. Department of Endocrine Surgery
12. Department of Surgical Oncology
13. Department of Surgical Gastroentrology
14. Department of PCCM
15. Department of Medical Gastroentrology
16. Department of Orthopedic Surgery
17. Department of Sports Medicine
18. Department of Pediatric Orthopedic
19. Department of Gynae Oncology
20. Department of Vascular Surgery
21. Department of Nephrology
22. Department of OMFS

King George's Medical University,
Lucknow.

Subject: Annual requirement of Essential accessories for installed Energy sources-[Erbe] for Financial Year 2026-27.

Respected Sir/Ma'am,

This is to inform you that Equipment Cell is compiling the requirement of essential accessories for installed Energy platform- Erbe . for Financial Year 2026-27.

Kindly provide the details in given format within 7 working days.

BASIC INFORMATION FOR INSTALLED ENERGY SOURCE- ERBE IN DEPARTMENTS.				
EQUIPMENT	MAKE/MODEL	TOTAL QUANTITY	NO. OF UNITS IN WARRANTY	NO. OF UNITS IN CMC CONTRACT

King George's Medical University, Lucknow

Common Equipment Cell

Ref No.

Date:

Thanks and kind regards,

Incharge/ Co- Incharge
Common Equipment Cell
KGMU, Lucknow.

To

Date 24/09/2026

The Incharge
Department of Equipment Cell
K. G M U Lucknow

Department of Ophthalmology
Dispatch No. 3055 /OPH/
Dated 24/09/26
KGMU, Lko.

Subject. In reference to letter Reference Numb CE/2026/704 Lucknow Dat 24/09/2026 regarding Annual requirement of Essento accessories for installed Energy Sources for Financial year 2026-27

Dear Sir,

Please find attached information Subjec to current installation base of Energy Sour at opthalmology department

Sl	Description
1	20193-083 Erbecautery Pad For Annual Consoptio Qty - 100
2.	20190-106 Erbe Electro Cautery Pencil For Annual Consumption - Qty - 100
3.	Indian VIO Cart - Qty - 02

Looking forward for valuable support

Urgent.

Sandeep Saxena 24/9/26

Head of opthalmic

Head
Department of Opthalmology
K.G. Medical University, Lucknow.

Poojakm
AMS
NOD 0650

US

KING GEORGE'S MEDICAL UNIVERSITY

DEPARTMENT OF ORAL & MAXILLOFACIAL SURGERY
FACULTY OF DENTAL SCIENCES
LUCKNOW U.P. 226003
FOUNDED 1905

Ref No/OMSD/855.../2026 Date: 24/09/2026

To,
The Incharge
Equipment Cell
King George's Medical University,
Lucknow, U.P.

Dear Sir,

Please find attached information subject to current installation base of Energy source at dept of Oral & Maxillofacial Surgery.

SL	Equipment	Make & Model	Total Qty	Unit in warranty	Unit in CMC
01	Diathermy	Erbo Vio 300 S	01		01

We required below mentioned accessories for our functional operation theatres.

SL	Description	Qty
01	20193-083 Erbe Cautery Pad annual consumption	2500
02	20190-106 Erbe Electro Cautery Pencil for annual consumption	2500

Looking forward for valuable support.

Yours faithfully,

(Dr. U.S Pal)
Professor & Head
Dept of Oral and Maxillofacial Surgery
King George's Medical University
Lucknow.

O/C

Head
Dept. Oral & Maxillofacial Surgery
FODS, King George's Medical
University U.P Lucknow.

सेवा में,

Incharge
Common Equipment Cell
K.G.M.U
Lucknow

द्वारा :- उचित माध्यम।

विषय :- E.N.T-OT में Cautery Pencil (Uni, and Cautery Plate उपलब्ध कराए के सम्बन्ध में,

महोदय,

सविनय आपको अवगत कराना है कि E.N.T-OT में निम्नलिखित सामान पूरी तरह से खत्म हो गया है। :-

1) Cautery Plate - 1000
2) Cautery Unipolar Pencil - 1500

उपलब्ध कराने का कष्ट करें।
आपकी अति कृपा होगी।

धन्यवाद

दिनांक :- 11/9/26

भवदीय
DNB Shalini Gupta
E.N.T-OT
K.G.M.U
Lucknow.

Forwarded

16/09/26

King George's Medical University UP, Lucknow
Common Equipment Cell
Email: ce@kgmcindia.edu

Reference No. Date:

King George's Medical University UP, Lucknow
Common Equipment Cell
Email: ce@kgmcindia.edu

reference No. Date:

Sl. No	Description	Pack Size	1 Surgery	2 Urology Surgery	3 Thoracic Surgery	4 Obst Gyn (Elective)	5 Obst Gyn (Emergency OT)	6 Gynecological Oncology	7 Pediatric Surgery	8 Surgical Oncology	9 Endocrine Surgery	10 Surgical Gastroenterology	11 Plastic Surgery	12 Neuro Surgery	13 Neuro Trauma	14 Pedia Ortho	15 Orthopaedic Surgery	16 Opthalmic	Demanded Summary Qty
1	20195-134/21195-134 Instrument Reuse BiClamp LAP forceps, Maryland, semi-deep ribbed, shaft ø 5 mm, non-adhesive coating, length 340 mm, with connecting cable 4 m and MF plug, complete instrument	1	15		2	20		10	2	5		5							59
2	20195-204 Instrument Reuse LAP BiSect Micro, shaft ø 5 mm, length 350 mm, complete instrument	1	15		4	15		10		5		5							54
3	20195-202//21195-202 Instrument Reuse, BiClamp 201 T, bent 18°, smooth, length 200 mm; with connecting cable 4 m and MF plug, with thermal insulation, for open surgical procedures, e.g. intestinal surgerys- Intestinal Surgery	1		2	4	10		10	1	10	10	10	20						77
4	21195-400 Instrument S/U Tripolar Tissue Navigation Instrument for Open Surgery; TriSect rapide* 140, single-use, bent 17 mm, shaft length 140 mm; with connecting cable 4 m and MF-2 plug	1	30			5		20											55
5	21195-401 Instrument S/U Tripolar Tissue Navigation Instrument for Open Surgery; TriSect rapide* 200, single-use, bent 17 mm, shaft length 200 mm; with connecting cable 4 m and MF-2 plug	1	30			5		20		20		40							115
6	21195-402 Instrument S/U Tripolar Tissue Navigation Instrument for Bariatrc Surgery; TriSect rapide* 350, single-use, bent 17 mm, shaft length 350 mm; with connecting cable 4 m and MF-2 plug	1	30	20	20	30		15		20		40							175
7	Reusable Non Sticky Bipolar forceps, Premium, Straight	1	10			5													
8	Reusable Non Sticky Bipolar forceps, Premium, Bayonet	1	10			5				30		30	120			10	20		225
9	20196-055 / 053 / 045 Reusable Bipolar connecting cable, Valleylab and non-Erbe units (2-Pin 28 mm), 4 m, for bipolar forceps with european flat plug	1	15	10		5	2	5	5	20	10	20		30	32	20	20		172
10	20192-113 / 117 Reusable Monopolar connecting cable [illegible] ACC, International ø 8 mm (Bovie Jacks), 6 m, for CUT and COAG MIS instruments, with connection ø 4 mm	1	10		10	5			5	50	10	50	100	100	100	20	50		522
11	20191-179 / 184 Reusable Hook electrode, flat, Ø 5 mm, shaft insulated, length 350 mm; incl. electrosurgical pencil with 2 buttons with Reusable Monopolar Connecting Cable VIO for ESU Pencil Hook Electrode - (20192-110)	1	10		2	1				10		10							45
12	21191-153 S/U Spatula electrode, straight, 2.3 x 19 mm, length 120 mm;	1		10						4		4							21
13	21191-155 S/U Spatula electrode, straight, insulated, 2.3 x 19 mm, length 120 mm;	1		5															10
14	20189-351/20189-302 Reusable 100% Washable, ReMode two-pedal foot switch with bracket for VIO 3, VIO 3n and VIO seal, AP & IP X8 Equipment; with connecting cable 5 m	1	4	2	4			2				1							13
15	20188-300 Reusable 100% Washable, One-pedal foot switch for VIO D/S, AP & IP X8 equipment; with connecting cable 5 m	1			4			2				1							7
16	20195-221/21195-221 Instrument Reuse, Open Vessel Sealer BiClamp 150 C, bent 23°, smooth, length 150 mm; with connecting cable 4 m and MF plug, with ceramic coating, e.g. for thyroidectomy, ENT, Thoracic Surgery	1			4							5							9
17	20195-200/21195-200 Instrument Reuse, BiClamp 210, bent 25°, smooth, length 210 mm; with connecting cable 4 m and MF plug, with corrugated surfaces, e.g. for vaginal hysterectomy	1	4		4														8
18	20150-030 S/U Applicator, straight, ø 6 mm, length 65 mm; with suction, e.g. for liver surgery	5	8																8
19	20150-301 S/U Pump cartridge plus for ERBEJET 2;	5	8																8
20	20821-030 Reusable Fiberoptic cable, ø 4.8 mm, length 3 m; high temperature resistant;	1							1										1
21	20132-250 S/U APC applicator, with fiber, shaft 35 mm, rigid, spatula electrode; ReMode; with	5	10	2															12
22	20132-254 S/U APC applicator, with fiber, shaft 350 mm, rigid, spatula electrode; ReMode; with connecting cable 3 m	5		2															2
23	ERBE MS bipolarmax Cart	1												4			2		6

King George's Medical University UP, Lucknow

Common Equipment Cell

Email: ce@kgmcindia.edu

Reference No.

Date:

Department			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Sl. No	Description	Pack Size	Surgery	Urology Surgery	Thoracic Surgery	Obst Gyn (Elective)	Obst Gyn (Emergency & OT)	Gynecological Oncology	Pediatric Surgery	Surgical Oncology	Endocrine Surgery	Surgical Gastroenterology	Plastic Surgery	Neuro Surgery	Neuro Trauma	Pedia Ortho	CVTS(open/endo surgery	Opthalmic	Demanded Summary Qty
1	20195-134/21195-134 Instrument Reuse BiClamp LAP forceps, Maryland, semi-deep ribbed, shaft ø 5 mm, non-adhesive coating, length 340 mm; with connecting cable 4 m and MF plug, complete instrument	1	15		2	20		10	2	5		5							59
2	20195-204 Instrument Reuse LAP BiSect Micro, shaft ø 5 mm, length 350 mm; complete instrument	1	15		4	15		10		5		5							54
3	20195-202//21195-202 Instrument Reuse, BiClamp 201 T, bent 18°, smooth, length 200 mm; with connecting cable 4 m and MF plug, with thermal insulation, for open surgical procedures, e.g. intestinal surgerys- intestinal Surgery	1		2	4	10		10	1	10	10	10	20						77
4	21195-400 Instrument S/U Tripolar Tissue Navigation Instrument for Open Surgery; TriSect rapide® 140, single-use, bent 17 mm, shaft length 140 mm; with connecting cable 4 m and MF-2 plug	1	30			5		20											55
5	21195-401 Instrument S/U Tripolar Tissue Navigation Instrument for Open Surgery; TriSect rapide® 200, single-use, bent 17 mm, shaft length 200 mm; with connecting cable 4 m and MF-2 plug	1	30			5		20		20		40							115
6	21195-402 Instrument S/U Tripolar Tissue Navigation Instrument for Bariatric Surgery; TriSect rapide® 350, single-use, bent 17 mm, shaft length 350 mm; with connecting cable 4 m and MF-2 plug	1	30	20	20	30		15		20		40							175
7	Reusable Non Sticky Bipolar forceps, Premium, Straight	1	10			5				30		30	120			10	20		225
8	Reusable Non Sticky Bipolar forceps, Premium, Bayonet	1	10			5			5	20	10	20		30	32	20	20		172
9	20196-055 / 053 / 045 Reusable Bipolar connecting cable, Valleylab and non-Erbe units (2-Pin 28 mm), 4 m, for bipolar forceps with european flat plug	1	15	10		5	2	5	5	50	10	50	100	100	100	20	50		522
10	20182-113 / 117 Reusable Monopolar connecting cable, VIO, ICC, ACC, International ø 4 mm (Bowie Jack), 4 m; for CUT and COAG MIS-instruments, with connection ø 4 mm	1	10		10	5				10		10							45
11	20191-179 / 184 Reusable Hook electrode, flat, ø 5 mm, shaft insulated, length 350 mm; incl. electrosurgical pencil with 2 buttons with Reusable Monopolar Connecting Cable VIO for ESU Pencil Hook Electrode - (20192-110)	1	10		2	1				4		4							21
12	21191-153 S/U Spatula electrode, straight, 2.3 x 19 mm, length 320 mm;	1		10															10
13	21191-155 S/U Spatula electrode, straight, insulated, 2.3 x 19 mm, length 120 mm;	1		5															5
14	20189-351/20189-302 Reusable 100% Washable, ReMode two-pedal foot switch with bracket for VIO 3, VIO 3n and VIO sea!, AP & IP X8 Equipment; with connecting cable 5 m	1	4	2	4			2			1								13
15	20188-300 Reusable 100% Washable, One-pedal foot switch for VIO D/3, AP & IP X8 equipment; with connecting cable 5 m	1			4			2			1								7
16	20195-221/21195-221 Instrument Reuse, Open Vessel Sealer BiClamp 150 C, bent 23°, smooth, length 150 mm; with connecting cable 4 m and MF plug, with ceramic coating, e.g. for thyroidectomy, ENT, Thoracic Surgery	1			4						5								9
17	20195-200/21195-200 Instrument Reuse, BiClamp 210, bent 25°, smooth, length 210 mm; with connecting cable 4 m and MF plug, with corrugated surfaces, e.g. for vaginal hysterectomy	1	4		4														8
18	20150-030 S/U Applicator, straight, ø 6 mm, length 65 mm; with suction, e.g. for liver surgery	5	8																8
19	20150-301 S/U Pump cartridge plus for ERBEJET 2;	5	8																8
20	20821-000 Reusable Fiberoptic cable, ø 4.8 mm, length 3 m, high temperature resistant;	1							1										1
21	20132-250 S/U APC applicator, with filter, shaft 35 mm, rigid, spatula electrode; ReMode, with	1	10	2															12
22	20132-254 S/U APC applicator, with filter, shaft 350 mm, rigid, spatula electrode; ReMode, with connecting cable 3 m	1		2															2
24	ERBE MS Indigeneous Cart	1												4				2	8

		Peak Site	Surgery	Urology/ Surgery	Thoracic Surgery	Obst/ Gyn (Elective)	Obst/ Gyn (Emerge ncy OT)	Gynecol/ Optical Oncology	Pediatric Surgery	Surgical Oncology	Endocrin e Surgery	Surgical/ Gastroin testrology	Plastic Surgery	Neuro Surgery	Neuro Trauma	Pedia/ Ortho	Ortho/ Spine Surgery	Opthalmi c	ORRTs	ENT	Neuro Surgery	Dermatol/ Plastic Surgery	Total Qty	Latest Benchmark Per Unit Excl. GST	GST Value @ 18%	Latest Benchmark Per Unit Incl. GST	Total Value Incl. GST
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19						
1	20338-134 Instrument Reuse BiClamp LAP forceps, Maryland, semi-deep jaw platform, non-adhesive coating, length 340 mm+, with connecting cable 4 m and M/F plug, suitable instrument	1	15																			98	1,06,291.00	19,314.55	1,25,605.55	1,23,73,737.40
2	20338-134 Instrument Reuse LAP BiSect Micro, shaft ø 5 mm, length 330 mm; complete	2	15		4	15		10		5		5										384	1,06,291.00	19,314.55	1,25,605.55	3,74,68,489.39
3	20338-020/21/28-321 Instrument Reuse, BiClamp 201 T, bent 18°, smooth, length 200 mm with connecting cable 4 m and M/F plug, with thermal insulation, for open surgical applications, e.g. intestinal surgery, Intestinal Surgery	3		2	4	10		10	1	10	10	10	20									77	1,79,550.00	8,977.50	1,88,527.50	1,45,16,617.50
4	20338-400 Instrument S/U Tripolar Tissue Navigation Instrument for Open Surgery; Robot-capable* 140, single-use, bent 17 mm, shaft length 140 mm; with connecting cable 4 m and M/F-2 plug	4	30			5		20		10		40										195	80,350.00	4,017.50	84,367.50	65,81,212.50
5	20338-401 Instrument S/U Tripolar Tissue Navigation Instrument for Open Surgery; Robot-capable* 200, single-use, bent 17 mm, shaft length 200 mm; with connecting cable 4 m and M/F-2 plug	5	30			5		20		20		40										135	80,350.00	4,017.50	84,367.50	97,81,462.50
6	20338-402 Instrument S/U Tripolar Tissue Navigation Instrument for Bariatric Surgery; Robot-capable* 350, single-use, bent 17 mm, shaft length 350 mm; with connecting cable 4 m and M/F-2 plug	6	30	20	20	30		15		20		40										175	80,350.00	4,017.50	84,367.50	1,47,64,312.50
7	Reusable Non Sticky Bipolar forceps, Premium, Straight	7	10			5			5	30	10	120				10	20					225	67,522.00	3,376.10	70,898.10	1,59,52,072.50
8	Reusable Non Sticky Bipolar forceps, Premium, Bayonet	8	10			5			5	20	10	20		30	12	20	20					173	1,03,445.00	5,172.25	1,08,617.25	1,87,82,957.00
9	20338-020/028/040: Reusable Bipolar connecting cable, Valleylab and non-Erbe units (Pin 28 mm), 4 m; for bipolar forceps with european flat plug	9	15	10		5		2	5	50	10	50	100	100	100	20	50					352	16,337.00	816.85	17,153.85	1,71,829.20
10	20032-113 / 117 Reusable Monopolar connecting cable, VIO, ICC, ACC, International ø 4 mm Binio Instr, 4 m, for CUT and COAG MIS instruments, with connection ø 4 mm	10	10			10		5		10		10										49	16,337.00	816.85	17,153.85	7,71,829.20
11	20338-178 / 184 Reusable hook electrode, flat, Ø 5 mm, shaft insulated, length 350 mm; incl. electrosurgical pencil with 2 buttons with Reusable Monopolar Connecting Cable VIO for ESU Pencil Hook Electrode - (20192-110)	11	10		2	1				4		4										22	65,000.00	3,250.00	68,250.00	14,33,500.00
12	21338-133 S/U Spatula electrode, straight, 2.3 x 19 mm; length 120 mm;	12		10																		98	9,135.00	456.75	9,591.75	95,917.50
13	21338-135 S/U Spatula electrode, straight, insulated, 2.3 x 19 mm; length 120 mm;	13		5																		5	9,135.00	456.75	9,591.75	47,958.75
14	20338-052/20338-321 Reusable 100% Washable, Rebloda two-pedal foot switch with divider for VIO 3, VIO 3H and VIO max, AP & IP HF Equipments with connecting cable 5 m	14	4	2	4					1												13	1,90,000.00	9,500.00	1,99,500.00	12,74,968.00
15	20338-500 Reusable 100% Washable, One-pedal foot switch for VIO D/S, AP & IP HF equipment, with connecting cable 5 m	15			4		2				1											7	90,000.00	4,500.00	94,500.00	6,61,500.00
16	20338-122/21335-321 Instrument Reuse, Open Vessel Sealer BiClamp 150 C, bent 23°, smooth, length 150 mm, with connecting cable 4 m and M/F plug, with ceramic coating, e.g. for Hysterectomy, ENT, Thoracic Surgery	16			4					5												6	1,79,550.00	8,977.50	1,88,527.50	11,30,565.00
17	20338-330/21335-203 Instrument Reuse, BiClamp 216, bent 25°, smooth, length 210 mm, with connecting cable 4 m and M/F plug, with corrugated surfaces, e.g. for vaginal hysterectomy	17	4		4																	6	1,11,620.00	5,581.00	1,17,201.00	6,54,406.00
18	20338-060 Applicator, straight, ø 6 mm, length 85 mm; with suction, e.g. for liver surgery	18	8																			9	51,188.00	2,559.40	53,747.40	4,83,726.60
19	20338-301 Pump cartridge plus for ERBEJET 2;	19	8																			2	49,619.00	2,480.95	52,099.95	1,04,199.90
20	20403-000 Thermistic cable, ø 4.8 mm, length 3 m, high temperature resistant;	20							1													12	1,13,620.00	5,681.00	1,19,301.00	14,31,612.00
21	20410-210 APC-coagulator, with filter, shaft 35 mm, rigid, spatula electrode, flabelate, with connecting cable 3 m	21	10	2																		2	1,55,565.00	6,778.25	1,62,343.25	2,84,600.50
22	20410-214 APC-coagulator, with filter, shaft 180 mm, rigid, spatula electrode, flabelate, with connecting cable 3 m	22	10	2																		6	35,000.00	1,750.00	36,750.00	2,20,500.00
23	20410-214 APC-coagulator, with filter, shaft 180 mm, rigid, spatula electrode, flabelate, with connecting cable 3 m	23		2																		2	25,000.00	1,250.00	26,400.00	1,58,400.00
24	20338-060 Applicator, straight, ø 6 mm, length 85 mm; with suction, e.g. for liver surgery	24																				1	1,05,000.00	5,250.00	1,10,250.00	1,10,250.00
25	20410-000 Bipolar coagulation forceps, straight, 5 mm, length 330 mm; with connecting cable 3 m	25	100	20	20	80	120	10	10	20	10	20	30	14	12	6	40	2	50	250	150	5	2615	7,100.00	355.00	7,455.00	1,81,49,025.00
26	20410-100 S/U Electrosurgical pencil with 2 buttons, VIO, ICC, ACC, non-Erbe units, hand instrument, with connecting cable 3 m, with spatula electrode without protection	26	100	100	100	400	600	50	50	100	50	100	100	60	60	30	200	10	250	150	20	1	965				
		TOTAL																									16,70,29,309.00

Original Copy

ICG video angiography system for existing Zeiss S-800 microscope

King George´s Medical University, Lucknow, U.P

Department of Neurosurgery

Shatabdi Hospital Phase 2 Building, 5th Floor

Phone No. 0522-2258880 Ext:- 4550,4574, E-mail:neurosurgery@kgmcindia.edu

Ref. No. NS/1960,

Dated. 16/10/26

सेवा में,

वित्त अधिकारी,
किंग जार्ज चिकित्सा विश्वविद्यालय,
लखनऊ।

महोदय,

आप अपने ई–मेल दिनांक 03.10.2026 का संदर्भ ग्रहण करने की कृपा करें जो कि वर्ष 2026–2027, में न्यूरोसर्जरी विभाग के लिए कय किये जाने ICG Video Angiography system for existing Zeiss S-800 (PENTERO) Microscope के Proprietary Certificate & Authorization Certificate & Relevant product catalogue/ Technical literature को प्राप्त कराये जाने के सम्बन्ध में हैं।

आपको अवगत कराना चाहूँगा कि वर्ष 2026–2027, में न्यूरोसर्जरी विभाग के लिए कय किये जाने वाले ICG Video Angiography system for existing Zeiss S-800 (PENTERO) Microscope के Proprietary Certificate & Authorization Certificate & Relevant product catalogue/ Technical literature को आपके पास आवश्यक कार्यवाही हेतु प्रेषित किया जा रहा है, ताकि उपरोक्त उपकरण जल्द से जल्द कय हो सकें।

धन्यवाद।

भवदीय,

डा0 बी0 के0 ओझा,
प्रोफेसर एवं विभागाध्यक्ष
न्यूरोसर्जरी विभाग,
किग जार्ज चिकित्सा विश्वविद्यालय,
लखनऊ।

(1)

Proprietary Article Certificate in the following form is to be provided by the Ministry/Department before procuring the goods from a single source under the provision of sub Rule 166 (i) and 1 66 (iii) as applicable.

(i) The indented goods are manufactured by M/s Carl Zeiss Meditec AG Germany

(ii) No other make or model is acceptable for the following reasons :

As it is to be used with existing microscope of Carl Zeiss, Germany.

(iii) Concurrence of finance wing to the proposal vide: .....

(iv) Approval of the competent authority vide: .....

31/10/26

(Signature with date and designation of the indenting officer)

Dr. B. K. Ojha
M.S. M.Ch.
Prof. & Head
Department of Neurosurgery
K.G.'s Medical University, Lucknow

(2)

Technical Specification of the ICG Video Angiography System for Existing Zeiss S-800 (PENTERO) Microscope:-

TECHNICAL SPECIFICATION	
NOTE: We need this equipment component for our existing Carl Zeiss Microscope S 800. It is a proprietary Equipment	
Sr. No.	**Name of the Specification**
	Intra-operative Vascular Fluorescence Filter (ICG):
1.	The upgrade module must offer an option for fluorescence-based video angiography detecting with Full-HD resolution in PENTERO 800 S existing installation.
2.	A setup phase for indocyanine green (ICG) video-angiography guiding in optimal adjustment for blood flow assessment must be available.
3.	The fluorescence-based video angiography system must support par focal recording of white light and near Infrared fluorescence detection for all working distances and zoom settings without requiring manual adjustments.
4.	The system must be able to show an overlay of the ICG fluorescence signal on the white light image.
5.	**Fully Integrated Near-Infrared (NIR) Fluorescence Video Angiography Hardware Module (Proprietary ZEISS INFRARED 800 or equivalent fully integrated equivalent) containing high sensitivity infrared camera, optical filters, and automated toggle setup.**
6.	**Essential Accessories Kit: Full interface connectivity cables, calibration templates, initial sterile drapes multi-pack (min. 10 units), and internal system software patches/activation keys.**
	Standards: CE & USFDA certification
1.	**Other terms and conditions: -** a) Comprehensive Warranty & Maintenance Support: Comprehensive On-Site Warranty (including all optics, laser/LED illumination elements, cameras, and software patches) for a duration of five (05) years, followed by 5 years of CMC- cost to be quoted separately. b) Original Manufacturer or their subsidiary or authorized dealer who is quoting should be present in India having selling experience of more than five years. c) In no case should the instrument remain in non-working condition for more than seven days, beyond which a penalty as per the rules of the institute will be levied. d) The vendor should have a good service and application backup along with instruments to provide effective troubleshooting and support. (response time < 24 hours). The repair/servicing should be on-site. e) The cost of every consumable and spare part must be quoted separately. The cost for the same would be frozen for ten years. The user department will not be liable for separate payment of any spare part that has not been quoted earlier in case of any malfunction. This item will be considered as covered under the warranty/CMC agreement.

Dr. Somit Agarwal, Professor, Department of Neurosurgery, King George Medical University

Dr. Hanuman Prasad Prajapat, M.S. M.Ch., Asstt. Prof., Department of Neurosurgery, K.G.'s Medical University, Lucknow

Dr. ANKUR BAJAJ, M.S., M.Ch., Department of Neurosurgery, K.G's. Medical University, Lucknow

Dr. Manish Jaiswal
MS, MCh.
Professor
Department of Neurosurgery
King George' Medical University, Lucknow

Dr. ANIL CHANDRA
M.S., MCh,
Professor, Department of Neurosurgery,
K.G's Medical University, Lucknow

Dr. B. K. Ojha
M.S. M.Ch.
Prof. & Head
Department of Neurosurgery
K.G.'s Medical University, Lucknow

डा० अवधेश कुमार जायसवाल / Dr. Awadhesh Kumar Jaiswal
आचार्य एवं विभागाध्यक्ष / Professor & Head
न्यूरो सर्जरी विभाग / Dept. of Neurosurgery
किंग जार्ज मेडिकल यूनिवर्सिटी / S.G.P.G.I.
लखनऊ / Lucknow

Dr. AWADHESH YADAV
MS, MCh.
Additional Professor
Department of Neurosurgery
King George's Medical University, Lucknow

Carl Zeiss Meditec AG 73447 Oberkochen

To whom it may concern

Carl Zeiss Meditec AG

Oberkochen location
Rudolf-Eber-Str. 11
73447 Oberkochen
Germany

Phone: +49 (0) 7364/ 20 2928

E-mail: alexander.partsch@zeiss.com

Division/Dept.: MED-CMS

Your contact: Alexander Partsch

Date: 01. September 2026

Proprietary Certificate for INFRARED 800/IR 800 Module for PENTERO 800S

Dear Sir/ Madam,

We, Carl Zeiss Meditec AG, located at Rudolf-Eber-Str.11, 73447 Oberkochen, Germany, hereby certify that the INFRARED 800/IR 800 Module of PENTERO 800S is the proprietary product of Carl Zeiss Meditec, AG.

All the related below mentioned upgradation is ZEISS own proprietary articles, and the product design, manufacturing and specifications are governed by Carl Zeiss Meditec, AG.

- The Upgrade kit system will offer an option for fluorescence-based video angiography detecting with Full-HD resolution.

- An optional setup phase for indocyanine green (ICG) video-angiography guiding in optimal adjustment for blood flow assessment will be available.

- The fluorescence-based video angiography system will support parfocal recording of white light and near-infrared fluorescence detection for all working distances and zoom settings without requiring manual adjustments.

- With the upgraded module, it is possible to visualize submillimeter blood vessels. Intraoperative imaging of cerebral blood flow is of particular interest in vascular neurosurgery and free flap surgery in reconstructive applications. Module should enable intraoperative visual assessment of blood flow after an anastomosis has been created and visualizes the vascular patency of the grafted tissue.

Best regards

Carl Zeiss Meditec AG

i.V.

Alexander Partsch
Senior Business Manager
ZEISS Microsurgery

Carl Zeiss Meditec AG
Standort: Oberkochen
Rudolf-Eber-Straße 11 · 73447 Oberkochen · Germany

i.V.

René Stanke
Senior Business Manager
ZEISS Microsurgery

Dr. Somil Jaiswal
MS, MCh
Professor
Department of Neurosurgery
King George' Medical University, Lucknow

Dr. Hanuman Prasad Prajapati
M.S. M.Ch.
Asstt. Prof.
Department of Neurosurgery
K.G.'s Medical University
Lucknow

Dr. ANKUR BAJAJ
M.S., M.Ch.
Department of Neurosurgery
K.G's. Medical University
Lucknow

Dr. B. K. Ojha
M.S. M.Ch.
Prof. & Head
Department of Neurosurgery
K.G.'s Medical University, Lucknow

डा० अवधेश कुमार जायसवाल
Dr. Awadhesh Kumar Jaiswal
प्राध्यापक एवं विभागाध्यक्ष/Professor & Head
तंत्रिका शल्य चिकित्सा विभाग/Deptt. of Neurosurgery
संजॉपीजीआईएमएस/S.G.P.G.I.M.S.
लखनऊ/Lucknow

Dr. ANIL CHANDRA
M.S.,MCh,
Professor, Department of Neurosurgery,
K.G's Medical University, Lucknow

Dr. AWADHESH YADAV
MS, MCh.
Additional Professor
Department of Neurosurgery
King George's Medical University, Lucknow

Dr. Manish Jaiswal
MS, MCh.
Professor
Department of Neurosurgery
King George' Medical University, Lucknow

PROPRIETARY/ SPECIFIC BRAND GOODS CERTIFICATE

1.	Item/ Type/ Model No. required along with specification	ICG Video Angiography System for Existing Zeiss S-800 (PENTERO) Microscope, (INFRARED 800/IR 800 for PENTERO 800S. 1.The upgrade module must offer an option for fluorescence-based video angiography detecting with Full-HD resolution in PENTERO 800 S existing installation. 2. A setup phase for indocyanine green (ICG) video-angiography guiding in optimal adjustment for blood flow assessment must be available. 3. The fluorescence-based video angiography system must support par focal recording of white light and near Infrared fluorescence detection for all working distances and zoom settings without requiring manual adjustments. 4. The system must be able to show an overlay of the ICG fluorescence signal on the white light image. **5. Fully Integrated Near-Infrared (NIR) Fluorescence Video Angiography Hardware Module (Proprietary ZEISS INFRARED 800 or equivalent fully integrated equivalent) containing high sensitivity infrared camera, optical filters, and automated toggle setup.** **6. Essential Accessories Kit: Full interface connectivity cables, calibration templates, initial sterile drapes multi-pack (min. 10 units), and internal system software patches/activation keys.**
2.	If the item a spare part attachment or accessory for an existing equipment Yes / No (If Yes, provide details)	Additional Yes PENTERO 800S Neurosurgical
3.	Name of the manufacturers/supplier of the item proposed by the indenter	Carl Zeiss Meditec. AG
4.	Are they sole manufacturers/ sold distributors of the Item Yes / No	Yes
5.	If there any other item with similar/equivalent specification available in the market to meet the job requirement envisaged. Yes / No (If Yes, explain why those alternatives cannot be	NO

Dr. Somil Jaiswal MS, MCh Professor Department of Neurosurgery King George' Medical University, Lucknow

Jr. ANKUR BAJAJ M.S., M.Ch. Department of Neurosurgery K.G's. Medical University Lucknow

Dr. Hanuman Prasad Prajapati M.S. M.Ch. Asstt. Prof. Department of Neurosurgery K.G.'s Medical University Lucknow

Dr. AWADHESH YADAV MS, MCh. Additional Professor Department of Neurosurgery King George's Medical University, Lucknow

Dr. Manish Jaiswal MS, MCh. Professor Department of Neurosurgery King George' Medical University, Lucknow

Dr. ANIL CHANDRA M.S. M.Ch. Professor, Department of Neurosurgery K.G's Medical University, Lucknow

डा० अवधेश कुमार जायसवाल Dr. Awadhesh Kumar Jaiswal प्रोफेसर एवं विभागाध्यक्ष/Professor & Head न्यूरो शल्य चिकित्सा विभाग/Deptt. of Neurosurgery संजय गांधी पी.जी.आई.ऑफ मेडिकल साइंसेज/S.G.P.G.I.M.S. लखनऊ/Lucknow

Dr. B. K. Ojha M.S. M.Ch. Prof. & Head Department of Neurosurgery K.G.'s Medical University, Lucknow

	procured and provide a comparative analysis of the functional advantages/cost-effectiveness of the recommended item)	
6.	Efforts made to locate alternative sources of supply or use of substitutes	Yes
7.	Why open tender can't be resorted to, for locating alternative source.	1- To Maintain quality of work. 2-Carl Zeiss Meditec AG is the sole manufacturer of the ICG Video Angiography System (I]nfrared 800/IR 800 Module for existing Pentero 800S Neurosurgical Microscope in the KGMU Neurosurgery O.T.
8.	Are the proprietary items certified to have reasonable rates? Yes / No (Attach supporting documents, if applicable)	Yes
9.	Any other justification for procuring the item from a single source	

I hereby certify that the above item is required to be procured on a proprietary/single-source basis, as the specified brand is the only known source that meets our functional requirements. Given the unique advantages of this brand, an open tender process would not serve any meaningful purpose in this case and can justifiably be waived.

(strike out whoever is not applicable)

Head of the Department
Dr. B. K. Ojha
M.S. M.Ch.
Prof. & Head
Department of Neurosurgery
K.G.'s Medical University, Lucknow

Dr. ANKUR BAJAJ
M.S., M.Ch.
Department of Neurosurgery
K.G's. Medical University
Lucknow

डा० अवधेश कुमार जायसवाल
Dr. Awadhesh Kumar Jaiswal
प्राध्यापक एवं विभागाध्यक्ष / Professor & Head
तंत्रिका शल्य चिकित्सा विभाग / Deptt. of Neurosurgery
संजीपीजीआईएमएसी / S.G.P.G.I.M.S.
लखनऊ / Lucknow

Dr. Hanuman Prasad Prajapati
M.S. M.Ch.
Asstt. Prof.
Department of Neurosurgery
K.G.'s Medical University
Lucknow

Dr. ANIL CHANDRA
M.S.,MCh.
Professor, Department of Neurosurgery,
K.G's Medical University, Lucknow

Dr. AWADHESH YADAV
MS, MCh.
Additional Professor
Department of Neurosurgery
King George's Medical University, Lucknow

Dr. Manish Jaiswal
MS, MCh.
Professor
Department of Neurosurgery
Medical University, Lucknow

Dr. Somil Jaiswal
MS, MCh
Professor
Department of Neurosurgery
King George' Medical University, Lucknow

All India Institute of Medical Sciences
Jodhpur

Admn/Prop/107/2021-AIIMS.JDH/749

Dated 20th April 2022

Notification of Award

To,
M/s GMB Innovative.
Shop No. 4, CSC, DDA Market, RBI Colony,
Paschim Vihar, New Delhi- 110063, India.
Email:- info@gmbgroup.in
Contact No:- +91-9810553366.

Subject: Procurement of Tumor Fluorescence YELLOW 560 for Operating Microscope on Proprietary Basis for the department of Neurosurgery at AIIMS, Jodhpur.

With reference to your quotation no. GMB/2021-22/MAR040 dated 22nd March 2022, kindly supply following items as per detail mentioned below:

S.No	Product Description	Qty	Unit Price in Rs.	GST @ 18% in Rs.	Total unit Price in Rs.
01	Tumor Fluorescence YELLOW 560 for Operating Microscope	01	49,83,000	8,96,940	58,79,940
				Grand total amount in Rs.	58,79,940

2. The equipment supplied shall be under 05 years comprehensive warranty (including all spares, accessories and labour) from the date of completion of satisfactory installation.

3. You have to execute agreement on non-judicial stamp paper worth Rs. 500/- in enclosed pro-forma, thereafter supply order will be issued by the institute.

4. You are required to submit Performance Security @ 03% of the cost of total order value in the form of Irrevocable Bank Guarantee (BG) or Fixed Deposit Receipt (FDR) from scheduled bank duly pledged in the favour of "AIIMS, Jodhpur" within 15 days from the date of issue of this letter along with the agreement bond and which shall be kept valid for a period of 60 days beyond completion of all the contractual obligations.

5. You are further requested to supply & install the above said items within 90 days from the date of issue of supply order.

6. **Payment terms:**
Payment shall be released after the successful installation/ commissioning of the ordered goods against the submission of the inspection certificate by the AIIMS, Jodhpur.

N.R.Bishnoi
Deputy Director (Admin)

Dr. Somil Jaiswal MS, MCh. Professor Department of Neurosurgery King George' Medical University Lucknow

Dr. ANKUR BAJAJ M.S., M.Ch. Department of Neurosurgery K.G's. Medical University Lucknow

Dr. Hanuman Prasad Prajapati MS, M.Ch. Asstt. Prof. Department of Neurosurgery K.G.'s Medical University Lucknow

डा० अवधेश कुमार जायसवाल
Dr. Awadhesh Kumar Jaisw...
प्राध्या एवं विभागा/Professor & He...
विभाग एवं चिकित्सा विज्ञान/ Deptt. of Neurosu...
संजीपीजीआईएमएस/S.G.P.G.I.M.S.
लखनऊ/Lucknow

Dr. Manish Jaiswal MS, MCh. Professor Department of Neurosurgery King George' Medical University, Lucknow

Dr. B. K. Ojha M.S., M.Ch. Prof. & Head Department of Neurosurgery K.G.'s Medical University, Lucknow

Dr. ANIL CHANDRA M.S.,MCh, Professor, Department of Neurosurgery, K.G's Medical University, Lucknow

DR. AWADHESH YADAV MS, MCh. Additional Professor Department of Neurosurgery King George's Medical University, Lucknow

(2)

ZEISS

Carl Zeiss Meditec AG 73447 Oberkochen

To whom it may concern

Carl Zeiss Meditec AG

Oberkochen location
Rudolf-Eber-Str. 11
73447 Oberkochen
Germany

Phone: +49 (0) 7364/ 20 2928

E-mail: alexander.partsch@zeiss.com

Division/Dept.: MED-CMS

Your contact: Alexander Partsch

Date: 01. September 2026

Proprietary Certificate for INFRARED 800/IR 800 Module for PENTERO 800S

Dear Sir/ Madam,

We, Carl Zeiss Meditec AG, located at Rudolf-Eber-Str.11, 73447 Oberkochen, Germany, hereby certify that the INFRARED 800/IR 800 Module of PENTERO 800S is the proprietary product of Carl Zeiss Meditec, AG.

All the related below mentioned upgradation is ZEISS own proprietary articles, and the product design, manufacturing and specifications are governed by Carl Zeiss Meditec, AG.

- The Upgrade kit system will offer an option for fluorescence-based video angiography detecting with Full-HD resolution.

- An optional setup phase for indocyanine green (ICG) video-angiography guiding in optimal adjustment for blood flow assessment will be available.

- The fluorescence-based video angiography system will support parfocal recording of white light and near Infrared fluorescence detection for all working distances and zoom settings without requiring manual adjustments.

- With the upgraded module, it is possible to visualize submillimeter blood vessels. Intraoperative imaging of cerebral blood flow is of particular interest in vascular neurosurgery and free flap surgery in reconstructive applications. Module should enable intraoperative visual assessment of blood flow after an anastomosis has been created and visualizes the vascular patency of the grafted tissue.

Dr. B. K. Ojha
M.S. M.Ch.
PROFESSOR & HEAD
Department of Neurosurgery

Best regards

Carl Zeiss Meditec AG

i.V.

Alexander Partsch
Senior Business Manager
ZEISS Microsurgery

Carl Zeiss Meditec AG
Standort: Oberkochen
Rudolf-Eber-Strasse 11 · 73447 Oberkochen · Germany

i.V.

René Stanke
Senior Business Manager
ZEISS Microsurgery

ZEISS

Carl Zeiss India (Bangalore) Pvt. Ltd.
Regd. Office
Plot No. 3, Jigani Link Road
Bommasandra Industrial Area
Bangalore - 560 099, INDIA

Tel. : 91-80-43438000
Fax. : 91-80-43438229
E-mail : info.in@zeiss.com
Web : www.zeiss.co.in

CIN: U33125KA2009PTC049465

Ref No: DEL/KGMU-LKO/DEL/MCS/VS/26-27/TEN/09

Date: October 12th, 2026

The Finance Officer,
King George's Medical University
Lucknow, Uttar Pradesh, India.

Sub.: Authorization letter.

Dear Sir

We, Carl Zeiss India (Bangalore) Pvt. Ltd. who are 100% subsidiary company of Carl Zeiss AG, Germany who are proven and reputable manufacturers of the Operating Microscope having registered office at Carl Zeiss Meditec AG, Goeschwitzer Str. 51 – 52, DE-07745, Jena, Germany and having factories at Germany, USA and Singapore hereby authorize M/s. Adis Mediworld, #1/1363, Ratan Khand, Sharda Nagar, Lucknow-226002 to quote, negotiate, procure order and supply the products as per your requirement for the above goods and its accessories manufactured by us.

The authorization is valid up to 31st March 2027. This letter of authority supersedes all previous Letters of authority if any.

Yours Faithfully,

For Carl Zeiss India (Bangalore) Private Limited

Joseph Toney INTJOSEP
Digitally signed by Joseph Toney INTJOSEP
Date: 2026.10.16 09:30:24 +05'30'

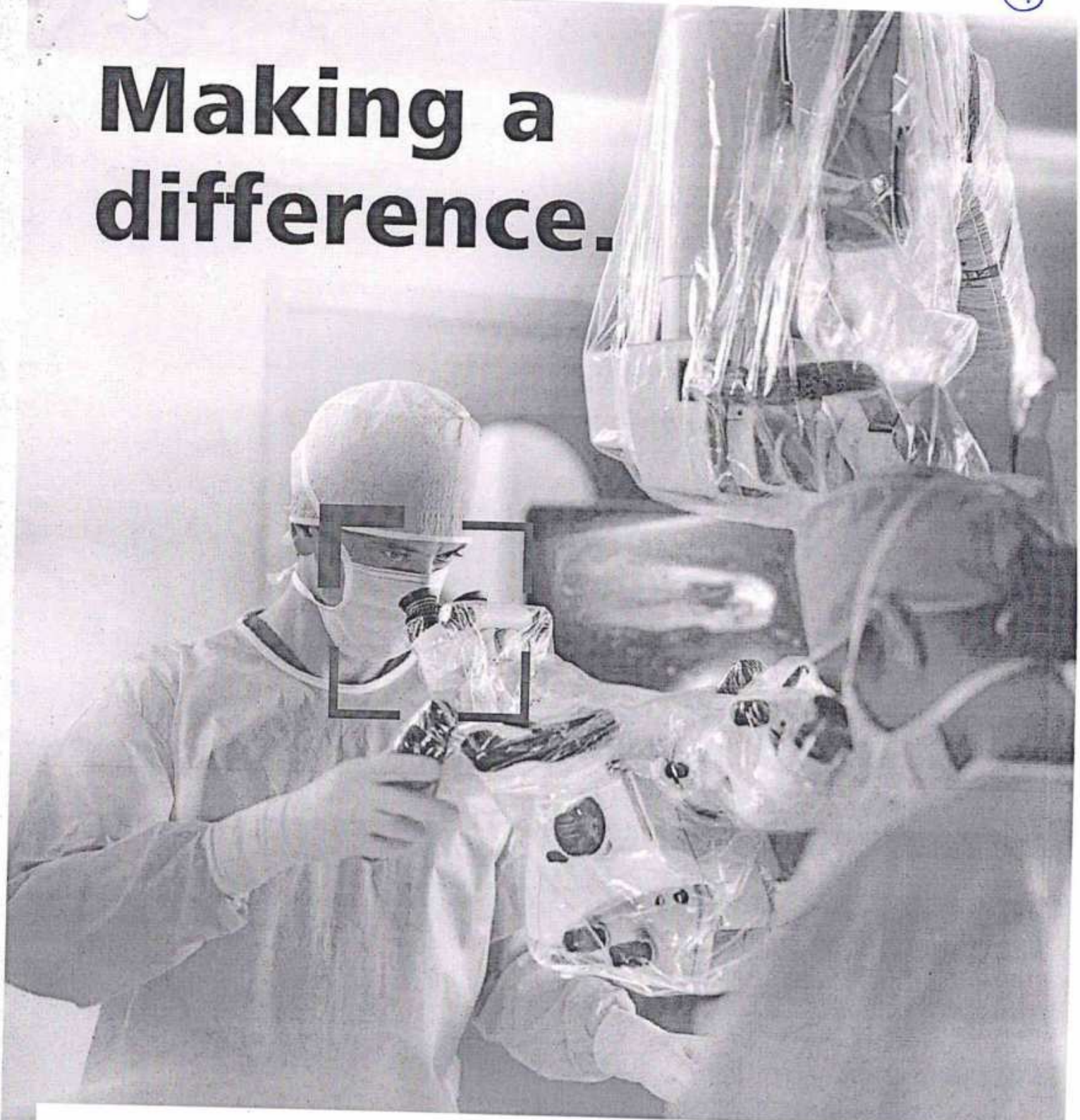
Authorized Signatory

Carl Zeiss India (Bangalore) Pvt. Ltd.

Dr. B. K. Ojha
M.S. M.Ch.
PROFESSOR & HEAD
Department of Neurosurgery
K.G.'s Medical University, Lucknow

(4)

Making a difference.



ZEISS PENTERO 800 S

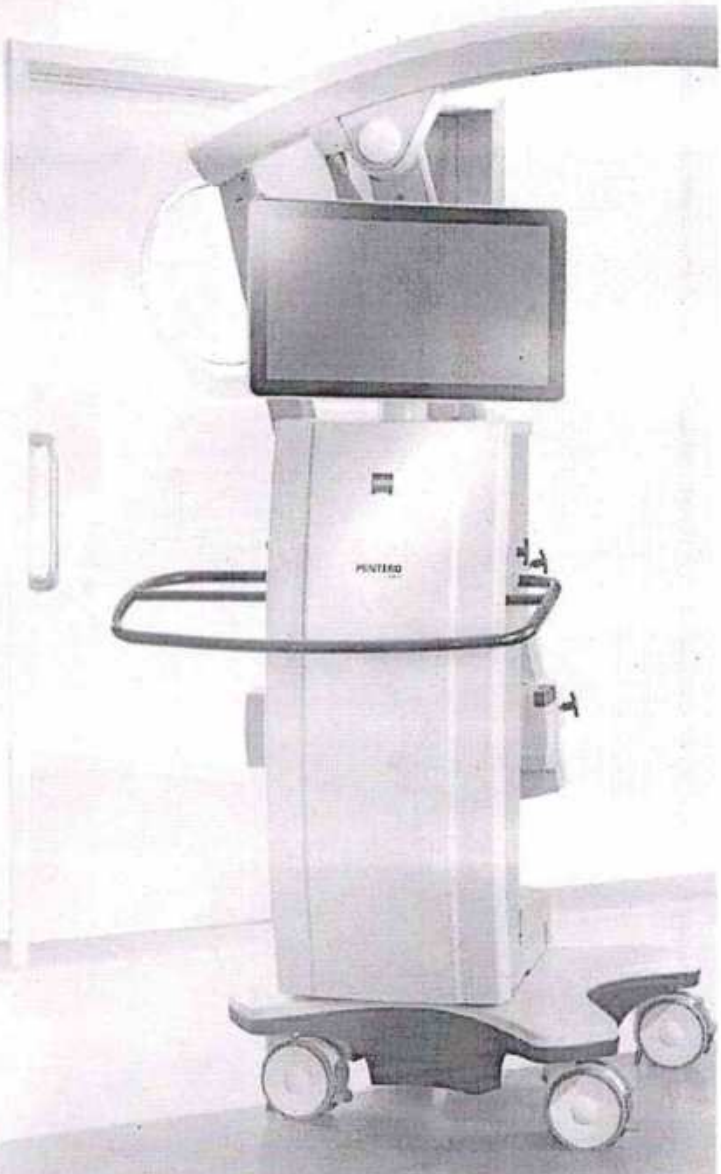
Dr. B. K. Ojha
M.S. M.Ch.
PROFESSOR & HEAD
Department of Neurosurgery
K.G.'s Medical University, Lucknow

zeiss.com/pentero

ZEISS

Seeing beyond

An iconic platform Reimagined

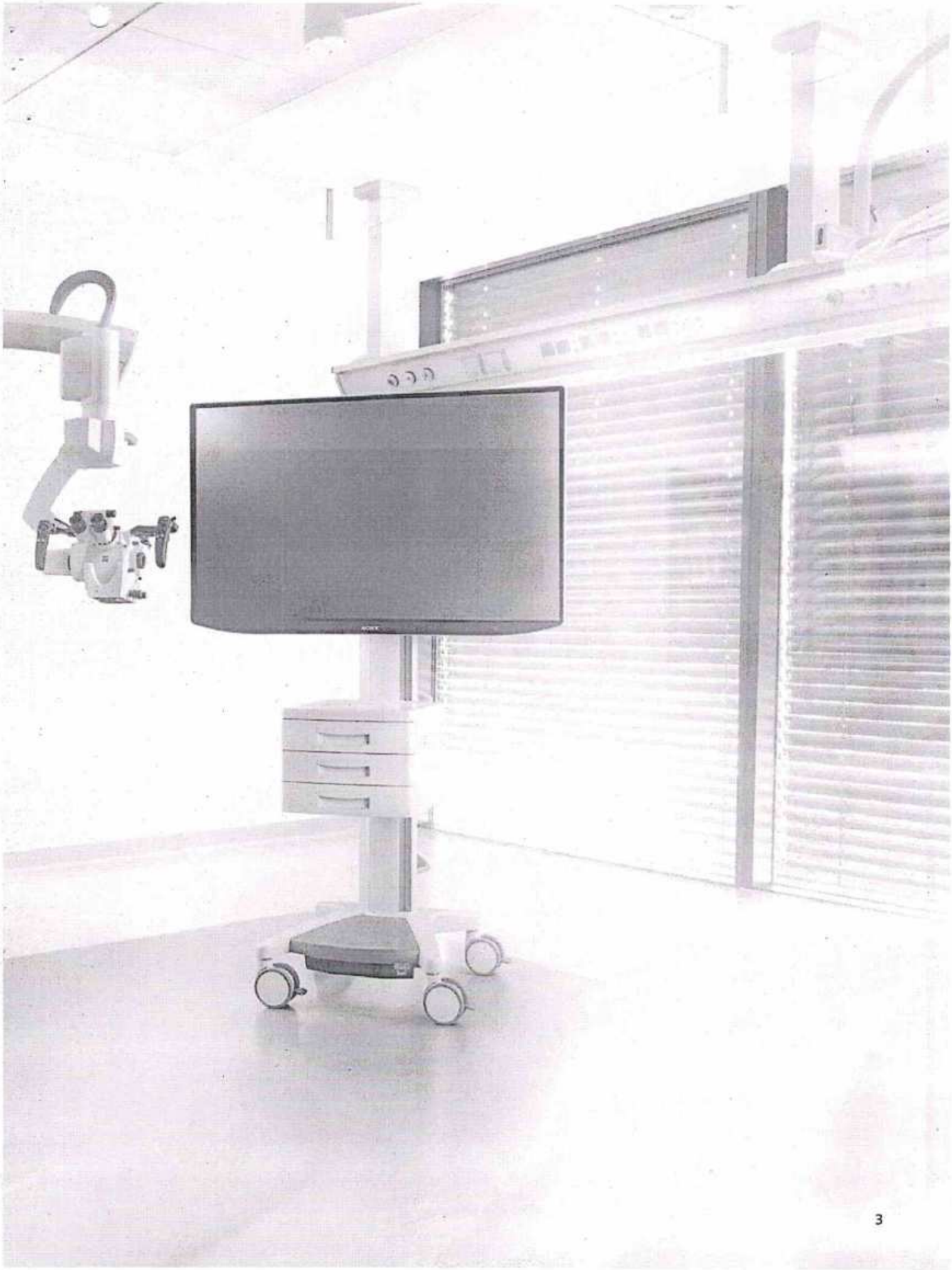


Modern microsurgery builds upon advances in providing comprehensive visual information at the right moment. PENTERO® from ZEISS has significantly shaped this progress: With more than 20 million surgical procedures to date, it is one of the most widely used surgical microscopes around the world.

ZEISS PENTERO 800 S opens up the next chapter in this success story. With your constantly evolving challenges in mind, we reimagined the iconic PENTERO platform for today's digital age – to support you in elevating your microsurgical interventions to yet another level.

Designed to suit your ambitious needs in spine surgery, neurosurgery, as well as plastic and reconstructive surgery, ZEISS PENTERO 800 S allows you to make a difference. It offers:

- Visual Certainty
- Seamless Performance
- Integrated Connectivity



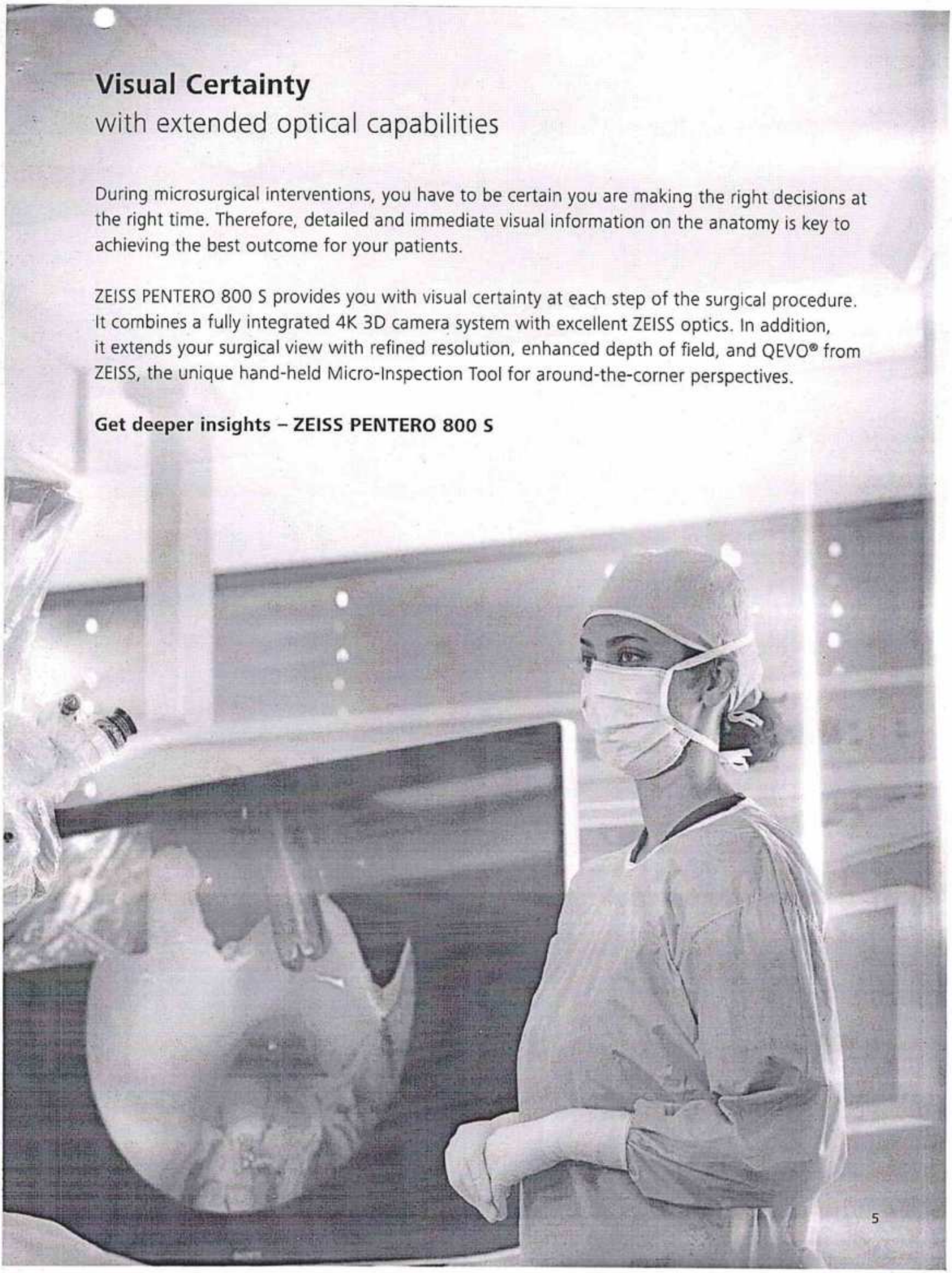
ZEISS
ZEISS

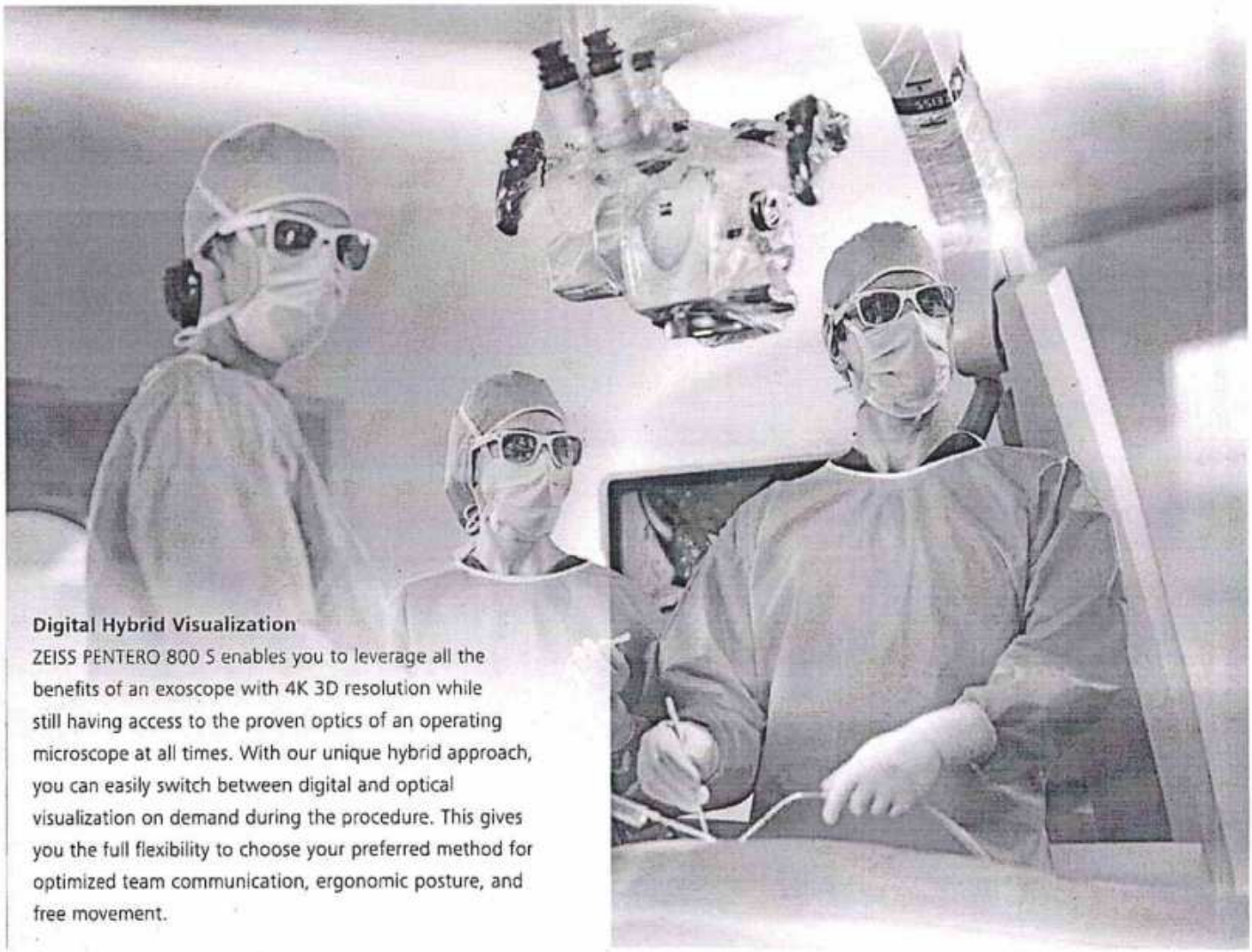
Visual Certainty
with extended optical capabilities

During microsurgical interventions, you have to be certain you are making the right decisions at the right time. Therefore, detailed and immediate visual information on the anatomy is key to achieving the best outcome for your patients.

ZEISS PENTERO 800 S provides you with visual certainty at each step of the surgical procedure. It combines a fully integrated 4K 3D camera system with excellent ZEISS optics. In addition, it extends your surgical view with refined resolution, enhanced depth of field, and QEVO® from ZEISS, the unique hand-held Micro-Inspection Tool for around-the-corner perspectives.

Get deeper insights – ZEISS PENTERO 800 S



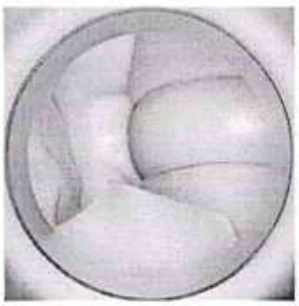


Digital Hybrid Visualization

ZEISS PENTERO 800 S enables you to leverage all the benefits of an exoscope with 4K 3D resolution while still having access to the proven optics of an operating microscope at all times. With our unique hybrid approach, you can easily switch between digital and optical visualization on demand during the procedure. This gives you the full flexibility to choose your preferred method for optimized team communication, ergonomic posture, and free movement.



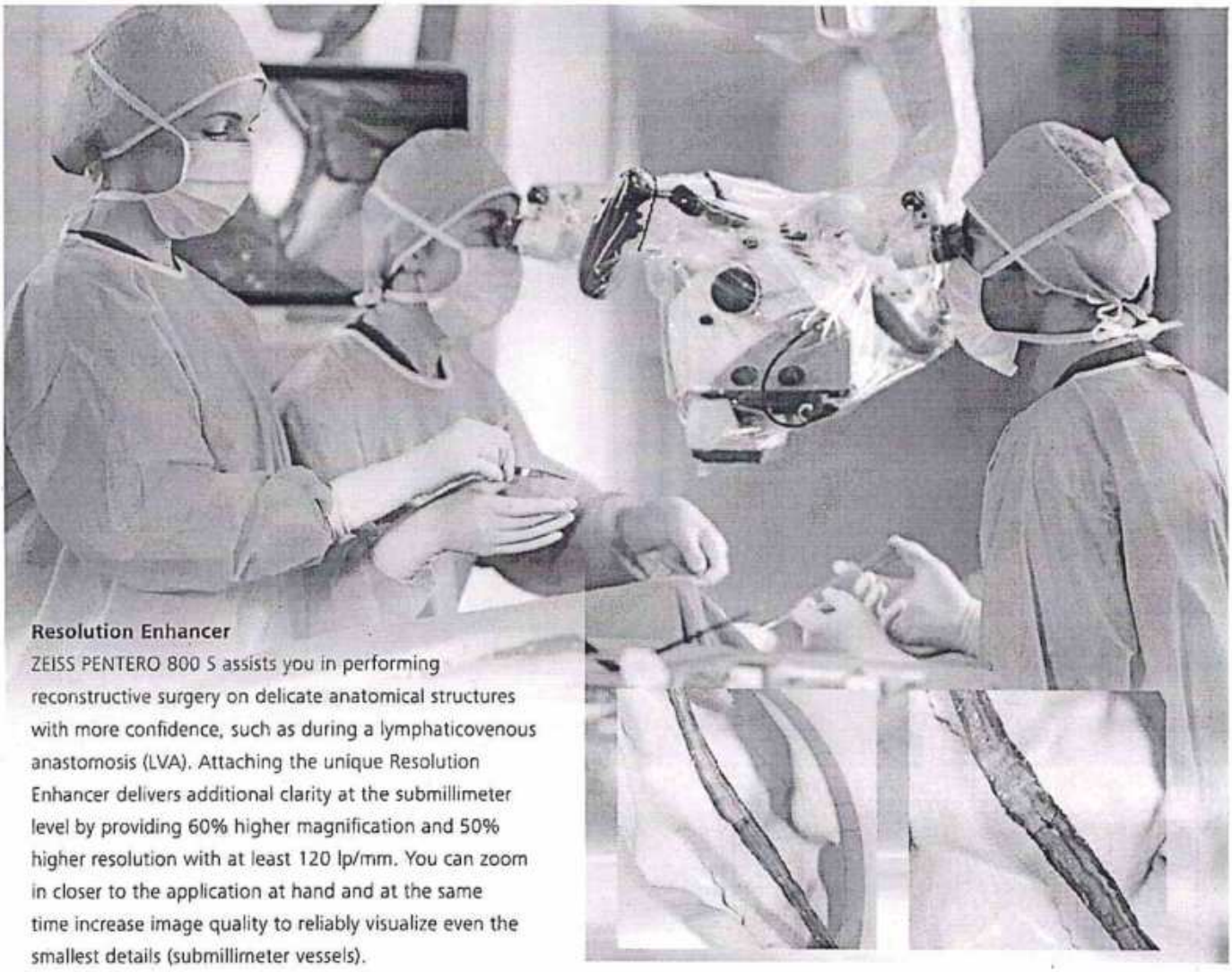
View in deep corridor



Increased depth of field with Depth+

Depth+

With the new Depth+ mode, you can further increase depth of field for a higher resolution in the outer area of your current focal point. This allows you to see everything in your field of view sharply with just a click. For example, during a minimally invasive transforaminal lumbar interbody fusion (TLIF), instant visual information on different anatomical layers is key to an efficient and safe procedure.



Resolution Enhancer

ZEISS PENTERO 800 S assists you in performing reconstructive surgery on delicate anatomical structures with more confidence, such as during a lymphaticovenous anastomosis (LVA). Attaching the unique Resolution Enhancer delivers additional clarity at the submillimeter level by providing 60% higher magnification and 50% higher resolution with at least 120 lp/mm. You can zoom in closer to the application at hand and at the same time increase image quality to reliably visualize even the smallest details (submillimeter vessels).

Lymphaticovenous anastomosis (LVA)

With +60% higher magnification and +50% higher resolution



Straight line of sight view



QEVO view behind tissue or corners

ZEISS QEVO

With ZEISS QEVO*, you can eliminate blind spots in the microsurgical view and effectively look around corners. Whenever needed, plug it in to your ZEISS PENTERO 800 S to get an immediate endoscopic view of the anatomy without increasing the surgical footprint. For instance, during spine surgery, you can inspect the anterior point of the spinal cord without retracting the anterior vasculature.

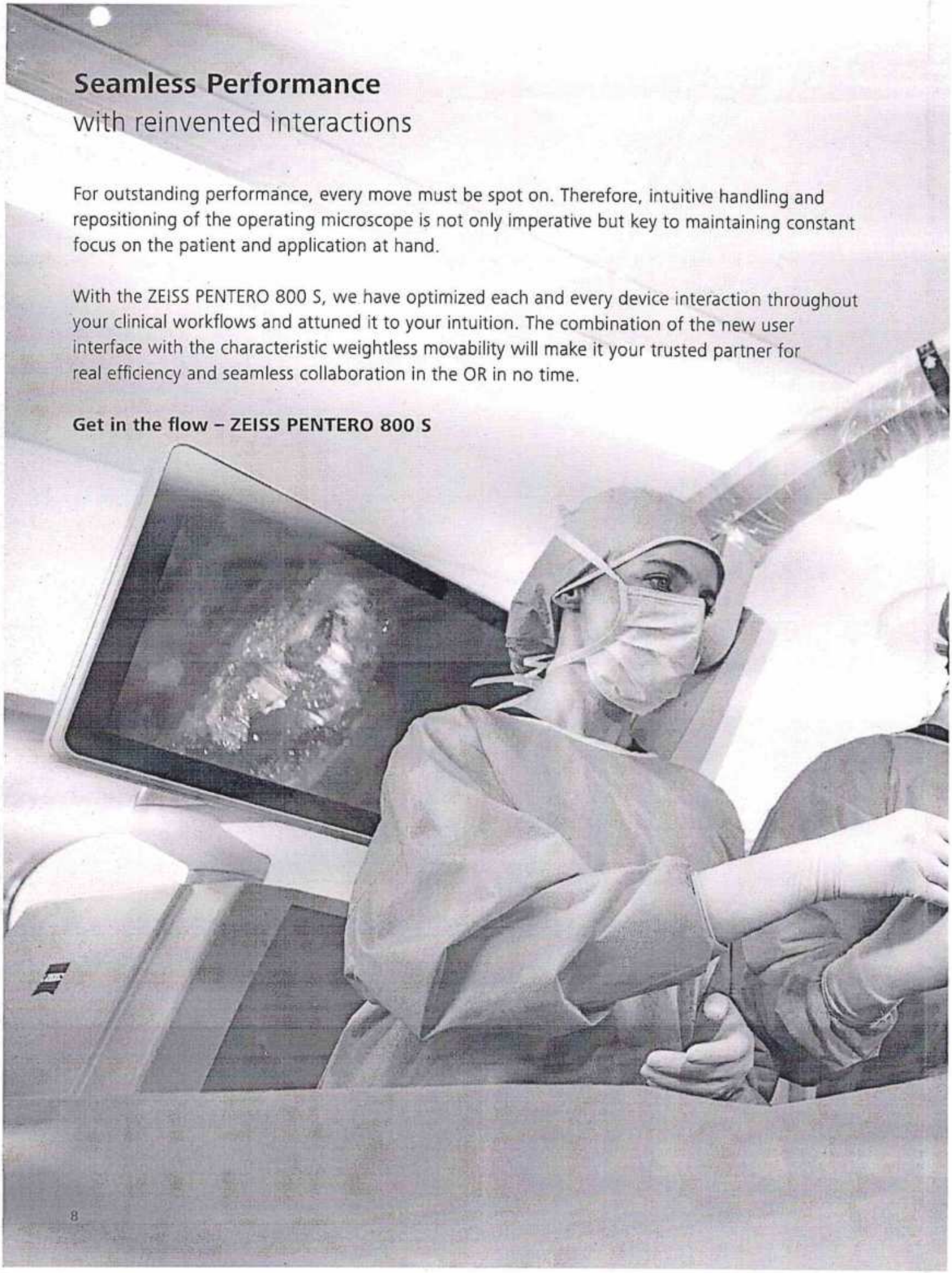
** QEVO not for commercial distribution in the USA – 510(k) pending.*

Seamless Performance
with reinvented interactions

For outstanding performance, every move must be spot on. Therefore, intuitive handling and repositioning of the operating microscope is not only imperative but key to maintaining constant focus on the patient and application at hand.

With the ZEISS PENTERO 800 S, we have optimized each and every device interaction throughout your clinical workflows and attuned it to your intuition. The combination of the new user interface with the characteristic weightless movability will make it your trusted partner for real efficiency and seamless collaboration in the OR in no time.

Get in the flow – ZEISS PENTERO 800 S





Intuitive user interface

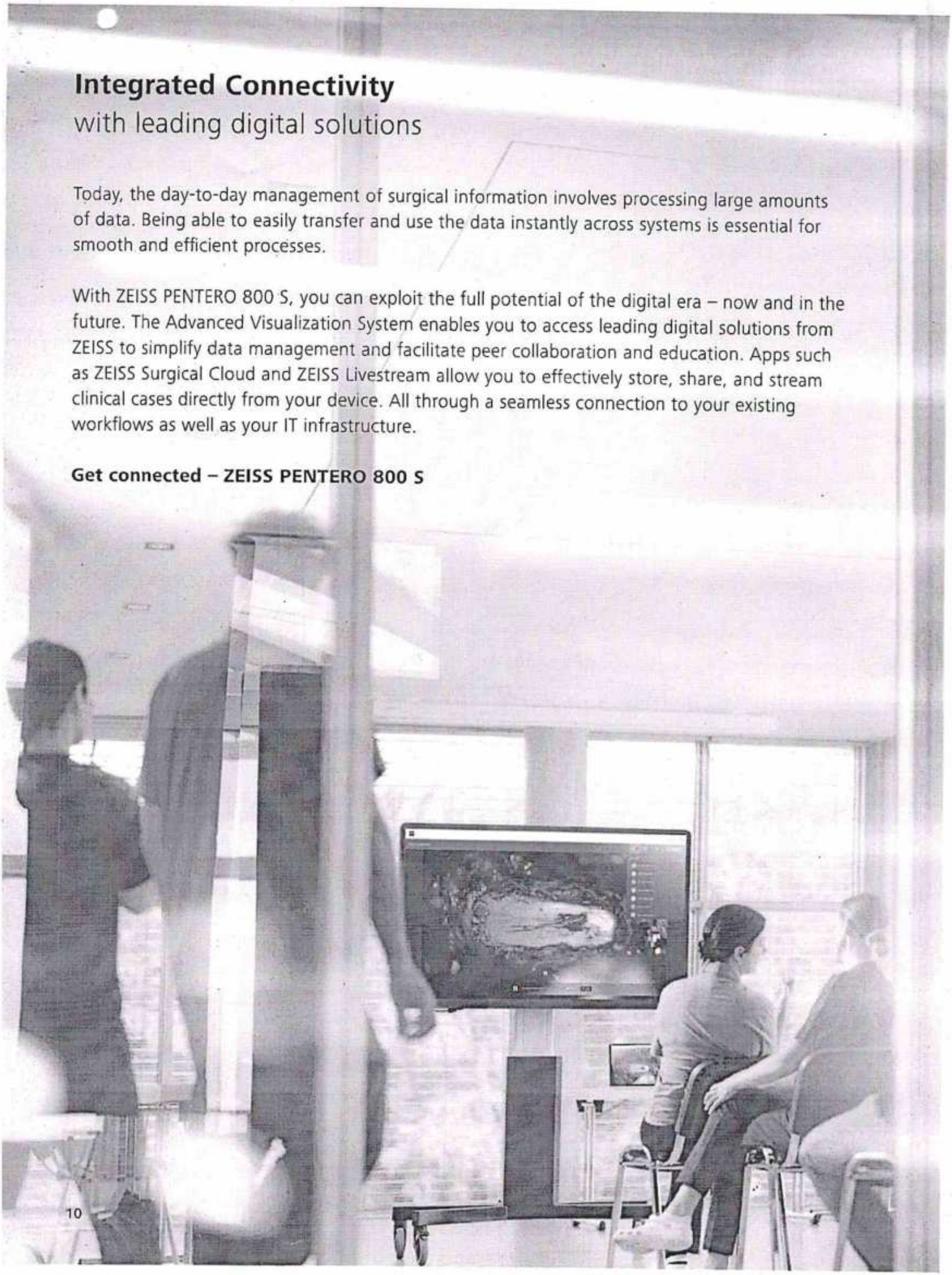
ZEISS PENTERO 800 S comes with an intuitive graphical user interface on a high-definition touch screen. This allows you to change system settings such as light intensity or handgrip configuration with the click of a button. The process of onboarding new users is sped up and time spent on routine tasks is saved for each case.

Integrated Connectivity
with leading digital solutions

Today, the day-to-day management of surgical information involves processing large amounts of data. Being able to easily transfer and use the data instantly across systems is essential for smooth and efficient processes.

With ZEISS PENTERO 800 S, you can exploit the full potential of the digital era – now and in the future. The Advanced Visualization System enables you to access leading digital solutions from ZEISS to simplify data management and facilitate peer collaboration and education. Apps such as ZEISS Surgical Cloud and ZEISS Livestream allow you to effectively store, share, and stream clinical cases directly from your device. All through a seamless connection to your existing workflows as well as your IT infrastructure.

Get connected – ZEISS PENTERO 800 S





Simplified patient data management
ZEISS Surgical Cloud directly synchronizes recorded images and videos including patient and treatment information with your ZEISS PENTERO 800 S and allows you to manage them easily. It supports you to enhance your professional collaboration and extend your network by remote sharing of large files and knowledge with your peers.

Broadcast your experience
ZEISS Livestream allows you to schedule a live surgery or treatment and send out invitation links to participants in advance. On the day of the live event, your participants can watch the procedure via the secure web link with just a few clicks.

ZEISS Intraoperative Fluorescence Technologies

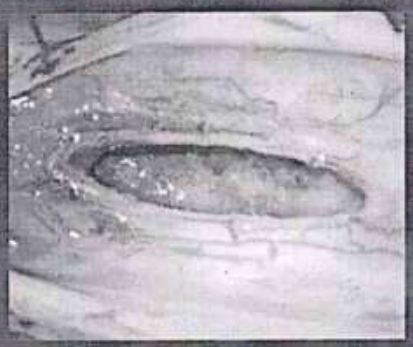
Deeper insights. Greater control.

During challenging cases, surgical visualization adjuncts are essential for making the right decisions at the right time. ZEISS PENTERO 800 S comes with leading intraoperative fluorescence technologies from ZEISS. You can select the fluorescence options according to your needs.



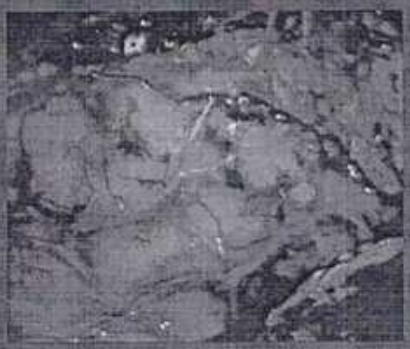
ZEISS INFRARED 800

With ZEISS INFRARED 800, it is possible to visualize submillimeter blood vessels. Intraoperative imaging of cerebral blood flow is of particular interest in vascular neurosurgery and free flap surgery in reconstructive applications. ZEISS INFRARED 800 enables intraoperative visual assessment of blood flow after an anastomosis has been created and visualizes the vascular patency of the grafted tissue.



ZEISS YELLOW 560[1]

The first intraoperative fluorescence module to highlight fluorescence-stained structures while visualizing non-stained tissue in its natural-like color.



ZEISS BLUE 400[1]

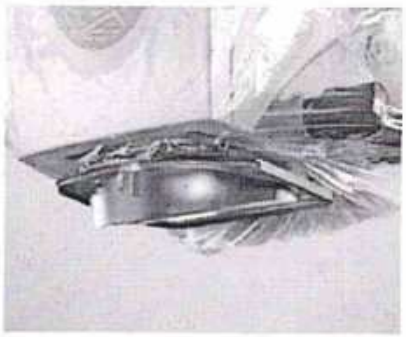
Allows intraoperative differentiation of high-grade glioma cells and healthy tissue in suspected high-grade gliomas (grade III and IV). The only microscope integrated fluorescence module to prove its efficiency in a successfully conducted Phase III multi-center study[2].

[1] Please use the fluorescent agent as per the approval status for the application in your country.
[2] Stummer W, Pichlmeier U, Meinel T et al. Fluorescence-guided surgery with 5-aminolevulinic acid for resection of malignant glioma: a randomised controlled multicentre phase III trial. Lancet Oncol 7: 392-401, 2006

ZEISS Consumables and Services

Adding value beyond the devices

The challenges you face every day include growing demands on clinical efficiency. The ZEISS offering goes beyond the device and software applications. It is rounded out by services and consumables, that support you in optimizing the clinical management of your patients.



ZEISS SMARTDRAPE

Combining simplicity and innovation, SMARTDRAPE® from ZEISS has been designed together with ZEISS PENTERO 800 S. It allows you and your team to have the benefits of a vivid view, efficient OR preparation, and effective patient protection. Simply activate AutoDrape® to automatically evacuate the air from the sterile drape within seconds.



ZEISS OPTIME

Our tailor-made service agreements for medical equipment offering modular services to help prevent unplanned breakdowns and assist you in running your business smoothly. Service agreements for ZEISS PENTERO 800 S can include remote support via ZEISS Smart Services for even faster qualified assistance.



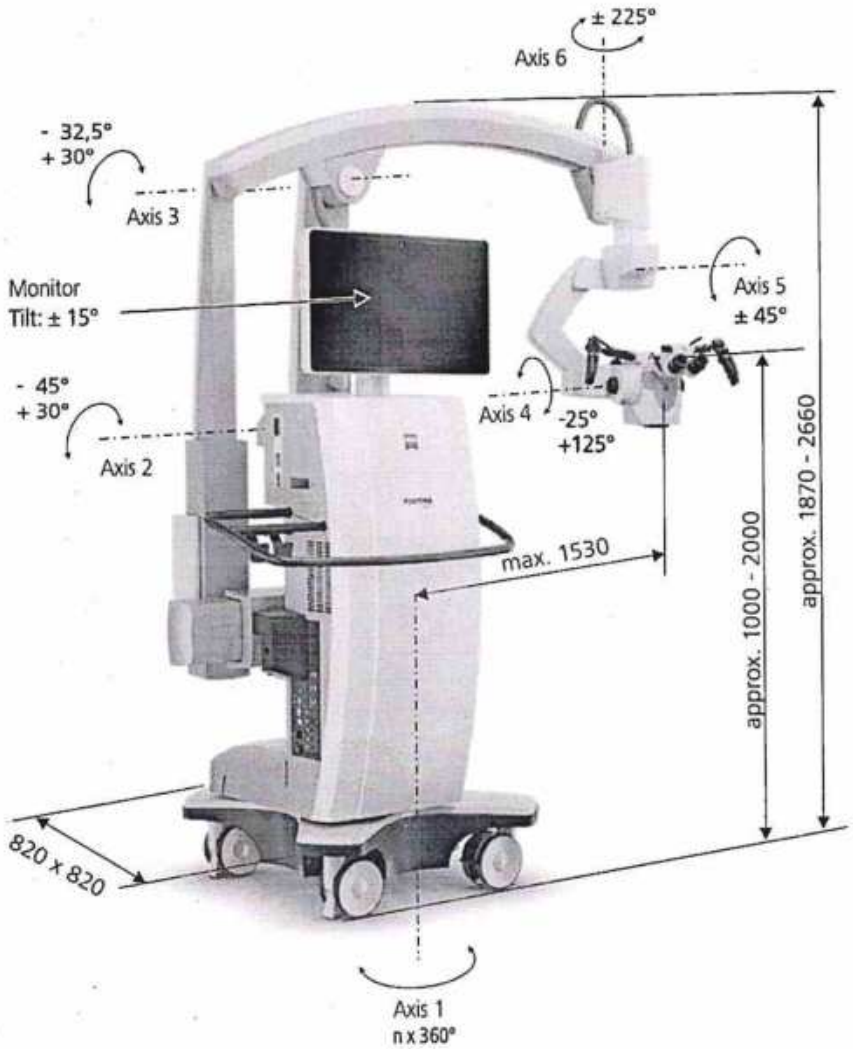
MyZEISS

The ZEISS customer platform that enables you to unlock the full potential of your ZEISS devices. It offers a wide selection of training videos and peer insights to help you use your products effectively and efficiently.

Technical Data

PENTERO® 800 S from ZEISS

Technical Data	
Rated Voltage	100 V–240 V AC
Current Consumption	Max. 1.200 VA
Rated Frequency	50 Hz–60 Hz
Electrical Standard	IEC 60601-1, IEC 60601-1-2, IEC 60825, IEC 62304, CAN/CSA-C22.2 NO. 60601-1
	Degree of protection against electric shock: Class 1
	Class 2 laser product as per IEC 60825
Weight	Total weight of device with max. add. load: Max. 365 kg
	Total weight of the device incl. single-use transport box: Approx. 800 kg



		Packages	Standard	Spine Comfort	P&R Comfort
System	PENTERO 800 S basic system		●	●	●
Main Tubes	Straight binocular tube		○	□	□
	180° tiltable tube		○	○	–
	Foldable Tube f170/f260		○	○	●
Eyepieces	10× widefield eyepieces		○	○	–
	12,5× widefield eyepieces		○	○	○
Focus	Laser Autofocus		□	●	●
Working Distance	200 – 500 mm		●	–	–
	200 – 625 mm		□	●	●
Illumination	Xenon – Fully integrated Xenon light source with automatic lamp exchange		●	●	●
Co-Observation	Face-to-face		□	●	●
	Left / right with stereo co-observer		□	□	□
Tube for co-observation	Straight binocular tube		○	○	○
	180° tiltable tube		○	○	○
	Foldable Tube f170/f260		○	○	○
Balance	AutoBalance		●	●	●
XY-Movement	Angular movement with joystick or foot pedal		□	●	●
Video System	4K Video Package – Fully integrated 4K 3Chip camera, 2160p		○	○	○
	4k 3D Video Package – 2× fully integrated 4K 3Chip camera, 2160p		○	○	○
Video Options	Video Recording		□	●	●
	HD Video-In		□	□	●
	External 55" 4K 3D monitor with monitor cart		□	□	□
Fluorescence[3] / QEVO	INFRARED 800 with FLOW 800 Option[4]		□	□	●[5]
	YELLOW 560		□	□	□
	BLUE 400		□	–	–
	QEVO		□	□	□
Visualization	Integrated Depth+		–	●	–
	MultiVision		□	□	□
	Resolution Enhancer		–	–	□
Networking & Storage	Integrated 1TB hard drive		●	●	●
	WLAN package		●	●	●
	ZEISS Surgical Cloud and ZEISS Livestream Preparation		□	□	□
	ZEISS Smart Services Package – Connectivity for ZEISS Smart Services		●	●	●
	Shared Network Package – Storage on shared network directories		□	□	□
	DICOM Package – Patient data exchange with PACS system via DICOM		□	□	□
	LAN interface		□	□	□
Navigation	Navigation Package		□	□	□
Foot Control Panel	Foot Control Panel wired / wireless		□	□	□

● Basic ○ Configurable □ Option

[3] YELLOW 560 and BLUE 400 can only be combined with INFRARED 800 with FLOW 800 Option, not with each other

[4] For PENTERO 800 S the FLOW 800 Option is not available

[5] Preparation for one fluorescence module included; separate license necessary

Corpectomy: Image courtesy of Prof. Dr. Oliver N. Hausmann, Hirslanden Klinik St. Anna, Lucerne, Switzerland (Cover page and page 10 and 11)
Spinal arachnoid web using ZEISS QEVO: Image courtesy Prof. Dr. Claudius Thomé, Medical University, Innsbruck, Austria (page 5)
Lumbar spine decompression using Digital Hybrid Visualization: Image courtesy of Prof. Dr. Oliver N. Hausmann, Hirslanden Klinik St. Anna, Lucerne, Switzerland (page 6)
Lymphovenous anastomosis: Image courtesy of Dr. Christian Taeger, Private Clinic, Munich, Germany (page 7)
Anterior cervical interbody fusion: Image courtesy of Prof. Dr. Oliver N. Hausmann, Hirslanden Klinik St. Anna, Lucerne, Switzerland (page 8)
Vessel patency after anastomosis using INFRARED 800: Prof. Dr. Milomir Ninkovic, University Clinic, Bogenhausen, Germany (page 12)
Intramedullary spinal tumor resection using YELLOW 560 (o f-label use): Yu-Mi Ryang, MD, Head of Department Neurosurgery and Center for Spine Therapy, Helios Klinikum Berlin-Buch, Germany (page 12)
Glioma surgery using BLUE 400: Prof. Dr. Walter Stummer, Department of Neurosurgery, University Hospital, Münster, Germany (page 12)

CE

PENTERO 800 S
QEVO ECU

CE 0297

QEVO
INFRARED 800
SMARTDRAPE

Carl Zeiss Meditec AG
Goeschwitzer Strasse 51–52
07745 Jena
Germany
www.zeiss.com/med/contacts

en-INT_30_010_0126III CZ-IX/2023 International edition: Only for sale in selected countries.
The contents of the brochure may differ from the current status of approval of the product, functions, or service offering in your country. Please contact our regional representatives for more information.
Subject to changes in design and scope of delivery and due to ongoing technical development. PENTERO, QEVO, SMARTDRAPE and AutoDrape are either trademarks or registered trademarks of Carl Zeiss Meditec AG or other companies of the ZEISS Group in Germany and / or other countries.
© Carl Zeiss Meditec AG, 2023. All rights reserved.

Arthroscopy Trolley System

King George's Medical University
Department of Orthopaedic Surgery
Lucknow (U.P.) 226018.

Ref. No. ..... Dated: .....

PROPRIETARY/ SPECIFIC BRAND GOODS CERTIFICATE

1	Item/ Type/ Model No. required along with specification	**Synergy Vision with Nanoscope and Panoscope**
2	If the item a spare part attachment or accessory for an existing equipment Yes / No (If Yes, provide details)	**This is a Camera System with essential Accessories.**
3	Name of the manufacturers/supplier of the item proposed by the indenter	**Arthrex GmbH ("Arthrex"), Erwin-Hielscher-Str. 9, 81249 Munich, Germany**
4	Are they sole manufacturers/ sold distributors of the Item Yes / No	**Yes, these are proprietary products.**
5	If there any other item with similar/equivalent specification available in the market to meet the job requirement envisaged. Yes / No (If Yes, explain why those alternatives cannot be procured and provide a comparative analysis of the functional advantages/cost-effectiveness of the recommended item)	**No, These are the proprietary & patented products and hence there are no similar products available in the market. These products being acquired are the latest generation technology available currently also used in countries like US, Europe. No Other Company has :** **1. HDR Technology, which is the advancement to 4K Technology for Surgical Precision** **2. Dual Visualization with Nanoscope Technology** **3. Panoscope Technology which that uses a fish-eye lens in the scope plus Synergy Vision™ digital image processing to deliver an ultra-wide field of view and let the surgeon toggle views at the press of a button**
6	Efforts made to locate alternative sources of supply or use of substitutes	**Yes but none available.**
7	Why open tender can't be resorted to, for locating alternative source.	**Open Tender cannot be done, as there is no alternative source.**
8	Are the proprietary items certified to have reasonable rates? Yes / No (Attach supporting documents, if applicable)	**Yes**
9	Any other justification for procuring the item from a single source	**These are product/items which have been required by us. We have discussed the rationale of requirement, which is to improve Patient and Surgical outcomes . by way of surgical precision and better access. This would also help us build Trust, Better Word of Mouth and Tool for exposure to latest technology in arthroscopy. The Products are unique and proprietary and are available only with Arthrex. We require these products for specific treatments to achieve better surgical outcomes. Therefore, based on surgical results, clinical**

King George's Medical University
Department of Orthopaedic Surgery
Lucknow (U.P.) 226018.

Ref. No. ..... Dated: .....

		requirements, and technical considerations, these products are being requested.

I hereby certify that the above item is required to be procured on a proprietary/single-source basis, as the specified brand is the only known source that meets our functional requirements. Given the unique advantages of this brand, an open tender process would not serve any meaningful purpose in this case and can justifiably be waived.

(strike out whoever is not applicable)

(Dr. Kumar Shantanu)
Professor
Department of Orthopaedic Surgery
King George's Medical University UP
Lucknow

Head of the Department
Dr. Ashish Kumar
Professor & Head
Department of Orthopaedic Surgery
King George s Medical University U P
Lucknow

Proprietary Article Certificate in the following form is to be provided by the Ministry/Department before procuring the goods from a single source under the provision of sub Rule 166 (i) and 1 66 (iii) as applicable.

(i) The indented goods are manufactured by M/s **Arthrex GmbH ("Arthrex"),**

(ii) No other make or model is acceptable for the following reasons :

The products possess proprietary technology and unique design specifications required for specialized surgical procedures to achieve optimal patient outcomes.

(iii) Concurrence of finance wing to the proposal vide: .....

(iv) Approval of the competent authority vide: .....

(Signature with date and designation of the indenting officer)

Dr. Kumar Shantanu
Professor
Department of Orthopaedic Surgery
King George's Medical University UP
Lucknow

Dr. Rakesh Kumar
Professor & Head
Department of Orthopaedic Surgery
King George's Medical University U P
Lucknow

October 13, 2026

Name and Address of Manufacturer:
Arthrex, Inc.
1370 Creekside Boulevard
Naples FL 34108-1945, USA

India – Proprietary Article Certificate (PAC)

To,
Finance Officer
King George's Medical University
U.P. Lucknow

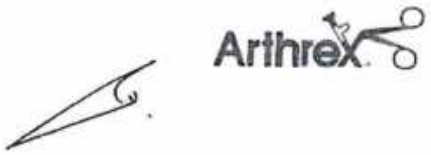
We, Arthrex GmbH ("Arthrex"), located at Erwin-Hielscher-Str. 9, 81249 Munich, Germany, hereby certify that we are the EMEA headquarter of and insofar operating the business for Arthrex Inc., located at 1370 Creekside Blvd., Naples, Florida 34108, USA being the legal manufacturer/distributor of the following products:

Sr. No.	Article Code	Description
1	AR-3200-0026	Synergy Vision™ Camera Control Unit
2	AR-3210-0035	Synergy Vision™ Camera Head, 4K, C-mount, autoclavable
3	AR-3200-1016	Synergy Vision™ Digital Documentation Tablet
4	AR-3210-0043	NanoNeedle Scope, 125 mm
5	AR-3210-0052	NanoNeedle Scope High-Flow Operative Sheath Kit (With Crown Tip andFenestration Cutout), 125 mm
6	AR-3355-4050	4K C-Mount Pano™ Scope Arthroscope, 45°, 4.2 mm x 161 mm
7	AR-3373-4202	Sheath, HF, Tap/Fen, 2 stopcock for Pano™ Scope
8	AR-3375-4201	Conical obturator w/handle for Pano™ Scope sheath, HF, Tap/Fen

We furthermore certify that we have appointed
Avana Medical Device Pvt. Ltd.,
No. 91, Sundar Nagar, 4th Avenue, Nandambakkam, Chennai - 600032, India
(hereinafter "Avana")

as our exclusive authorized distributor in the territory of India ("Territory") in the human medicine market within the orthopedic / sports orthopedic / biologic / aesthetic scope ("Scope") for the respective product portfolios ("Products").
Avana is entitled to sell the Products in the Territory and within the Scope as our authorized distributor.
The letter of Authorization is valid until 08th Oct 2027.

Authorized signatory & stamp:

Name:	Mrs. Russul Bakir
Job Title:	Regulatory Affairs Manager Arthrex
Signature & Stamp:	

Arthrex Inc. 1370 Creekside Boulevard, Naples, Florida 34108-1945 • Tel: 800-933-7001 or 239-643-5553 • Fax: 239-591-6980 • www.arthrex.com

E-Q-3

Technical Specification of latest Arthoscopy System with compliete instrument set

1.1) System Overview

- The system must be a **combined all-in-one 4K imaging platform** integrating camera control unit, LED light source, and image/documentation management.
- Must support **4K UHD imaging, HDR, wide-view Pano™ imaging,**
- Must be compatible with **Nano Needle scopes**

1.2) Camera Control Unit (CCU)

- Operating System: Embedded Linux
- Image Resolution: 3840 × 2160 pixels (4K UHD)
- Gain Settings: Low (0 dB), Medium (+9 dB), High (+18 dB)
- Image Output Ports:
  - 1x DisplayPort 1.2
  - 2x HDMI 2.0
  - 4x SDI (3G-SDI/12G-SDI)
- Input: 1x HDMI 2.0 supporting 4K/Full HD
- Internal Storage: 1 TB SSD
- Integrated Wi-Fi & Ethernet for DICOM export and streaming
- Augmented Reality Modes: RED+, RED-, Bio Optic, Highlight
- Defibrillation-proof and CF applied part classification
- Must provide at least 3 programmable camera head buttons

1.3) Camera Head

- Single or triple CMOS sensor with C-mount interface
- Image Resolution: 3840 × 2160 pixels, 10-bit per color channel
- Housing: Welded titanium, IPX7, autoclavable, with anti-glare window
- Weight: Approx. 0.534–0.544 kg (with cable)
- Sterilization: Steam and hydrogen peroxide
- Must support NIR and Pano imaging (Synergy Visionary model)

1.4) Light Source

- LED technology (cold light source)
- Light Output: ≥ 1650 Lumens (Typical: 1900 Lumens)
- Color Temperature: 5500 – 8400 K
- CRI: ≥ 61.5
- Must support ACMI™, Storz™, Wolf™, Olympus™ light cables

Dr. Vineet Kumar
Professor
Department of Orthopaedics
Dr. RMLIMS, Lucknow

Dr. Deepak Kumar
Professor & Head
Department of Orthopaedics
Dr. RMLIMS, Lucknow

(Dr. Kumar Shantanu)
Professor
Department of Orthopaedic Surgery
King George's Medical University UP
Lucknow

Dr Narendra Singh Kushwaha
Professor
Department of Orthopaedic Surgery
King George s Medical University U P
Lucknow

Dr. Ashish Kumar
Professor & Head
Department of Orthopaedic Surgery
King George s Medical University U P
Lucknow

1.5) Tablet Interface

- Screen Size: 13 inches
- Resolution: 1920 × 1080 pixels
- Interface: USB-C, VESA mountable
- IP Rating: Front – IP44, Back – IP23
- Must support user-level customization for image, video, and camera settings

1.6) Image and Video Documentation

- Support for real-time annotation, still/video recording, and export to PACS (DICOM)
- Multiple export formats: USB, iPad/iPhone, file server
- Formats: JPEG (photos), MP4 (video), RAW (DICOM), PDF (reports)

1.7) Safety & Connectivity

- Ingress Protection: IPX0 (CCU)
- Power Supply: 100–240V, 50/60Hz
- Protection Class: I
- USB 2.0, USB 3.0, USB-C, RS-232, RJ45, ACB 1.0 & 2.0 ports

1.8) MEDICAL GRADE MONITOR

- Screen technology TFT AM LCD / LED backlight
- Active screen size (diagonal): 31 inch or more
- Aspect ratio (H:V) 16:9
- Resolution: (3840 x 2160 pixels)
- Screen protection: Anti-reflective tempered glass
- Power consumption: 100W (Max)
- Power Supply: 100-240 VAC / 47-63 Hz

Dr. Vineet Kumar
Professor
Department of Orthopaedics
Dr. RMLIMS, Lucknow

2. 4K ARTHROSCOPE SET

- Should be a 4K Telescope with length not more than 160mm and diameter 4mm
- Angle of View 30deg – 1 QTY
- Should be autoclavable
- Compatible sheath & Obturator – 1 of each.
- Standard Ocular window for coupling the camera head
- Preferable to have a speed lock fixation in the Sheath.

Dr. Deepak Kumar
Professor & Head
Department of Orthopaedics
Dr. RMLIMS, Lucknow

3. ARTHROSCOPIC SHAVER SYSTEM

- Should have intuitive touch screen display with automatic handpiece recognition
- Should control the shaver settings via touchscreen of foot pedal
- Functions: Oscillation, Forward, Reverse
- Should have 3 oscillation modes: STD, EFF, AGG with variable speed settings
- Should have 2 channels each for Shaver Handpiece and Shaver Footswitch
- Handpiece should not be more than 850 gms

(Dr. Kumar Shantanu)
Professor
Department of Orthopaedic Surgery
King George's Medical University UP
Lucknow

Dr. Ashish Kumar
Professor & Head
Department of Orthopaedic Surgery
King George's Medical University U P
Lucknow

- Handpiece should be compatible with blades of sizes 3.5-5.5mm in diameter
- Cable length should be adequate and not less than 4meters
- FWD/REV should atleast be of 8000RPM
- OSC should atleast be of 3000RPM
- Handpiece should have shaver blade with quick release
- Handpiece should be autoclavable with detachable suction lever
- Footswitch should perform functions like Reverse, Forward, Ocillation, Speed increase and toggle between oscillation modes

4. *ARTHROSCOPY FLUID MANAGEMENT SYSTEM*

- Should have Intuitive Touch Screen Control with 4 presets: Shoulder, Knee, Small Joint, Hip.
- Should have Flowrate: ≥ 1500 ml/min and should be automatically adjusted
- Max. Flowrate setting: adjustable from 50% to 100% (increments of 10%)
- Pressure setting: 10 – 120 (increments of 5)
- Should have real time flow rate monitoring.
- Estimated fluid usage information should be displayed on the screen.
- Should have Shaver Boost & Lavage functionality.
- Overpressure control: 300 mmHg ± 5
- Weight: 6.24 kg
- Water protection class: IP22
- AC input: 100-240 V, 50/60 Hz, 1.5A Max/100VAC, 0.7A Max/240VAC

5. ARTHROSCOPIC RF SYSTEM(BI-POLAR)

5.1 RF CONSOLE

- Should have Intuitive touchscreen control with Automatic detection of connected probe.
- Control via hand-control buttons on probes, foot pedal or touchscreen
- Hand control also available with foot pedal connected.
- Optional foot pedal override functionality
- 3 button control with Ablation, Coagulation, Ablation-Power-Setting on Probe
- Should have metal proximity detection: suspends power when close to metal objects
- Probes can get unplugged and replugged during surgical time and system can therefore withstand power-interruptions.
- Working frequency: 100kHz
- Water protection class: IP22
- Max. power consumption: 650 VA
- Noise level: < 42dB
- Applied part type: CF
- Medical device directive: Class IIb

Dr. Vineet Kumar
Professor
Department of Orthopaedics
Dr. RMLIMS, Lucknow

Dr. Deepak Kumar
Professor & Head
Department of Orthopaedics
Dr. RMLIMS, Lucknow

5.2 RF FOOTSWITCH or RF FOOT PEDAL

- Buttons: Ablation; Coagulation; Ablation power setting
- Water protection class: IP68
- Cleaning/disinfection:
  - Cleaning: enzymatic cleaner without subsequent acid neutralization
  - Surface wipe-disinfection with commercially available surfactants
  - or surface disinfectants

(Dr. Kumar Shantanu)
Professor
Department of Orthopaedic Surgery
King George's Medical University UP
Lucknow

Dr Narendra Singh Kushwaha
Professor
Department of Orthopaedic Surgery
King George's Medical University U P
Lucknow

Dr. Ashish Kumar
Professor & Head
Department of Orthopaedic Surgery
King George's Medical University U P
Lucknow

6. EQUIPMENT TROLLEY

- Can be OEM/Indigenous trolley with 4 or more racks – 1 Qty

Sl No	**ACL & PCL Instruments Set**
1	RetroConstructionTM Drill Guide Handle, Side Release
2	Tibial ACL Marking Hook for Retroconstruction Drill Guié
3	Ratcheting Drill Sleeve, 2.4 mm
4	Tibial PCL, Hook Arm
5	Femoral PCL, Hook Arm
6	PCL Curved Curette, closed end
7	Drill Cannulated 4.5
8	Cannulated Drill, 8 mm
9	Cannulated Drill, 9 mm
10	Cannulated Drill, 10 mm
11	Cannulated Drill, ll mm
12	Semitendinosus Stripper, 5 mm
13	Cannulated Headed Reamer, 7 mm
14	Cannulated Headed Reamer, 8 mm
15	Cannulated Headed Reamer, 9 mm
16	Cannulated Headed Reamer, 10 mm
17	Cannulated Headed Reamer, l l mm
18	Transportal ACL Guide, 6mm
19	Graft Sizing Block, 4,5-12 mm holes in 0.5 increments
20	ACL Cruciate Toolbox Instrumentation Case
	Shoulder Instruments Set
1	Probe - Hook, 150 mm Shaft, 5.4 mm Tip
2	Suture Cutter, Open Ended Left Notch, Ø 4.2 mm
3	BirdBeak@, 22 ° Up Tip, Straight Shaft, 2.75 mm
4	Suture Retriever, Straight Shaft, Straight Ti , Ø 3.4 mm
5	Knot Pusher, Closed End
6	Glenoid Rasp
7	Shoulder Tissue Elevator, 15deg
8	Rotator Cuff Grasper w/SR handle
9	D-Curette, Both Sides Cut, 5.4 mm x 150 mm
10	Extra Long Switching Stick, 4 mm
11	Reusable Obturator for AR-6530
12	Reusable Obturator for AR-6535
13	Shoulder Instrument Case
	Hand Held Instruments
1	Medium Punch, Straight Tip, Straight Shaft, Ø 3.4 mm
2	Medium Punch, Straight Tip, 15 ° Up Curved Shaft, Ø 3.4 mm Ø 3.4 mm
3	Rotary Punch, 90° Left Tip, Straight Shaft, Ø 3.4 mm
4	Alligator Grasper, Straight Shaft, Self-releasing Handle, Ø 3.4 mm
5	Probe - Hook, 150 mm Shaft, 3.4 mm Tip, w/5.0 mm markings
6	Extra Long Switching Stick, 4 mm

Dr. [illegible] Kumar
Professor
Department of Orthopaedi
Dr. RMLIMS, Lucknow

Dr. Deepak Kumar
Professor & Head
Department of Orthopaedic
Dr. RMLIMS, Lucknow

(Dr. Kumar Shantanu)
Professor
Department of Orthopaedic Surgery
King George's Medical University UP
Lucknow

Dr Narendra Singh Kushwaha
Professor
Department of Orthopaedic Surgery
King George s Medical University U P
Lucknow

Dr Ashish Kumar
Professor & Head
Department of Orthopaedic Surgery
King George s Medical University U P
Lucknow

	3 Point Shoulder Traction Set
1	3-Point Shoulder Distraction System
2	Weight Hanger Rod, 1.5 Kg
3	Atraumatic Hand Holder Traction Attachment, autoclavable
4	Slotted Disc Weight, 1.0 kg
5	Slotted Disc Weight, 0.5 kg
6	Slotted Disc Weight, 0.25 kg
7	Traction Scale Attachment
	Graft Board systems
1	GraftProTM Graft Prep Board
2	GraftProTM Soft Tissue Clamp
3	GraftProTM Soft Tissue Clamp
4	GraftProTM GraftLink ® Attachment
5	GraftProTM GraftLink ® Tensioner

(Dr. Kumar Shantanu)
Professor
Department of Orthopaedic Surgery
King George's Medical University UP
Lucknow

(Dr. N.S. Kushwaha)
Professor
Dr Narendra Singh Kushwaha
Professor
Department of Orthopaedic Surgery
King George's Medical University UP
Lucknow

(Dr. Vineet Kumar)
Additional Professor
RMLIMS, Luckow

(Dr. Deepak Kumar)
Professor & Head
RMLIMS, Luckow

(Prof. Ashish Kumar)
Head

Innovation, Sciences et Développement économique Canada
Office de la Propriété Intellectuelle du Canada

Innovation, Science and Economic Development Canada
Canadian Intellectual Property Office

CA 3234434 A1 2023/04/27

(21) 3 234 434

(12) DEMANDE DE BREVET CANADIEN
CANADIAN PATENT APPLICATION

(13) A1

(86) Date de dépôt PCT/PCT Filing Date: 2022/10/18
(87) Date publication PCT/PCT Publication Date: 2023/04/27
(85) Entrée phase nationale/National Entry: 2024/04/09
(86) N° demande PCT/PCT Application No.: US 2022/047042
(87) N° publication PCT/PCT Publication No.: 2023/069451
(30) Priorité/Priority: 2021/10/18 (US63/257,025)

(51) Cl.Int./Int.Cl. *A61B 1/00* (2006.01), *A61B 1/04* (2006.01), *G02B 27/10* (2006.01), *H04N 23/56* (2023.01)

(71) Demandeur/Applicant:
ARTHREX, INC., US

(72) Inventeurs/Inventors:
STEINER, MICHAEL DOMINIK, US;
MORALES CORREA, EFRAIN, US

(74) Agent: GOWLING WLG (CANADA) LLP

(54) Titre : SYSTEME DE CAMERA CHIRURGICALE A PLAGE DYNAMIQUE ELEVEE ET IMAGERIE FLUORESCENTE
(54) Title: SURGICAL CAMERA SYSTEM WITH HIGH DYNAMIC RANGE AND FLUORESCENT IMAGING

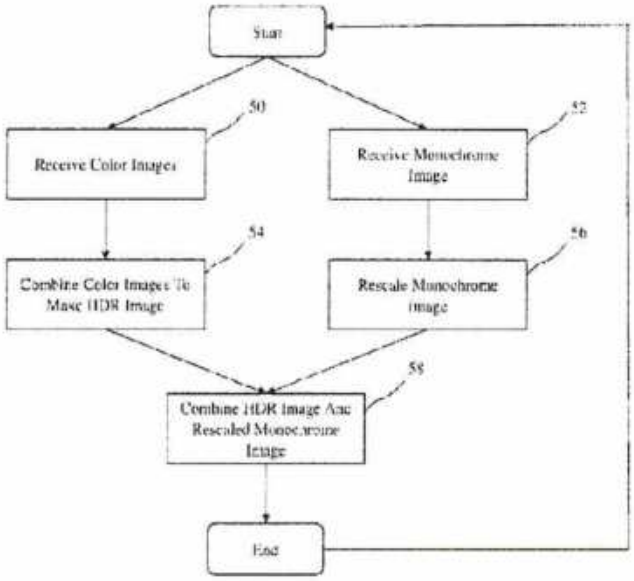


Figure 2

(57) Abrégé/Abstract:
An endoscopic camera system having an optical assembly; a first color image sensor transmitting a first low dynamic range image; a second color image sensor transmitting a second low dynamic range image; a monochrome image sensor transmitting a monochrome image; an HDR processor coupled to the first color image sensor and the second color image sensor for receiving the first low dynamic range image and the second low dynamic range image, the HDR processor being configured to combine the first low dynamic range image and the second dynamic range image into a high dynamic range image; and a combiner coupled to the HDR processor and the monochrome image sensor, the combiner being configured to combine the high dynamic range image with the monochrome image.

Date Submitted: 2024/04/09

CA App. No.: 3234434

Abstract:

An endoscopic camera system having an optical assembly; a first color image sensor transmitting a first low dynamic range image; a second color image sensor transmitting a second low dynamic range image; a monochrome image sensor transmitting a monochrome image; an HDR processor coupled to the first color image sensor and the second color image sensor for receiving the first low dynamic range image and the second low dynamic range image, the HDR processor being configured to combine the first low dynamic range image and the second dynamic range image into a high dynamic range image; and a combiner coupled to the HDR processor and the monochrome image sensor, the combiner being configured to combine the high dynamic range image with the monochrome image.

SURGICAL CAMERA SYSTEM WITH HIGH DYNAMIC RANGE AND FLUORESCENT IMAGING

BACKGROUND

[0001] The present disclosure relates to devices used in endoscopic surgery and, more particularly, to an endoscopic camera system for producing images with high dynamic range and fluorescence detection.

[0002] The dynamic range of a scene may be defined as a ratio of the radiances of the brightest part of the scene and the darkest part of the scene. These radiances are detected by an imaging sensor, which has an intrinsic dynamic range. The intrinsic dynamic range can be defined as the ratio of the maximum detected scene radiance to the minimum detected scene radiance. The maximum is strongly dependent on pixel well depth and the minimum is strongly dependent on dark current noise and read noise. It is desirable to have images with greater dynamic range than the intrinsic dynamic range of most existing image sensors. In addition to visible light detection, surgeons often detect fluorescence in surgical procedures.

[0003] There exists a need for a system and method of providing high dynamic range and fluorescence images that remedies the shortcomings of the prior art.

SUMMARY

[0004] This disclosure is directed to systems and methods for combining two low dynamic range images and a fluorescence image into a single high dynamic range image. Additionally, this disclosure is directed to systems and methods for combining two low dynamic range images and a fluorescence image with a different resolution into a single high dynamic range image.

[0005] In an implementation, an endoscopic camera system has an optical assembly. A first color image sensor is in optical communication with the optical assembly, the first image sensor receiving a first exposure of visible light and transmitting a first low dynamic range image. A second color image sensor is also in optical communication with the optical assembly, the

second image sensor receiving a second exposure of visible light and transmitting a second low dynamic range image, the second exposure being higher than the first exposure. A monochrome image sensor in also in optical communication with the optical assembly, the monochrome image sensor receiving an exposure of non-visible light and transmitting a monochrome image. An HDR processor is coupled to the first color image sensor and the second color image sensor for receiving the first low dynamic range image and the second low dynamic range image. The HDR processor is configured to combine the first low dynamic range image and the second dynamic range image into a high dynamic range image. A combiner is coupled to the HDR processor and the monochrome image sensor, the combiner being configured to combine the high dynamic range image with the monochrome image.

[0006] In an implementation, the first color image sensor and the second color image sensor each have a first resolution and the monochrome image sensor has a second resolution, the second resolution being lower than the first resolution. The system has a scaler coupled to the monochrome image sensor and the combiner. The scaler is configured to rescale the monochrome image to have about the same resolution as the high dynamic range image. The first color image sensor and the second color image sensor may each have a resolution of about 4K and the monochrome image sensor may have a resolution of about 2K. The color image sensors may have at least about twice the resolution of the monochrome image sensor. The color image sensors may have about four times the resolution of the monochrome image sensor. The monochrome image sensor may have a larger pixel size than the first color image sensor and the second color image sensor. Optionally, the monochrome image sensor is configured to detect near infra-red radiation.

[0007] In an implementation, an endoscopic camera system has an optical assembly. A first color image sensor is in optical communication with the optical assembly, the first image sensor receiving a first exposure of visible light and transmitting a first low dynamic range image. A second color image sensor is in optical communication with the optical assembly, the second image sensor receiving a second exposure of visible light and transmitting a second low

dynamic range image, the second exposure being higher than the first exposure. A monochrome image sensor is in optical communication with the optical assembly, the monochrome image sensor receiving an exposure of non-visible light and transmitting a monochrome image.

[0008] A color receiver receives the first low dynamic range image from the first color image sensor and the second low dynamic range image from the second image sensor. A monochrome receiver receives the monochrome image from the monochrome image sensor. A processor coupled is to color receiver for receiving the first low dynamic range image and the second low dynamic range image, the processor being configured to combine the first low dynamic range image and the second dynamic range image into a high dynamic range image. A scaler is coupled to the monochrome receiver for scaling the monochrome image into a rescaled monochrome image to match a resolution of the high dynamic range image. A combiner is coupled to the processor and to the scaler, the combiner being configured to combine the high dynamic range image and the rescaled monochrome image.

[0009] In an implementation, the first color image sensor and the second color image sensor each have a resolution of about 4K and the monochrome image sensor has a resolution of about 2K. Optionally, the monochrome image sensor is configured to detect near infra-red radiation. Optionally, the color image sensors have at least about twice the resolution of the monochrome image sensor. Optionally, the color image sensors have about four times the resolution of the monochrome image sensor. Optionally, the monochrome image sensor has a larger pixel size than the first color image sensor and the second color image sensor. Optionally, the first color image sensor has a different resolution than the second color image sensor; and the system further has a color scaler coupled to at least one of the first color image sensor and the second color image sensor for scaling at least one color image to match the resolution of the color images

[0010] This disclosure is also directed to a method of producing an image having the steps of: receiving a first color image from a first color image sensor having a first exposure;

receiving a second color image from a second color image sensor having a second exposure, the second exposure being different than the first exposure; receiving a monochrome image from a monochrome image sensor configured for sensing non-visible light; combining the first color image and the second color image to make a high dynamic range image; and combining the high dynamic range image with the monochrome image. The color image sensors may have about four times the resolution of the monochrome image sensor; and the method may have the step of rescaling the monochrome image prior to combination with the high dynamic range image. In an implementation, the color image sensors have about twice the resolution of the monochrome image sensor. In an implementation, the color image sensors have a resolution of about 4K the monochrome image sensor has a resolution of about 2K. The monochrome image sensor may have a larger pixel size than the first color image sensor and the second color image sensor.

[0011] These and other features are described below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The features, aspects and advantages of the present disclosure will become better understood with regard to the following description, appended claims and accompanying figures wherein:

[0013] FIG. 1 is a schematic diagram of an endoscopic camera system according to an implementation; and

[0014] FIG. 2 is a schematic diagram of a method for making high dynamic range and fluorescence images according to an implementation.

DETAILED DESCRIPTION

[0015] In the following description of the preferred implementations, reference is made to the accompanying drawings which shows by way of illustration specific implementations in which the disclosure may be practiced. It is to be understood that other implementations may be

utilized, and structural and functional changes may be made without departing from the scope of this disclosure.

[0016] The present disclosure is directed to a system and method for producing high dynamic range and fluorescent images.

[0017] With reference to Fig. 1, an endoscopic camera system 10 according to an implementation has a camera head 12. The camera head 12 is coupled to an endoscope 14. The camera head 12 may have an input device, such as buttons, switches, or dials. The camera head 12 is connectable to a camera controller 16 ("CCU" or "camera controller"). The camera head 12 and the camera controller 16 may be connected via wire to facilitate data transfer between the camera and the camera controller. The camera 12 and the camera controller 16 may also be wirelessly connected to facilitate data transfer, such as via IEEE 802.11b or IEEE 802.11n or ultra-wide band (UWB). The camera controller 16 may be connectable to at least one input device 18 such as a mouse, keyboard, touchpad, or touchscreen monitor. Additionally, the camera controller 20 may be connectable to a display 20 and a storage device 22, such as for storing images.

[0018] In an implementation, an optical element 24, such as a prism assembly, a monochrome image sensor 26, a first color image sensor 28 and a second color image sensor 30 are positioned inside the camera head 12. Image light is directed through the endoscope 14 and onto the prism assembly 24. In an alternative implementation, the optical element 24, the monochrome image sensor 26, the first color image sensor 28 and the second color image sensor 30 are positioned proximal to a distal end 32 of the endoscope 14. The camera head 12 may be coupled to a light source 34. In an additional implementation, the light source may be positioned inside of the camera head 12 or the endoscope 14

[0019] The light source 34 includes a lamp. The lamp may be, for example, a semiconductor light source such as laser or LED to illuminate the field of view. The light source 36 is configured to appropriately illuminate the field of view of the video camera. Further, the light generated as well as camera sensitivity may extend beyond the visible

spectrum. The illumination may be intended to excite fluorescence directly in a target, or in a fluorescent substance such as indocyanine green, that is then sensed by the monochrome image sensor 26. For example, the light source 34 might produce illumination in the near infrared (NIR) range and the monochrome image sensor 26 sense the fluorescence at a longer IR wavelength. The illumination and camera sensitivity could extend from UV to NIR continuously or be composed of separate narrow bands.

[0020] Each of the monochrome image sensor 26, the first color image sensor 28 and the second color image sensor 30 may be, for example, a charge couple device (CCD) sensor or complementary metal oxide semiconductor (CMOS) sensor. The image sensors need not be identical and may have different characteristics. In a preferred implementation, the monochrome image sensor 26 is a 2k sensor used for the detection of non-visible light, such as near infra-red and infra-red light, and each of the first color image sensor 28 and the second color image sensor 30 is a 4k sensor. In additional implementations, the first color image sensor 28 and the second color image sensor 30 have different resolutions from each other. For example, in an implementation, the first color image sensor 28 is a 4k sensor, the second color image sensor 30 is 2k sensor and the monochrome image sensor 26 is a 2k sensor.

[0021] In an implementation, the first color image sensor 28 and the second image sensor 30 receive differential amounts of light. The optical element 24 may direct light so that the first color image sensor 28 receives a lower exposure, and is therefore a low exposure sensor that generates a low exposure image, and the second color image sensor 30 receives a higher exposure, and is therefore a high exposure sensor that generates a high exposure image. In an implementation, the optical element 24 directs between about 10% and about 40% of light to the first color image sensor 28 and between about 60% to about 90% of light to the second color image sensor 30. In an implementation, the optical element 24 directs between about 10% and about 20% of light to the first color image sensor 28 and between about 80% to about 90% of light to the second color image sensor 30. In an implementation, the optical element 24 directs about 10% of light to the first color image sensor 28 and about 90% of light to the second color

image sensor 30. In an additional implementation, at least one of the first color image sensor 28 and the second color image sensor 30 have an optical coating to control exposure. In an additional implementation, the integration time at least one of the first color image sensor 28 and the second color image sensor 30 is independently controlled to control exposure

[0022] Alternatively, the first color image sensor 28 may receive a higher exposure and the second color image sensor 30 may receive a lower exposure. Each of the first color image sensor 28 and the second color image sensor 30 generate relatively low dynamic range images. The images from both sensors are combined to create a single image with a high dynamic range. The combination to create a single image with a high dynamic range can be performed either before or after creating RGB images each from the relatively low dynamic range images. The high dynamic range image can then be tone-mapped into the range of the display. The combining and tone-mapping methods can be selected from those known in the art of creating and displaying a high dynamic range from relatively low dynamic range images.

[0023] For example, and without limitation, a method for combining two relatively low dynamic range images into a high dynamic range image may include some of the methods taught in: Paul E. Debevec and Jitendra Malik, "Recovering High Dynamic Range Radiance Maps From Photographs", ACM SISGRAPH 2008 Classes, Article 31, Pages 1-10; M.A. Robertson, S. Borman and R.L. Stevenson, "Dynamic Range Improvement Through Multiple Exposures", 1999 International Conference on Image Processing, IEEE, 1999; and Tom Mertens, Jan Kautz and Frank Van Reeth, "Exposure fusion", 15th Pacific Conference on Computer Graphics and Applications, IEEE 2007, the entire contents of each of which are incorporated herein by reference in their entirety.

[0024] The power consumption of each sensor is directly proportional to the number of active pixels. A 4k sensor typically has 3840x2160 active pixels and consumes about 600mW whereas a 2k sensor typically has 1920x1080 active pixels and consumes about 300mW or less. In endoscopic camera systems, the camera head is held by the user for extended periods of time, and, a hotter camera head (a camera head that draws significant power) may be uncomfortable

and cause extra fatigue. Keeping power consumption low and camera head touch temperature low is also required to meet safety standards.

[0025] Since near infrared wavelengths are longer, the advantages of using 4k sensors with smaller pixel sizes may not improve image quality beyond a 2k image sensor. By combining two 4k color image sensors with one 2k monochrome sensor for non-visible light, the configuration optimizes for power usage while not compromising image quality.

[0026] There is also an advantage to using a 2k sensor with larger pixels. Typically, the larger the pixel size, the better the sensitivity (signal to noise ratio) of the image sensor. For endoscopic procedures where NIR signals are faint, a larger pixel size is an advantage. The combination of two 4k color sensors for visible light and one 2k sensor for non-visible light, with each sensor having the same optical format (such as 1/3"), provides an advantageous configuration for camera head power consumption, visible light image quality, and, NIR light sensitivity

[0027] The camera controller 16 is preferably a programmable unit containing sufficient processing capacity to accommodate a wide range of control, user interface and image acquisition/processing functions. The camera controller 16 has a monochrome receiver 36 for receiving data from the monochrome image sensor 26. The camera controller 16 also has a color receiver 38 for receiving data from the first color sensor 28 and the second color sensor 30. An HDR processor 40 combine's images from the first color sensor 28 and the second color sensor 30 to create an HDR image.

[0028] A scaler 42 rescales the 2K image from the 2K monochrome sensor to a 4K image. In an implementation, the scaler 42 retimes the 2k sensor data rate into a 4k data rate, such as by row and column doubling, or, other interpolation method. In an implementation, the scaler 42 rescales, such as by polyphase scaling or other resampling method the resulting NIR image to match to the apparent size of the visible light image. This rescaling step is desirable, given the properties of the optical path, to meet a concurrent focus requirement (where visible light image focus and NIR image focus are at the same point using a single focus knob). A similar

color scaler may be used when the first color image sensor 28 and the second color image sensor 30 have different resolutions from each other prior to combining the images from the first color image sensor and the second color image sensor.

[0029] An image combiner 44 combines the rescaled non-visible light image with the high dynamic range visible light image to generate HDR and NIR images. The resulting images may then be sent to the display 20 or stored, such as on the storage device 22. Although the monochrome receiver 36, color receiver 38, HDR processor 40, scaler 42 and image combiner 44 have been illustrated as separate elements, one or more of those elements may be combined into a single processor.

[0030] With reference to Fig. 2, this disclosure is also directed to a method for generating high dynamic range and fluorescence images. Images are received from the first color image sensor 28 and the second color image sensor 30 in step 50. A image of detected non-visible light (such as an image of near infrared fluorescence) is received from the monochrome image sensor 26 in step 52. The images received from the first color image sensor 28 and the second color image sensor 30 are combined to make a high dynamic range image in step 54. The monochrome image is rescaled to have approximately the same resolution as the high dynamic range image in step 56. Finally, the rescaled monochrome image is combined with the high dynamic range image to generate a final image having both high dynamic range and detected non-visible light in step 58. The final image can then be displayed and saved.

[0031] There is disclosed in the above description and the drawings, a system and method for making high dynamic range and fluorescence images that fully and effectively overcomes the disadvantages associated with the prior art. However, it will be apparent that variations and modifications of the disclosed implementations may be made without departing from the principles of this disclosure. The presentation of the implementations herein is offered by way of example only and not limitation, with a true scope and spirit of the disclosure being indicated by the following claims.

WHAT IS CLAIMED IS:

1. An endoscopic camera system comprising:

an optical assembly;

a first color image sensor in optical communication with the optical assembly, the first image sensor receiving a first exposure of visible light and transmitting a first low dynamic range image;

a second color image sensor in optical communication with the optical assembly, the second image sensor receiving a second exposure of visible light and transmitting a second low dynamic range image, the second exposure being higher than the first exposure;

a monochrome image sensor in optical communication with the optical assembly, the monochrome image sensor receiving an exposure of non-visible light and transmitting a monochrome image;

an HDR processor coupled to the first color image sensor and the second color image sensor for receiving the first low dynamic range image and the second low dynamic range image, the HDR processor being configured to combine the first low dynamic range image and the second dynamic range image into a high dynamic range image; and

a combiner coupled to the HDR processor and the monochrome image sensor, the combiner being configured to combine the high dynamic range image with the monochrome image.

2. The endoscopic camera system of claim 1 further comprising a scaler coupled to the monochrome image sensor and the combiner; wherein the first color image sensor and the second color image sensor each have a first resolution and the monochrome image sensor has a second resolution, the second resolution being lower than the first resolution; and wherein the scaler is configured to rescale the monochrome image to have about the same resolution as the high dynamic range image.

3. The endoscopic camera system of claim 1 further comprising a scaler coupled to the monochrome image sensor and the combiner; wherein the first color image sensor and the second color image sensor each have a resolution of about 4K and the monochrome image sensor has a resolution of about 2K; and wherein the scaler is configured to rescale the monochrome image to have about the same resolution as the high dynamic range image.

4. The endoscopic camera system of claim 3 wherein the monochrome image sensor is configured to detect near infra-red radiation.

5. The endoscopic camera system of claim 1 wherein the color image sensors have at least about twice the resolution of the monochrome image sensor.

6. The endoscopic camera system of claim 5 wherein the color image sensors have about four times the resolution of the monochrome image sensor.

7. The endoscopic camera system of claim 1 wherein the monochrome image sensor has a larger pixel size than the first color image sensor and the second color image sensor.

8. An endoscopic camera system comprising:

an optical assembly;

a first color image sensor in optical communication with the optical assembly, the first image sensor receiving a first exposure of visible light and transmitting a first low dynamic range image;

a second color image sensor in optical communication with the optical assembly, the second image sensor receiving a second exposure of visible light and transmitting a second low dynamic range image, the second exposure being higher than the first exposure;

a monochrome image sensor in optical communication with the optical assembly, the monochrome image sensor receiving an exposure of non-visible light and transmitting a monochrome image;

a color receiver for receiving the first low dynamic range image from the first color image sensor and the second low dynamic range image from the second image sensor;

a monochrome receiver for receiving the monochrome image from the monochrome image sensor;

a processor coupled to color receiver for receiving the first low dynamic range image and the second low dynamic range image, the processor being configured to combine the first low dynamic range image and the second dynamic range image into a high dynamic range image;

a scaler coupled to the monochrome receiver for scaling the monochrome image into a rescaled monochrome image to match a resolution of the high dynamic range image;

a combiner coupled to the processor and to the scaler, the combiner being configured to combine the high dynamic range image and the rescaled monochrome image.

9. The endoscopic camera system of claim 8 wherein the first color image sensor and the second color image sensor each have a resolution of about 4K and the monochrome image sensor has a resolution of about 2K

10. The endoscopic camera system of claim 8 wherein the monochrome image sensor is configured to detect near infra-red radiation.

11. The endoscopic camera system of claim 8 wherein the color image sensors have at least about twice the resolution of the monochrome image sensor.

12. The endoscopic camera system of claim 8 wherein the color image sensors have about four times the resolution of the monochrome image sensor.

13. The endoscopic camera system of claim 8 wherein the monochrome image sensor has a larger pixel size than the first color image sensor and the second color image sensor.

14. The endoscopic camera system of claim 8 wherein the first color image sensor has a different resolution than the second color image sensor; and the system further comprises a color scaler coupled to at least one of the first color image sensor and the second color image sensor for scaling at least one color image to match the resolution of the color images.

15. A method of producing an image comprising the steps of:

receiving a first color image from a first color image sensor having a first exposure;

receiving a second color image from a second color image sensor having a second exposure, the second exposure being different than the first exposure;

receiving a monochrome image from a monochrome image sensor configured for sensing non-visible light;

combining the first color image and the second color image to make a high dynamic range image; and

combining the high dynamic range image with the monochrome image.

16. The method of producing an image of claim 15 wherein the color image sensors have about four times the resolution of the monochrome image sensor; and the method further comprises the step of rescaling the monochrome image prior to combination with the high dynamic range image.

17. The method of producing an image of claim 15 wherein the color image sensors have about twice the resolution of the monochrome image sensor; and the method further comprises the step of rescaling the monochrome image prior to combination with the high dynamic range image.

18. The method of producing an image of claim 15 wherein the color image sensors have a resolution of about 4K the monochrome image sensor has a resolution of about 2K; and the method further comprises the step of rescaling the monochrome image prior to combination with the high dynamic range image.

19. The method of producing an image of claim 15 wherein the monochrome image sensor has a larger pixel size than the first color image sensor and the second color image sensor.

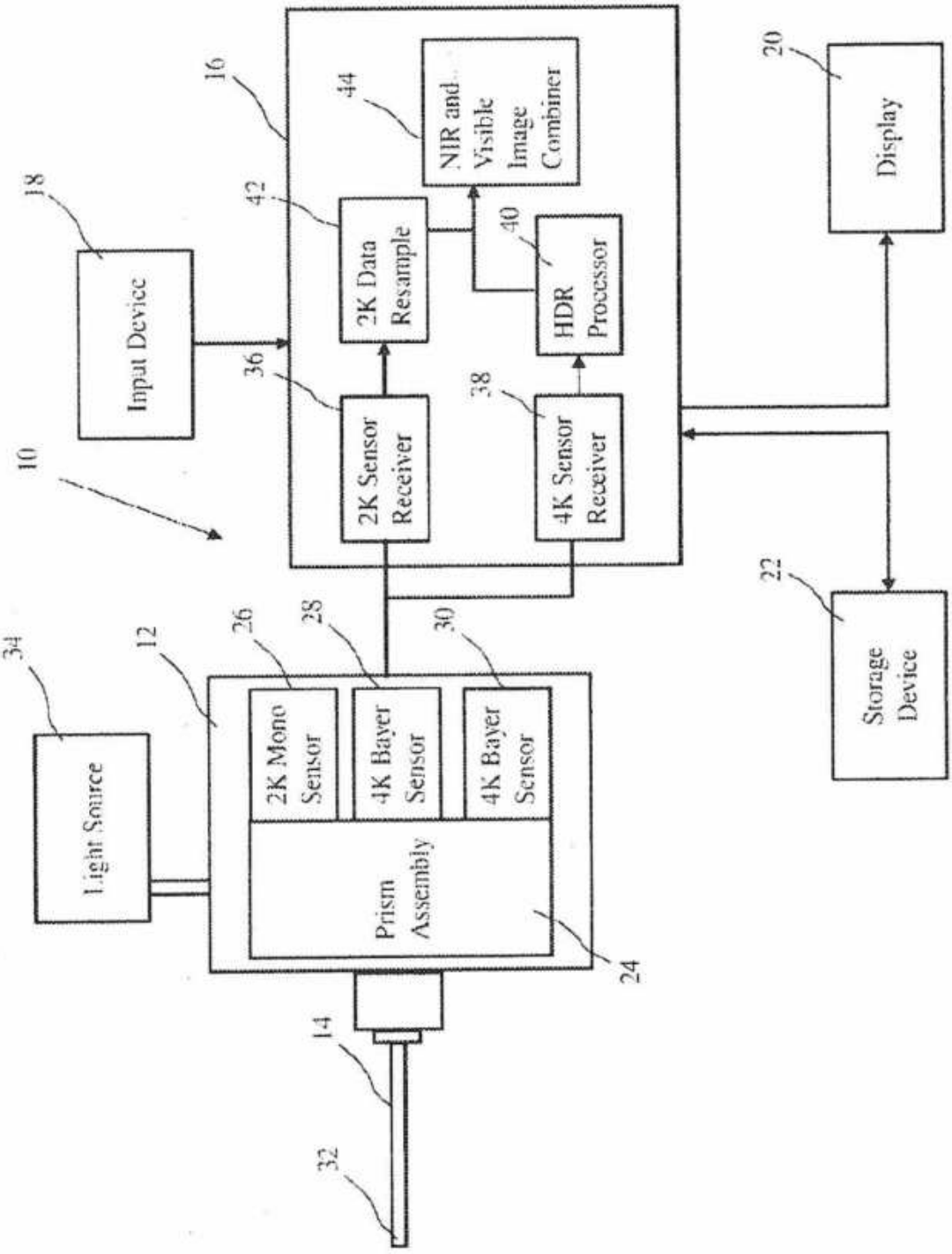

10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
Input Device
2K Sensor Receiver
4K Sensor Receiver
2K Data Resample
HDR Processor
NIR and Visible Image Combiner
Display
Storage Device
Light Source
2K Mono Sensor
4K Bayer Sensor
4K Bayer Sensor
Prism Assembly

Figure 1

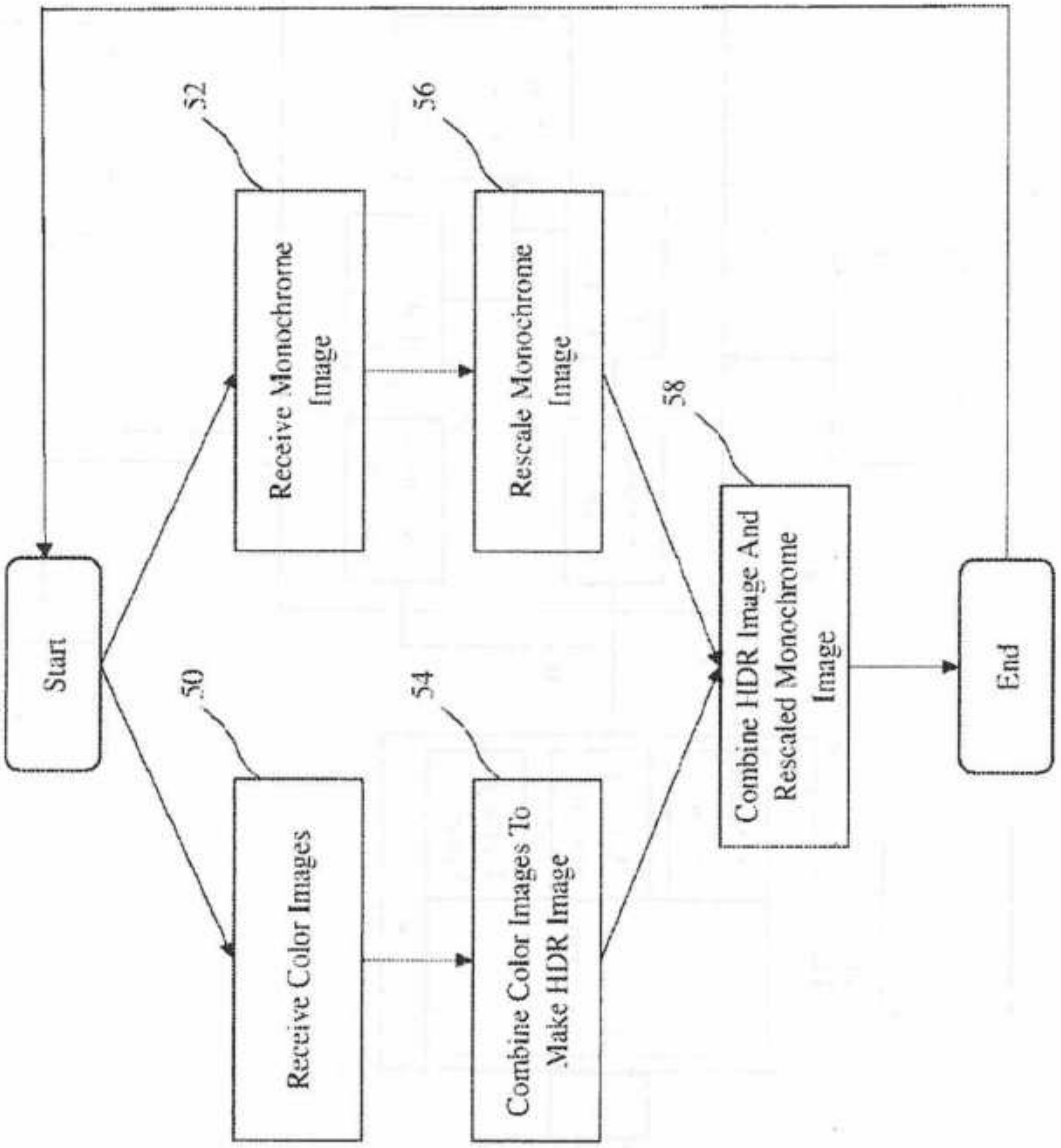

Start
50
Receive Color Images
52
Receive Monochrome Image
54
Combine Color Images To Make HDR Image
56
Rescale Monochrome Image
58
Combine HDR Image And Rescaled Monochrome Image
End

Figure 2

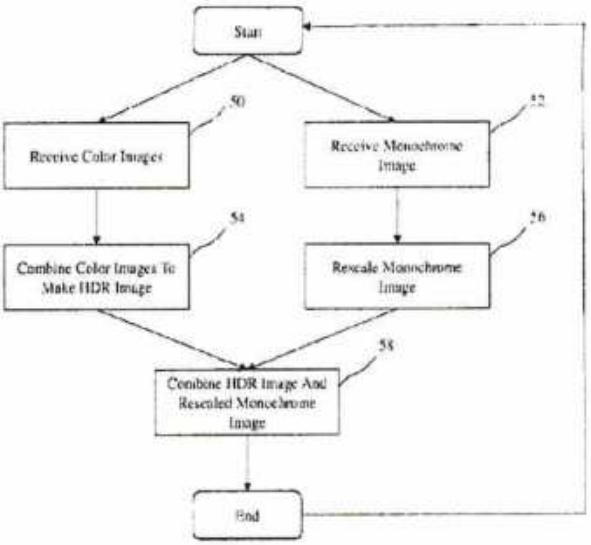

Start
50
Receive Color Images
52
Receive Monochrome Image
54
Combine Color Images To Make HDR Image
56
Rescale Monochrome Image
58
Combine HDR Image And Rescaled Monochrome Image
End

Figure 2

US010568499B2

(12) **United States Patent**
Tesar

(10) **Patent No.: US 10,568,499 B2**
(45) **Date of Patent: Feb. 25, 2020**

(54) **SURGICAL VISUALIZATION SYSTEMS AND DISPLAYS**

(71) Applicant: **CAMPLEX, INC.**, Germantown, TN (US)

(72) Inventor: **John Tesar**, Tucson, AZ (US)

(73) Assignee: **CAMPLEX, INC.**, Germantown, TN (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **16/042,318**

(22) Filed: **Jul. 23, 2018**

(65) **Prior Publication Data**

US 2019/0053700 A1 Feb. 21, 2019

Related U.S. Application Data

(63) Continuation of application No. 14/491,827, filed on Sep. 19, 2014, now Pat. No. 10,028,651.
(Continued)

(51) **Int. Cl.**
A61B 1/313 (2006.01)
A61B 90/00 (2016.01)
(Continued)

(52) **U.S. Cl.**
CPC ***A61B 1/3132*** (2013.01); ***A61B 1/005*** (2013.01); ***A61B 1/00154*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC ... A61B 1/3132; A61B 34/20; A61B 17/1611; A61B 90/50; A61B 90/361;
(Continued)

(56) **References Cited**

U.S. PATENT DOCUMENTS

497,064 A 5/1893 Van Meter
2,826,114 A 3/1958 Bryan
(Continued)

FOREIGN PATENT DOCUMENTS

CN 2336380 Y 9/1999
CN 101518438 9/2009
(Continued)

OTHER PUBLICATIONS

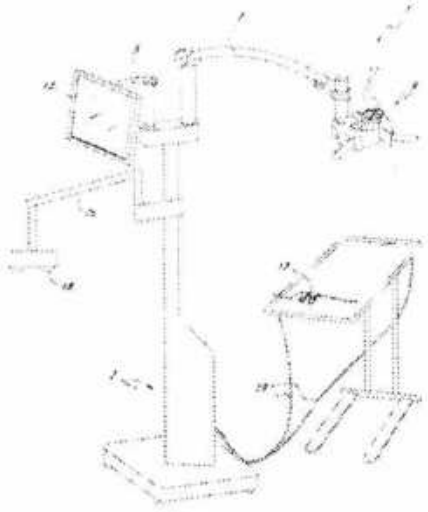
"Portion", Definition, American Heritage® Dictionary of the English Language, Fifth Edition, 2016. Retrieved Apr. 12, 2018 from https://www.thefreedictionary.com/portion in 1 page.
(Continued)

Primary Examiner — Tracy Y. Li
(74) *Attorney, Agent, or Firm* — Knobbe, Martens, Olson & Bear, LLP

(57) **ABSTRACT**

A medical apparatus is described for providing visualization of a surgical site. The medical apparatus includes an electronic display disposed within a display housing, the electronic display configured to produce a two-dimensional image. The medical apparatus includes a display optical system disposed within the display housing, the display optical system comprising a plurality of lens elements disposed along an optical path. The display optical system is configured to receive the two-dimensional image from the electronic display, produce a beam with a cross-section that remains substantially constant along the optical path, and produce a collimated beam exiting the opening in the display housing. The medical apparatus can also include an auxiliary video camera configured to provide an oblique view of a patient on the electronic display without requiring a surgeon to adjust their viewing angle through oculars viewing the electronic display.

7 Claims, 20 Drawing Sheets



Related U.S. Application Data

(60) Provisional application No. 61/923,188, filed on Jan. 2, 2014, provisional application No. 61/922,068, filed on Dec. 30, 2013, provisional application No. 61/921,389, filed on Dec. 27, 2013, provisional application No. 61/921,051, filed on Dec. 26, 2013, provisional application No. 61/920,451, filed on Dec. 23, 2013, provisional application No. 61/880,808, filed on Sep. 20, 2013.

(51) **Int. Cl.**

A61B 90/50	(2016.01)
G02B 17/08	(2006.01)
G02B 21/36	(2006.01)
G02B 27/02	(2006.01)
A61B 1/00	(2006.01)
A61B 1/005	(2006.01)
A61B 1/05	(2006.01)
A61B 1/06	(2006.01)
A61B 1/07	(2006.01)
A61B 17/02	(2006.01)
A61B 17/34	(2006.01)
A61B 34/20	(2016.01)
G02B 21/00	(2006.01)
G02B 21/20	(2006.01)
A61B 90/30	(2016.01)

(52) **U.S. Cl.**

CPC ***A61B 1/051*** (2013.01); ***A61B 1/0676*** (2013.01); ***A61B 1/07*** (2013.01); ***A61B 17/0218*** (2013.01); ***A61B 17/3423*** (2013.01); ***A61B 34/20*** (2016.02); ***A61B 90/361*** (2016.02); ***A61B 90/50*** (2016.02); ***G02B 17/08*** (2013.01); ***G02B 21/0012*** (2013.01); ***G02B 21/20*** (2013.01); ***G02B 21/361*** (2013.01); ***G02B 21/362*** (2013.01); ***G02B 21/367*** (2013.01); ***G02B 21/368*** (2013.01); ***G02B 27/022*** (2013.01); ***G02B 27/026*** (2013.01); *A61B 1/00045* (2013.01); *A61B 2017/3445* (2013.01); *A61B 2034/2057* (2016.02); *A61B 2090/306* (2016.02); *A61B 2090/371* (2016.02)

(58) **Field of Classification Search**

CPC A61B 17/0206; A61B 1/07; A61B 1/005; A61B 1/051; A61B 1/0676; A61B 1/00154; A61B 17/0218; A61B 17/3423; A61B 1/00045; A61B 2034/2057; A61B 17/3421; A61B 2034/2051; A61B 2090/371; A61B 2090/306; A61B 50/13; A61B 2034/2055; A61B 2034/2048; A61B 2017/00535; A61B 2017/3445; G02B 27/026; G02B 21/0012; G02B 21/20; G02B 21/361; G02B 23/2484; G02B 23/2415; G02B 21/368; G02B 27/022; G02B 17/08; G02B 21/362; G02B 21/367; G02B 13/06

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,050,870	A	8/1962	Heilig
3,108,781	A	10/1963	Saffir
3,128,988	A	4/1964	Mandroian
3,141,650	A	7/1964	Saffir
3,405,990	A	10/1968	Nothnagle et al.
3,409,346	A	11/1968	Stapsy
3,664,330	A	5/1972	Deutsch
4,056,310	A	11/1977	Shimizu et al.
4,063,557	A	12/1977	Wuchinich et al.
4,087,198	A	5/1978	Theis, Jr.
4,167,302	A	9/1979	Karasawa
4,176,453	A	12/1979	Abbott
4,223,676	A	9/1980	Wuchinich et al.
4,226,228	A	10/1980	Shin et al.
4,344,746	A	8/1982	Leonard
4,354,734	A	10/1982	Nkahashi
4,395,731	A	7/1983	Schoolman
4,562,832	A	1/1986	Wilder et al.
4,651,201	A	3/1987	Schoolman
4,655,557	A	4/1987	Takahashi
4,665,391	A	5/1987	Spani
4,684,224	A	8/1987	Yamashita et al.
4,703,314	A	10/1987	Spani
4,750,488	A	6/1988	Wuchinich et al.
4,750,902	A	6/1988	Wuchinich et al.
4,779,968	A	10/1988	Sander
4,783,156	A	11/1988	Yokota
4,786,155	A	11/1988	Fantone et al.
4,813,927	A	3/1989	Morris et al.
4,873,572	A	10/1989	Mi nazaki et al.
4,900,301	A	2/1990	Mc ris et al.
4,905,670	A	3/1990	Ad ir
4,920,336	A	4/1990	Mc jer
4,922,902	A	5/1990	Wi chinich et al.
4,986,622	A	1/1991	Mi tinez
4,989,452	A	2/1991	To n et al.
5,032,111	A	7/1991	Mc ris et al.
5,047,009	A	9/1991	Morris et al.
5,098,426	A	3/1992	Sklar et al.
5,143,054	A	9/1992	Adair
5,151,821	A	9/1992	Marks
5,176,677	A	1/1993	Wuchinich et al.
5,201,325	A	4/1993	McEwen et al.
5,221,282	A	6/1993	Wuchinich
5,251,613	A	10/1993	Adair
5,327,283	A	7/1994	Zobel
5,354,314	A	10/1994	Hardy et al.
5,417,210	A	5/1995	Funda
5,441,059	A	8/1995	Dannan
5,464,008	A	11/1995	Kim
5,523,810	A	6/1996	Volk
5,537,164	A	7/1996	Smith
5,553,995	A	9/1996	Martinez
5,575,789	A	11/1996	Bell et al.
5,584,796	A	12/1996	Cohen
5,593,402	A	1/1997	Patrick
5,601,549	A	2/1997	Miyagi
5,625,493	A	4/1997	Matsumura et al.
5,634,790	A	6/1997	Pathmanabhan et al.
5,667,481	A	9/1997	Villalta et al.
5,697,891	A	12/1997	Hori
5,712,995	A	1/1998	Cohn
5,716,326	A	2/1998	Dannan
5,743,731	A	4/1998	Lares et al.
5,743,846	A	4/1998	Takahashi et al.
5,747,824	A	5/1998	Jung et al.
5,751,341	A	5/1998	Chaleki
5,797,403	A	8/1998	Dil orenzo
5,803,733	A	9/1998	Trott et al.
5,822,036	A	10/1998	Massie et al.
5,825,534	A	10/1998	Strahle
5,835,266	A	11/1998	Kitajima
5,841,510	A	11/1998	Roggy
5,861,983	A	1/1999	Twisselman
5,889,611	A	3/1999	Zonneveld
5,897,491	A	4/1999	Kastenbauer et al.
5,909,380	A	6/1999	Dubois
5,913,818	A	6/1999	Co et al.
5,928,139	A	7/1999	Koros et al.
5,949,388	A	9/1999	Atsumi
5,982,532	A	11/1999	Mittelstadt et al.
6,016,607	A	1/2000	Morimoto et al.
6,023,638	A	2/2000	Swanson
6,088,154	A	7/2000	Morita
6,139,493	A	10/2000	Koros et al.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,152,736	A	11/2000	Schmidinger	
6,152,871	A	11/2000	Foley et al.	
6,176,825	B1	1/2001	Chin et al.	
6,217,188	B1	4/2001	Wainwright et al.	
6,246,898	B1	6/2001	Vesely et al.	
6,293,911	B1	9/2001	Imaizumi et al.	
6,317,260	B1	11/2001	Ito	
6,319,223	B1	11/2001	Wortrich et al.	
6,340,363	B1	1/2002	Bolger et al.	
6,350,235	B1	2/2002	Cohen et al.	
6,354,992	B1	3/2002	Kato	
6,398,721	B1	6/2002	Nakamura	
6,405,072	B1	6/2002	Cosman	
6,434,329	B1	8/2002	Dube et al.	
6,443,594	B1	9/2002	Marshall et al.	
6,450,706	B1	9/2002	Chapman	
6,450,950	B2	9/2002	Irion	
6,491,661	B1	12/2002	Boukhny et al.	
6,508,759	B1	1/2003	Taylor et al.	
6,517,207	B2	2/2003	Chapman	
6,525,310	B2	2/2003	Dunfield	
6,525,878	B1	2/2003	Takahashi	
6,527,704	B1	3/2003	Chang et al.	
6,538,665	B2	3/2003	Crow et al.	
6,549,341	B2	4/2003	Nomura et al.	
6,561,999	B1	5/2003	Nazarifar et al.	
6,582,358	B2	6/2003	Akui et al.	
6,587,711	B1	7/2003	Alfano et al.	
6,589,168	B2	7/2003	Thompson	
6,618,207	B2	9/2003	Lei	
6,626,445	B2	9/2003	Murphy et al.	
6,633,328	B1	10/2003	Byrd et al.	
6,635,010	B1	10/2003	Lederer	
6,636,254	B1	10/2003	Onishi et al.	
6,661,571	B1 *	12/2003	Shioda	A61B 1/04 359/368
6,668,841	B1	12/2003	Chou	
6,698,886	B2	3/2004	Pollack et al.	
6,720,988	B1	4/2004	Gere et al.	
6,757,021	B1	6/2004	Nguyen-Nhu	
6,805,127	B1	10/2004	Karnsic	
6,817,975	B1	11/2004	Farr et al.	
6,824,525	B2	11/2004	Nazarifar et al.	
6,847,336	B1	1/2005	Lemelson et al.	
6,869,398	B2	3/2005	Obenchain et al.	
6,873,867	B2	3/2005	Vilsmeier	
6,892,597	B2	5/2005	Tews	
6,903,883	B2	6/2005	Amanai	
6,908,451	B2	6/2005	Brody et al.	
6,985,765	B2	1/2006	Morita	
6,996,460	B1	2/2006	Krahnstoever et al.	
7,034,983	B2	4/2006	Desimone et al.	
7,050,225	B2	5/2006	Nakamura	
7,050,245	B2	5/2006	Tesar et al.	
7,054,076	B2	5/2006	Tesar et al.	
7,116,437	B2	10/2006	Weinstein et al.	
7,125,119	B2	10/2006	Farberov	
7,150,713	B2	12/2006	Shener et al.	
7,150,714	B2	12/2006	Myles	
7,154,527	B1	12/2006	Goldstein et al.	
7,155,316	B2	12/2006	Sutherland	
7,163,543	B2	1/2007	Smedley et al.	
7,226,451	B2	6/2007	Shluzas et al.	
7,244,240	B2	7/2007	Nazarifar et al.	
7,278,092	B2	10/2007	Krzanowski	
7,298,393	B2	11/2007	Morita	
7,306,559	B2	12/2007	Williams	
7,307,799	B2	12/2007	Minefuji	
7,326,183	B2	2/2008	Nazarifar et al.	
7,471,301	B2	12/2008	Lefevre	
7,480,872	B1	1/2009	Ubillos	
7,494,463	B2	2/2009	Nehls	
7,518,791	B2	4/2009	Sander	
7,537,565	B2	5/2009	Bass	
7,538,939	B2	5/2009	Zimmerman et al.	
7,559,887	B2	7/2009	Dannan	
7,621,868	B2	11/2009	Breidenthal et al.	
7,633,676	B2	12/2009	Brunner et al.	
7,644,889	B2	1/2010	Johnson	
7,651,465	B1	1/2010	Sperling et al.	
7,713,237	B2	5/2010	Nazarifar et al.	
7,764,370	B2	7/2010	Williams et al.	
7,766,480	B1	8/2010	Graham et al.	
7,777,941	B2	8/2010	Zimmer	
7,785,253	B1	8/2010	Arambula	
7,786,457	B2	8/2010	Gao	
7,806,865	B1	10/2010	Wilson	
7,844,320	B2	11/2010	Shahidi	
7,872,746	B2	1/2011	Gao et al.	
7,874,982	B2	1/2011	Selover et al.	
7,896,839	B2	3/2011	Nazarifar et al.	
7,907,336	B2	3/2011	Abele et al.	
7,927,272	B2	4/2011	Bayer et al.	
7,932,925	B2	4/2011	Inbar et al.	
7,956,341	B2	6/2011	Gao	
8,009,141	B1	8/2011	Chi et al.	
8,012,089	B2	9/2011	Bayat	
8,018,523	B2	9/2011	Choi	
8,018,579	B1	9/2011	Krah	
8,027,710	B1	9/2011	Dannan	
8,038,612	B2	10/2011	Paz	
8,070,290	B2	12/2011	Gille et al.	
8,088,066	B2	1/2012	Grey et al.	
8,136,779	B2	3/2012	Wilson et al.	
8,149,270	B1	4/2012	Yaron et al.	
8,159,743	B2	4/2012	Abele et al.	
8,169,468	B2	5/2012	Scott et al.	
8,187,167	B2	5/2012	Kim	
8,187,180	B2	5/2012	Pacey	
8,194,121	B2	6/2012	Blumzvig et al.	
8,221,304	B2	7/2012	Shioda et al.	
8,229,548	B2	7/2012	Frangioni	
8,294,733	B2	10/2012	Eino	
8,295,693	B2	10/2012	McDowall	
8,358,330	B2	1/2013	Riederer	
8,405,733	B2	3/2013	Saijo	
8,408,772	B2	4/2013	Li	
8,409,088	B2	4/2013	Grey et al.	
8,419,633	B2	4/2013	Koshikawa et al.	
8,419,634	B2	4/2013	Nearman et al.	
8,430,840	B2	4/2013	Nazarifar et al.	
8,439,830	B2	5/2013	McKinley et al.	
8,460,184	B2	6/2013	Nearman et al.	
8,464,177	B2	6/2013	Ben-Yoseph	
8,482,606	B2	7/2013	Razzaque	
8,498,695	B2	7/2013	Westwick et al.	
8,521,331	B2	8/2013	Itkowitz	
8,702,592	B2	4/2014	Langlois et al.	
8,702,602	B2	4/2014	Berci et al.	
8,734,328	B2	5/2014	McDowall	
8,786,946	B2	7/2014	Nakamura	
8,827,899	B2	9/2014	Farr et al.	
8,827,902	B2	9/2014	Dietze, Jr. et al.	
8,836,723	B2	9/2014	Tsao et al.	
8,858,425	B2	10/2014	Farr et al.	
8,876,711	B2	11/2014	Lin et al.	
8,878,924	B2	11/2014	Farr	
8,882,662	B2	11/2014	Charles	
8,976,238	B2	3/2015	Ernsperger et al.	
8,979,301	B2	3/2015	Moore	
9,033,870	B2	5/2015	Farr et al.	
9,216,068	B2	12/2015	Tesar	
9,492,065	B2	11/2016	Tesar et al.	
9,615,728	B2	4/2017	Charles et al.	
9,629,523	B2	4/2017	Tesar et al.	
9,642,606	B2	5/2017	Charles et al.	
9,681,796	B2	6/2017	Tesar et al.	
9,723,976	B2	8/2017	Tesar	
9,782,159	B2	10/2017	Tesar	
9,936,863	B2	4/2018	Tesar	
10,022,041	B2	7/2018	Charles et al.	
10,028,651	B2	7/2018	Tesar	
10,231,607	B2	3/2019	Charles et al.	
2001/0055062	A1	12/2001	Shioda et al.	

(56) **References Cited**

U.S. PATENT DOCUMENTS

2002/0013514 A1 1/2002 Brau
2002/0049367 A1 4/2002 Irion et al.
2002/0065461 A1 5/2002 Cosman
2002/0082498 A1 6/2002 Wendt et al.
2003/0055410 A1 3/2003 Evans et al.
2003/0059097 A1 3/2003 Abovitz et al.
2003/0078494 A1 4/2003 Panescu et al.
2003/0088179 A1 5/2003 Seeley et al.
2003/0102819 A1 6/2003 Min et al.
2003/0103191 A1 6/2003 Staurenghi et al.
2003/0142204 A1 7/2003 Rus et al.
2003/0147254 A1 8/2003 Yoneda et al.
2004/0017607 A1 1/2004 Hauger et al.
2004/0027652 A1 2/2004 Erdogan et al.
2004/0036962 A1 2/2004 Brunner et al.
2004/0070822 A1 4/2004 Shioda et al.
2004/0087833 A1 5/2004 Bauer et al.
2004/0111183 A1 6/2004 Sutherland
2004/0196553 A1 10/2004 Banju et al.
2004/0230191 A1 11/2004 Frey et al.
2005/0018280 A1 1/2005 Richardson
2005/0019722 A1 1/2005 Schmid et al.
2005/0026104 A1 2/2005 Takahashi
2005/0031192 A1* 2/2005 Sieckmann G02B 21/002 382/154
2005/0033117 A1 2/2005 Ozaki et al.
2005/0052527 A1 3/2005 Remy et al.
2005/0063047 A1 3/2005 Obrebski et al.
2005/0064936 A1 3/2005 Pryor
2005/0065435 A1 3/2005 Rauch et al.
2005/0095554 A1 5/2005 Wilkinson
2005/0107808 A1 5/2005 Evans et al.
2005/0171551 A1 8/2005 Sukovich et al.
2005/0215866 A1 9/2005 Kim
2005/0228232 A1 10/2005 Gillinov et al.
2005/0279355 A1 12/2005 Loubser
2006/0004261 A1 1/2006 Douglas
2006/0020213 A1 1/2006 Whitman et al.
2006/0025656 A1 2/2006 Buckner et al.
2006/0069315 A1 3/2006 Miles et al.
2006/0069316 A1 3/2006 Dorfman et al.
2006/0085969 A1 4/2006 Bennett et al.
2006/0092178 A1 5/2006 Tanguya, Jr. et al.
2006/0114411 A1 6/2006 Wei et al.
2006/0129140 A1 6/2006 Todd et al.
2006/0152516 A1 7/2006 Plummer
2006/0235279 A1 10/2006 Hawkes et al.
2006/0236264 A1 10/2006 Cain et al.
2006/0241499 A1 10/2006 Irion et al.
2006/0276693 A1 12/2006 Pacey
2006/0293557 A1 12/2006 Chuanggui et al.
2007/0010716 A1 1/2007 Malandain
2007/0019916 A1 1/2007 Takami
2007/0038080 A1 2/2007 Salisbury, Jr. et al.
2007/0086205 A1 4/2007 Krupa et al.
2007/0129719 A1 6/2007 Kendale et al.
2007/0153541 A1 7/2007 Bennett et al.
2007/0173853 A1 7/2007 MacMillan
2007/0238932 A1 10/2007 Jones et al.
2007/0282171 A1 12/2007 Karpowicz et al.
2008/0015417 A1 1/2008 Hawkes et al.
2008/0058606 A1 3/2008 Miles et al.
2008/0081947 A1 4/2008 Irion et al.
2008/0091066 A1 4/2008 Sholev
2008/0094583 A1 4/2008 Williams et al.
2008/0096165 A1 4/2008 Virnicchi et al.
2008/0097467 A1 4/2008 Gruber et al.
2008/0123183 A1 5/2008 Awdeh
2008/0151041 A1 6/2008 Shafer et al.
2008/0183038 A1 7/2008 Tilson et al.
2008/0195128 A1 8/2008 Orbay et al.
2008/0221394 A1 9/2008 Melkent et al.
2008/0221591 A1 9/2008 Farritor et al.
2008/0266840 A1 10/2008 Nordmeyer et al.
2008/0269564 A1 10/2008 Gelnett
2008/0269730 A1 10/2008 Dolson
2008/0278571 A1 11/2008 Mora
2008/0300465 A1 12/2008 Feigenwinter et al.
2008/0303899 A1 12/2008 Berci
2008/0310181 A1 12/2008 Gurevich et al.
2008/0319266 A1 12/2008 Poll et al.
2009/0030436 A1 1/2009 Charles
2009/0034286 A1 2/2009 Krupa et al.
2009/0040783 A1 2/2009 Krupa et al.
2009/0105543 A1 4/2009 Miller et al.
2009/0137893 A1 5/2009 Seibel et al.
2009/0137989 A1 5/2009 Kataoka
2009/0149716 A1 6/2009 Diao et al.
2009/0156902 A1 6/2009 Dewey et al.
2009/0185392 A1 7/2009 Krupa et al.
2009/0190209 A1 7/2009 Nakamura
2009/0190371 A1 7/2009 Root et al.
2009/0209826 A1 8/2009 Sanders et al.
2009/0238442 A1 9/2009 Upham et al.
2009/0244259 A1 10/2009 Kojima et al.
2009/0245600 A1 10/2009 Hoffman et al.
2009/0248036 A1 10/2009 Hoffman et al.
2009/0258638 A1 10/2009 Lee
2009/0304582 A1 12/2009 Rousso et al.
2009/0318756 A1 12/2009 Fisher et al.
2009/0326322 A1 12/2009 Diolaiti
2009/0326331 A1 12/2009 Rosen
2010/0013910 A1 1/2010 Farr
2010/0013971 A1 1/2010 Amano
2010/0081919 A1 4/2010 Hyle et al.
2010/0107118 A1 4/2010 Pearce
2010/0128350 A1 5/2010 Findlay et al.
2010/0161129 A1* 6/2010 Costa B25J 9/1697 700/259
2010/0168520 A1 7/2010 Poll et al.
2010/0182340 A1 7/2010 Bachelder et al.
2010/0198014 A1 8/2010 Poll et al.
2010/0198241 A1 8/2010 Gerrah et al.
2010/0208046 A1 8/2010 Takahashi
2010/0245557 A1 9/2010 Luley, III et al.
2010/0249496 A1 9/2010 Cardenas et al.
2010/0286473 A1 11/2010 Roberts
2010/0305409 A1 12/2010 Chang
2010/0312069 A1 12/2010 Sutherland et al.
2010/0318099 A1 12/2010 Itkowitz et al.
2010/0331855 A1 12/2010 Zhao et al.
2011/0034781 A1 2/2011 Loftus
2011/0038040 A1 2/2011 Abele et al.
2011/0042452 A1 2/2011 Cormack
2011/0063734 A1 3/2011 Sakaki
2011/0065999 A1 3/2011 Manzanares
2011/0071359 A1 3/2011 Bonadio et al.
2011/0080536 A1 4/2011 Nakamura et al.
2011/0115882 A1 5/2011 Shahinian et al.
2011/0115891 A1 5/2011 Trusty
2011/0144436 A1 6/2011 Nearman et al.
2011/0178395 A1 7/2011 Miesner et al.
2011/0184243 A1 7/2011 Wright et al.
2011/0190588 A1 8/2011 McKay
2011/0234841 A1 9/2011 Akeley et al.
2011/0249323 A1 10/2011 Tesar et al.
2011/0257488 A1 10/2011 Koyama et al.
2011/0263938 A1 10/2011 Levy
2011/0264078 A1 10/2011 Lipow et al.
2011/0288560 A1 11/2011 Shohat et al.
2011/0298704 A1 12/2011 Krah
2011/0301421 A1 12/2011 Michaeli et al.
2011/0316994 A1 12/2011 Leinchen
2012/0029280 A1 2/2012 Kucklick
2012/0035423 A1 2/2012 Sebastian et al.
2012/0035638 A1 2/2012 Mathaneswaran et al.
2012/0040305 A1 2/2012 Karazivan et al.
2012/0041272 A1 2/2012 Dietze, Jr. et al.
2012/0059222 A1 3/2012 Yoshida
2012/0065468 A1 3/2012 Levy et al.
2012/0087006 A1 4/2012 Signaigo
2012/0088974 A1 4/2012 Maurice
2012/0089093 A1 4/2012 Trusty
2012/0097567 A1 4/2012 Zhao et al.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2012/0108900	A1	5/2012	Viola et al.
2012/0116173	A1	5/2012	Viola
2012/0127573	A1	5/2012	Robinson et al.
2012/0130399	A1	5/2012	Moll et al.
2012/0134028	A1	5/2012	Maruyama
2012/0157775	A1	6/2012	Yamaguchi
2012/0157787	A1	6/2012	Weinstein et al.
2012/0157788	A1	6/2012	Serowski et al.
2012/0158015	A1	6/2012	Fowler et al.
2012/0190925	A1	7/2012	Luiken
2012/0197084	A1	8/2012	Drach et al.
2012/0230668	A1	9/2012	Vogt
2012/0232352	A1	9/2012	Lin et al.
2012/0245432	A1	9/2012	Karpowicz et al.
2012/0265023	A1	10/2012	Berci et al.
2012/0320102	A1	12/2012	Jorgensen
2012/0330129	A1	12/2012	Awdeh
2013/0012770	A1	1/2013	Su
2013/0027516	A1	1/2013	Hart et al.
2013/0041226	A1	2/2013	McDowall
2013/0041368	A1	2/2013	Cunningham et al.
2013/0060095	A1	3/2013	Bouquet
2013/0066304	A1	3/2013	Belson et al.
2013/0072917	A1	3/2013	Kaschke et al.
2013/0077048	A1	3/2013	Mirlay
2013/0085337	A1	4/2013	Hess et al.
2013/0159015	A1	6/2013	O'Con
2013/0197313	A1	8/2013	Wan
2013/0245383	A1	9/2013	Friedrich et al.
2013/0298208	A1	11/2013	Ayed
2013/0331730	A1	12/2013	Fenech et al.
2014/0005485	A1	1/2014	Tesar et al.
2014/0005486	A1	1/2014	Charles et al.
2014/0005487	A1	1/2014	Tesar
2014/0005488	A1	1/2014	Charles et al.
2014/0005489	A1	1/2014	Charles
2014/0005555	A1	1/2014	Tesar
2014/0081659	A1	3/2014	Nawana et al.
2014/0168785	A1	6/2014	Belgum
2014/0168799	A1	6/2014	Hurbert et al.
2014/0179998	A1	6/2014	Pacey et al.
2014/0187859	A1	7/2014	Leeuw et al.
2014/0198190	A1	7/2014	Okumu
2014/0247482	A1	9/2014	Doi et al.
2014/0275801	A1	9/2014	Menchaca et al.
2014/0276008	A1	9/2014	Steinbach et al.
2014/0285403	A1	9/2014	Kobayashi
2014/0316209	A1	10/2014	Overes et al.
2014/0327742	A1	11/2014	Kiening et al.
2014/0347395	A1	11/2014	Tsao et al.
2014/0362228	A1	12/2014	McCloskey et al.
2014/0378843	A1	12/2014	Valdes et al.
2015/0018622	A1	1/2015	Tesar
2015/0025324	A1	1/2015	Wan
2015/0080982	A1	3/2015	Van Funderburk
2015/0087918	A1	3/2015	Vasan
2015/0094533	A1	4/2015	Kleiner et al.
2015/0112148	A1	4/2015	Bouquet
2015/0141755	A1	5/2015	Tesar
2015/0238073	A1	8/2015	Charles
2015/0297311	A1	10/2015	Tesar
2015/0300816	A1	10/2015	Yang et al.
2016/0018598	A1	1/2016	Hansson
2016/0089026	A1	3/2016	Heerren
2016/0139039	A1	5/2016	Ikehara et al.
2016/0220324	A1	8/2016	Tesar
2017/0020627	A1	1/2017	Tesar
2017/0143442	A1	5/2017	Tesar
2018/0055348	A1	3/2018	Tesar et al.
2018/0055502	A1	3/2018	Charles et al.
2018/0064316	A1	3/2018	Charles et al.
2018/0064317	A1	3/2018	Tesar
2018/0070804	A1	3/2018	Tesar
2018/0256145	A1	9/2018	Tesar
2018/0318033	A1	11/2018	Tesar
2018/0353059	A1	12/2018	Tesar
2018/0368656	A1	12/2018	Austin et al.
2019/0046021	A1	2/2019	Charles et al.

FOREIGN PATENT DOCUMENTS

CN	102495463	6/2012
CN	202920720	11/2012
DE	103 41 125	4/2005
DE	10 2010 030 285	12/2011
DE	10 2010 044 502	3/2012
EP	0 293 228	11/1988
EP	0 233 940	11/1993
EP	0 466 705	6/1996
EP	1 175 106	1/2002
EP	1 333 305	8/2003
EP	2 641 561	9/2013
JP	49-009378	3/1974
JP	03-018891	1/1991
JP	06-315487	11/1994
JP	07-261094	10/1995
JP	08-131399	5/1996
JP	2001-087212	4/2001
JP	2001-117049	4/2001
JP	2001-161638	6/2001
JP	2002-011022	1/2002
JP	3402797	5/2003
JP	2003-322803	11/2003
JP	2004-024835	1/2004
JP	3549253	8/2004
JP	2007-068876	3/2007
JP	2009-288296	12/2009
JP	4503748	7/2010
JP	2010-206495	9/2010
JP	2011-118741	6/2011
WO	WO 87/001276	3/1987
WO	WO 91/012034	8/1991
WO	WO 99/017661	4/1999
WO	WO 00/078372	12/2000
WO	WO 01/072209	10/2001
WO	WO 2007/047782	4/2007
WO	WO 2008/073243	6/2008
WO	WO 2009/051013	4/2009
WO	WO 2010/079817	7/2010
WO	WO 2010/114843	10/2010
WO	WO 2010/123578	10/2010
WO	WO 2011/069469	6/2011
WO	WO 2012/047962	4/2012
WO	WO 2012/078989	6/2012
WO	WO 2013/049679	4/2013
WO	WO 2013/109966	7/2013
WO	WO 2013/116489	8/2013
WO	WO 2014/004717	1/2014
WO	WO 2014/060412	4/2014
WO	WO 2014/189969	11/2014
WO	WO 2015/042460	3/2015
WO	WO 2015/042483	3/2015
WO	WO 2015/100310	7/2015
WO	WO 2016/090336	6/2016
WO	WO 2016/154589	9/2016
WO	WO 2017/091704	6/2017
WO	WO 2018/208691	11/2018
WO	WO 2018/217951	11/2018

OTHER PUBLICATIONS

Amendment in U.S. Appl. No. 14/411,068, dated Feb. 16, 2018.
Office Action in U.S. Appl. No. 14/411,068, dated Apr. 6, 2018.
Amendment in U.S. Appl. No. 14/411,068, dated Oct. 5, 2018.
Official Communication in European Application No. 13808996.6, dated Jun. 15, 2018.
Notice of Decision or Rejection in Japanese Application No. 2015-520471, dated Jul. 24, 2018.
Preliminary Amendment in U.S. Appl. No. 15/483,995, dated Nov. 21, 2017.
Office Action in U.S. Appl. No. 15/483,995, dated Mar. 9, 2018.
Amendment in U.S. Appl. No. 15/483,995, dated Sep. 7, 2018.

(56) **References Cited**

OTHER PUBLICATIONS

Office Action in U.S. Appl. No. 15/645,589, dated Feb. 9, 2018.
Amendment in U.S. Appl. No. 15/645,589, dated Aug. 7, 2018.
Office Action in U.S. Appl. No. 15/626,516, dated Mar. 14, 2018.
Amendment in U.S. Appl. No. 15/626,516, dated Sep. 13, 2018.
Amendment in U.S. Appl. No. 15/589,058, dated Jun. 7, 2018.
Final Office Action in U.S. Appl. No. 15/589,058, dated Aug. 27, 2018.
Restriction Requirement and Election of Species Response in U.S. Appl. No. 14/491,935, dated Jan. 8, 2018.
Official Communication in European Application No. 14846410.0, dated Jul. 18, 2018.
Official Communication in Japanese Application No. 2016-544032, dated Jun. 26, 2018.
Restriction Requirement and Election of Species Response in U.S. Appl. No. 14/581,779, dated Jan. 2, 2018.
Office Action in U.S. Appl. No. 14/581,779, dated Apr. 24, 2018.
Amendment in U.S. Appl. No. 14/581,779, dated Sep. 24, 2018.
Amendment in U.S. Appl. No. 14/960,276, dated Jan. 26, 2018.
Office Action in U.S. Appl. No. 14/960,276, dated Mar. 8, 2018.
Amendment in U.S. Appl. No. 14/960,276, dated Sep. 7, 2018.
Office Action in U.S. Appl. No. 14/960,276, dated Nov. 2, 2018.
Extended European Search Report in European Application No. 15865454.1, dated Jun. 27, 2018.
Office Action in U.S. Appl. No. 15/081,653, dated Mar. 28, 2018.
Amendment in U.S. Appl. No. 15/081,653, dated Sep. 27, 2018.
Office Action in U.S. Appl. No. 15/360,565, dated Aug. 10, 2018.
International Preliminary Report on Patentability and Written Opinion in PCT Application No. PCT/US2016/063549, dated Jun. 7, 2018.
International Search Report and Written Opinion in PCT Application No. PCT/US2018/031442, dated Sep. 14, 2018.
International Search Report and Written Opinion in PCT Application No. PCT/US2018/034227, dated Jul. 30, 2018.
Aesculap Inc.; Aesculap Neurosurgery Pneumatic Kerrison; http://www.aesculapusa.com/assets/base/doc/doc763-pneumatic_kerrison_brochure.pdf; 2008; in 12 pages.
Aliaga, Daniel G.; "Image Morphing and Warping"; Department of Computer Science; Purdue University; Spring 2010; in 61 pages.
"ARRI Medical Shows SeeFront 3D Display with HD 3D Surgical Microscope"; dated Jun. 9, 2013; downloaded from http://www.seefront.com/news-events/article/arri-medical-shows-seefront-3d-display-with-hd-3d-surgical-microscope/ in 2 pages.
"ARRISCOPE: A New Era in Surgical Microscopy"; Arriscope Brochure published May 20, 2014 in 4 pages.
AustriaMicroSystems; "AS5050: Smallest Magnetic Rotary Encoder for μA Low Power Applications"; www.austriamicrosystems.com/AS5050 printed Nov. 2012 in 2 pages.
Bayonet Lock Video; 00:16 in length; Date Unknown, Received Oct. 15, 2014 [Screenshots captured at 00:00, 00:02, 00:05, 00:08, and 00:16].
BellowsTech; "Actuators"; www.bellowstech.com/metal-bellows/actuators/ printed Jul. 17, 2012 in 4 pages.
"Carl Zeiss Unveils $99 VR One Virtual Reality Headset"; www.electronista.com/articles/14/10/10/zeiss.vr.one.able.to.accept.variety.of.smartphones.using.custom.trays printed Oct. 13, 2014 in 2 pages.
Designboom; "Bright LED"; http://www.designboom.com/project/fiber-optics-light-glove/; Sep. 28, 2007.
Fei-Fei, Li; Lecture 10: Multi-View Geometry; Stanford Vision Lab; Oct. 24, 2011; in 89 pages.
"Fuse™. Full Spectrum Endoscopy™"; http://www.endochoice.com/Fuse printed Oct. 7, 2013 in 3 pages.
Hardesty, Larry; "3-D Cameras for Cellphones: Clever math could enable a high-quality 3-D camera so simple, cheap and power-efficient that it could be incorporated into handheld devices"; MIT News Office; http://web.mit.edu/newsoffice/2011/lidar-3d-camera-cellphones-0105.html; Jan. 5, 2012; in 4 pages.
Hartley et al.; "Multiple View Geometry in Computer Vision: Chapter 9—Epipolar Geometry and the Fundamental Matrix"; http://www.robots.ox.ac.uk/~vgg/hzbook/hzbook2/HZepipolar.pdf; Mar. 2004; 2nd Edition; Ch. 9; pp. 239-261.
Heidelberg Engineering; "MultiColor: Scanning Laser Imaging"; http://www.heidelbergengineering.com/us/products/spectralis-models/imaging-modes/multicolor/; Copyright © 2013; printed Apr. 5, 2013.
Kramer, Jennifer; "The Right Filter Set Gets the Most out of a Microscope"; Biophotonics International; Jan./Feb. 1999; vol. 6; pp. 54-58.
Krishna, Golden; "Watch: What Good is a Screen?"; http://www.cooper.com/author/golden_krishna as printed Jul. 9, 2014 in 62 pages.
Lang et al.; "ZEISS Microscopes for Microsurgery"; Springer-Verlag; Berlin, Heidelberg; 1981.
Leica Microsystems; "Images TrueVision Integrated 3D"; http://www.leica-microsystems.com/products/surgical-microscopes/neurosurgery-spine/details/product/truevision-integrated-3d/gallery/; Nov. 26, 2014; in 3 pages.
Leica Microsystems; "Leica Microsystems' Ophthalmic Surgical Microscopes with TrueVision 3D Technology Available Globally"; http://www.leica-microsystems.com/products/surgical-microscopes/neurosurgery-spine/details/product/truevision-integrated-3d/news/; Sep. 18, 2014; in 5 pages.
Lutze et al.; "Microsystems Technology for Use in a Minimally Invasive Endoscope Assisted Neurosurgical Operating System—MINOP II"; 2005; http://web.archive.org/web/20151120215151/http://www.meditec.hia.rwth-aachen.de/fileadmin/content/meditec/bilder/forschung/aktuelle_projekte/robotische/Exoscope_Aesculap.pdf; Nov. 20, 2015 in 4 pages.
Male Bayonet Video; 00:04 in length; Date Unknown; Received Oct. 10, 2014 [Screenshots captured at 00:00, 00:01, 00:02, 00:03, and 00:04].
MediTec; "MINOP II—Robotical Microscope Platform"; http://web.archive.org/web/20151120213932/http://www.meditec.hia.rwth-aachen.de/en/research/former-projects/minop-ii/; Nov. 20, 2015 in 3 pages.
Melexis; "MLX75031 Optical Gesture and Proximity Sensing IC"; http://melexis.com/optical-sensors/optical-sensing.mlx75031-815.aspx?sta printed Mar. 15, 2013 in 1 page.
MMR Technologies; "Micro Miniature Refrigerators"; http://www.mmr-tech.com/mmr_overview.php; Copyright © 2011; printed Feb. 11, 2013.
Moog; "Surgical Handpieces: Therapeutic Ultrasonic Devices"; http://www.moog.com/products/surgical-hpieces/ printed Sep. 25, 2013 in 1 page.
Morita; "TwinPower Turbine® High Speed Handpieces Standard, 45°, and Ultra Series Head Designs"; J. Morita Mfg. Corp., http://www.morita.com/usa/root/img/pool/pdf/product_brochures/twinpower_brochure_1-264_0512_web.pdf; May 2012; in 20 pages.
"Narrow Band Imaging"; http://web.archive.org/web/20150701233623/https://en.wikipedia.org/wiki/Narrow_band_imaging printed Jul. 1, 2015 in 1 page.
Olympus; "Olympus Introduces the World's First and Only Monopolar, Disposable Tonsil Adenoid Debrider (DTAD)"; http://www.olympusamerica.com/corporate/corp_presscenter_headline.asp?pressNo=926; Sep. 11, 2012; in 2 pages.
OmniVision; "OV2722 full HD (1080p) product brief: 1/6-Inch Native 1080p HD CameraChip Sensor for Ultra-Compact Applications"; http://web.archive.org/web/20120730043057/http://www.ovt.com/download_document.php?type=sensor&sensorid=119; May 2012 in 2 pages.
Orthofix; "ProView MAP System Retractors"; www.us.orthofix.com/products/proviewretractors.asp?cid=39; Copyright © 2010; printed Apr. 1, 2013.
OrtusTech; "Sample Shipment Start: World's Smallest Size Full-HD Color TFT LCD"; http://ortustech.co.jp/english/notice/20120427.html printed May 22, 2012 in 2 pages.
Purcher, Jack; "Apple Wins a Patent for an Oculus Rift-Like Display System"; http://www.patentlyapple.com/patently-apple/2014/09/apple-wins-a-patent-for-an-oculus-rift-like-display-system.html; Sep. 9, 2014.
Rustum, Dr. Abu; "ICG Mapping Endometrial Cancer"; Pinpoint Endometrium Ca Lenfedenektomi MSKCC May 2013; Memorial

(56) **References Cited**

OTHER PUBLICATIONS

Sloan Kettering Cancer Center; May 2013; Published to YouTube.com Sep. 1, 2013; in 2 pages; http://web.archive.org/web/20150402210857/https://www.youtube.com/watch?v=DhChvaUCe4I.

Saab, Mark; "Applications of High-Pressure Balloons in the Medical Device Industry"; http://www.ventionmedical.com/documents/medicalballoonpaper.pdf; Copyright © 1999; in 19 pages.

Savage, Lynn; "Sound and Light, Signifying Improved Imaging"; www.photonics.com/Article.aspx?AID=45039; Nov. 1, 2010; in 6 pages.

Sun et al.; "Neurotoxin-Directed Synthesis and in Vitro Evaluation of Au Nanoclusters"; RSC Advances, 2015; vol. 5, No. 38; pp 29647-29652.

Timm, Karl Walter; "Real-Time View Morphing of Video Streams"; University of Illinois; Chicago, Illinois; 2003; in 168 pages.

TrueVision Microscopes; http://truevisionmicroscopes.com/images/productsnew/081a-f.jpg; printed Nov. 26, 2014 in 1 page.

TrueVision; "About TrueVision"; http://web.archive.org/web/20071208125103/http://www.truevisionsys.com/about.html; as viewed Dec. 8, 2007 in 2 pages.

TrueVision;"Leica Microsystems and TrueVision® 3D Surgical create the first 3D digital hybrid microscope"; Press Release; Oct. 5, 2012; in 2 pages.

TrueVision; "TrueVision Technology"; http://web.archive.org/web/20071208125125/http://www.truevisionsys.com/technology.html; as viewed Dec. 8, 2007 in 2 pages.

Whitney et al.; "Pop-up book MEMS"; Journal of Micromechanics and Microengineering; Oct. 14, 2011; vol. 21, No. 115021, in 7 pages.

Wikipedia; "Zoom Lens"; http://en.wikipedia.org/wiki/Optical_Zoom; printed Oct. 7, 2014 in 3 pages.

Zeiss; "Informed for Medical Professionals, Focus: Fluorescence"; Carl Zeiss; 2nd Issue; Oct. 2006; 30-801-LBW-GFII-X-2006; Printed in Germany; in 32 pages.

Zeiss; "Ophthalmic Surgery in Its Highest Form, OPMI® VISU 210"; Carl Zeiss, 2005, 30-097/III-e/USA Printed in Germany AW-TS-V/2005 Uoo; in 19 pages.

Zeiss; "SteREO Discovery. V12, Expanding the Boundaries"; Carl Zeiss, Sep. 2004; 46-0008 e 09.2004, in 6 pages.

Zeiss; "Stereomicroscopes: Stemi SV 6, SV 11, Sv 11 Apo"; The Profile; 1999; in 30 pages.

Zeiss; "Time for a Change: OPMI® pico for ENT"; Carl Zeiss, 2005, 30-451/III-e Printed in Germany LBW-TS-V/2005 Uoo, in 8 pages.

Zhang, Michael; "LIFX: A WiFi-Enabled LED Bulb that May Revolutionize Photographic Lighting"; http://www.petapixel.com/2012/09/22/lifx-a-wifi-enabled-led-bulb-that-may-revolutionize-photographic-lighting/ printed Sep. 28, 2012 in 9 pages.

Zhang, Sarah; "The Obscure Neuroscience Problem That's Plaguing VR"; http://web.archive.org/web/20150812172934/http://www.wired.com/2015/08/obscure-neuroscience-problem-thats-plaguing-vr/; Aug. 11, 2015 in 5 pages.

Peliminary Amendment in U.S. Appl. No. 14/411,068, dated Aug. 13, 2015.

Office Action in U.S. Appl. No. 14/411,068, dated Aug. 17, 2017.

Official Communication in European Application No. 13808996.6, dated Jan. 4, 2016.

Official Communication in European Application No. 13808996.6, dated Apr. 14, 2016.

Official Communication in European Application No. 13808996.6, dated Feb. 21, 2017.

Official Communication in European Application No. 13808996.6, dated Jun. 6, 2017.

Official Communication in Japanese Application No. 2015-520471, dated May 9, 2017.

Official Communication in Japanese Application No. 2015-520471, dated Nov. 21, 2017.

International Search Report and Written Opinion in PCT Application No. PCT/US2013/047972, dated Jan. 3, 2014.

International Preliminary Report on Patentability in PCT Application No. PCT/US2013/047972, dated Jan. 8, 2015.

Amendment in U.S. Appl. No. 15/589,058, dated Nov. 15, 2017.

Office Action in U.S. Appl. No. 15/589,058, dated Dec. 8, 2017.

Official Communication in European Application No. 14800423.7, dated Feb. 8, 2017.

International Search Report and Written Opinion in PCT Application No. PCT/US2014/038839, dated Oct. 17, 2014.

International Preliminary Report on Patentability in PCT Application No. PCT/US2014/038839, dated Dec. 3, 2015.

Preliminary Amendment in U.S. Appl. No. 14/491,935, dated Feb. 5, 2015.

Restriction Requirement in U.S. Appl. No. 14/491,935, dated Sep. 8, 2017.

Partial Supplementary European Search Report in European Application No. 14845427.5, dated May 4, 2017.

Extended European Search Report in European Application No. 14845427.5, dated Aug. 8, 2017.

Extended European Search Report in European Application No. 14846410.0, dated Jun. 23, 2017.

International Search Report and Written Opinion in PCT Application No. PCT/US2014/056643, dated Dec. 11, 2014.

International Preliminary Report on Patentability and Written Opinion in PCT Application No. PCT/US2014/056643, dated Mar. 31, 2016.

Invitation to Pay Additional Fees in PCT Application No. PCT/US2014/056681, dated Jan. 14, 2015.

International Search Report and Written Opinion in PCT Application No. PCT/US2014/056681, dated Mar. 20, 2015.

International Preliminary Report on Patentability and Written Opinion in PCT Application No. PCT/US2014/056681, dated Mar. 31, 2016.

Preliminary Amendment in U.S. Appl. No. 14/581,779, dated Jul. 6, 2015.

Restriction Requirement in U.S. Appl. No. 14/581,779, dated Oct. 31, 2017.

Extended European Search Report in European Application No. 14873324.9, dated Aug. 25, 2017.

Invitation to Pay Additional Fees in PCT Application No. PCT/US2014/072121, dated Mar. 2, 2015.

International Search Report and Written Opinion in PCT Application No. PCT/US2014/072121, dated May 1, 2015.

International Preliminary Report on Patentability and Written Opinion in PCT Application No. PCT/US2014/072121, dated Jul. 7, 2016.

Preliminary Amendment in U.S. Appl. No. 14/960,276, dated Apr. 18, 2016.

Office Action in U.S. Appl. No. 14/960,276, dated Jul. 28, 2017.

International Search Report and Written Opinion in PCT Application No. PCT/US2015/064133, dated Feb. 9, 2016.

International Preliminary Report on Patentability and Written Opinion in PCT Application No. PCT/US2015/064133, dated Jun. 15, 2017.

Preliminary Amendment in U.S. Appl. No. 15/081,653, dated Oct. 11, 2016.

International Search Report and Written Opinion in PCT Application No. PCT/US2016/024330, dated Jul. 1, 2016.

International Preliminary Report on Patentability and Written Opinion in PCT Application No. PCT/US2016/024330, dated Oct. 5, 2017.

Preliminary Amendment in U.S. Appl. No. 15/360,565, dated Feb. 6, 2017.

Invitation to Pay Additional Fees in PCT Application No. PCT/US2016/063549, dated Feb. 2, 2017.

International Search Report and Written Opinion in PCT Application No. PCT/US2016/063549, dated Apr. 14, 2017.

Preliminary Amendment in U.S. Appl. No. 16/357,081, dated Sep. 4, 2019.

Official Communication in European Application No. 13808996.6, dated May 13, 2019.

Final Office Action in U.S. Appl. No. 15/483,995, dated Nov. 29, 2018.

Amendment in U.S. Appl. No. 15/483,995, dated May 28, 2019.

(56) **References Cited**

OTHER PUBLICATIONS

Office Action in U.S. Appl. No. 15/483,995, dated Jun. 13, 2019.
Final Office Action in U.S. Appl. No. 15/645,589, dated Nov. 28, 2018.
Amendment in U.S. Appl. No. 15/645,589, dated May 28, 2019.
Office Action in U.S. Appl. No. 15/645,589, dated Jun. 13, 2019.
Preliminary Amendment filed in U.S. Appl. No. 16/036,665, dated Nov. 1, 2018.
Final Office Action in U.S. Appl. No. 15/626,516, dated Jan. 15, 2019.
Response in U.S. Appl. No. 15/626,516, dated Jul. 15, 2019.
Restriction Requirement in U.S. Appl. No. 15/495,484, dated May 14, 2019.
Amendment in U.S. Appl. No. 15/589,058, dated Feb. 26, 2019.
Office Action in U.S. Appl. No. 15/589,058, dated Mar. 5, 2019.
Amendment in U.S. Appl. No. 15/589,058, dated Sep. 5, 2019.
Office Action in U.S. Appl. No. 14/491,935, dated May 13, 2019.
Official Communication in European Application No. 14846410.0, dated Mar. 20, 2019.
Final Office Action in U.S. Appl. No. 14/581,779, dated Jan. 4, 2019.
Amendment in U.S. Appl. No. 14/581,779, dated Jul. 2, 2019.
Office Action in U.S. Appl. No. 14/581,779, dated Aug. 5, 2019.
Official Communication in Japanese Application No. 2016-542194, dated Nov. 6, 2018.
Decision of Rejection in Japanese Application No. 2016-542194, dated May 14, 2019.
Amendment in U.S. Appl. No. 14/960,276, dated May 2, 2019.
Final Office Action in U.S. Appl. No. 14/960,276, dated Jun. 7, 2019.
Final Office Action in U.S. Appl. No. 15/081,653, dated Nov. 16, 2018.
Final Amendment in U.S. Appl. No. 15/081,653, dated May 15, 2019.
Office Action in U.S. Appl. No. 15/081,653, dated Jul. 12, 2019.
Extended European Search Report in European Application No. 16769809.1, dated Nov. 23, 2018.
Amendment in U.S. Appl. No. 15/360,565, dated Feb. 8, 2019.
Office Action in U.S. Appl. No. 15/360,565, dated May 22, 2019.
Extended European Search Report in European Application No. 16869253.1, dated May 29, 2019.
Office Action in U.S. Appl. No. 15/973,433, dated Jun. 28, 2019.

* cited by examiner

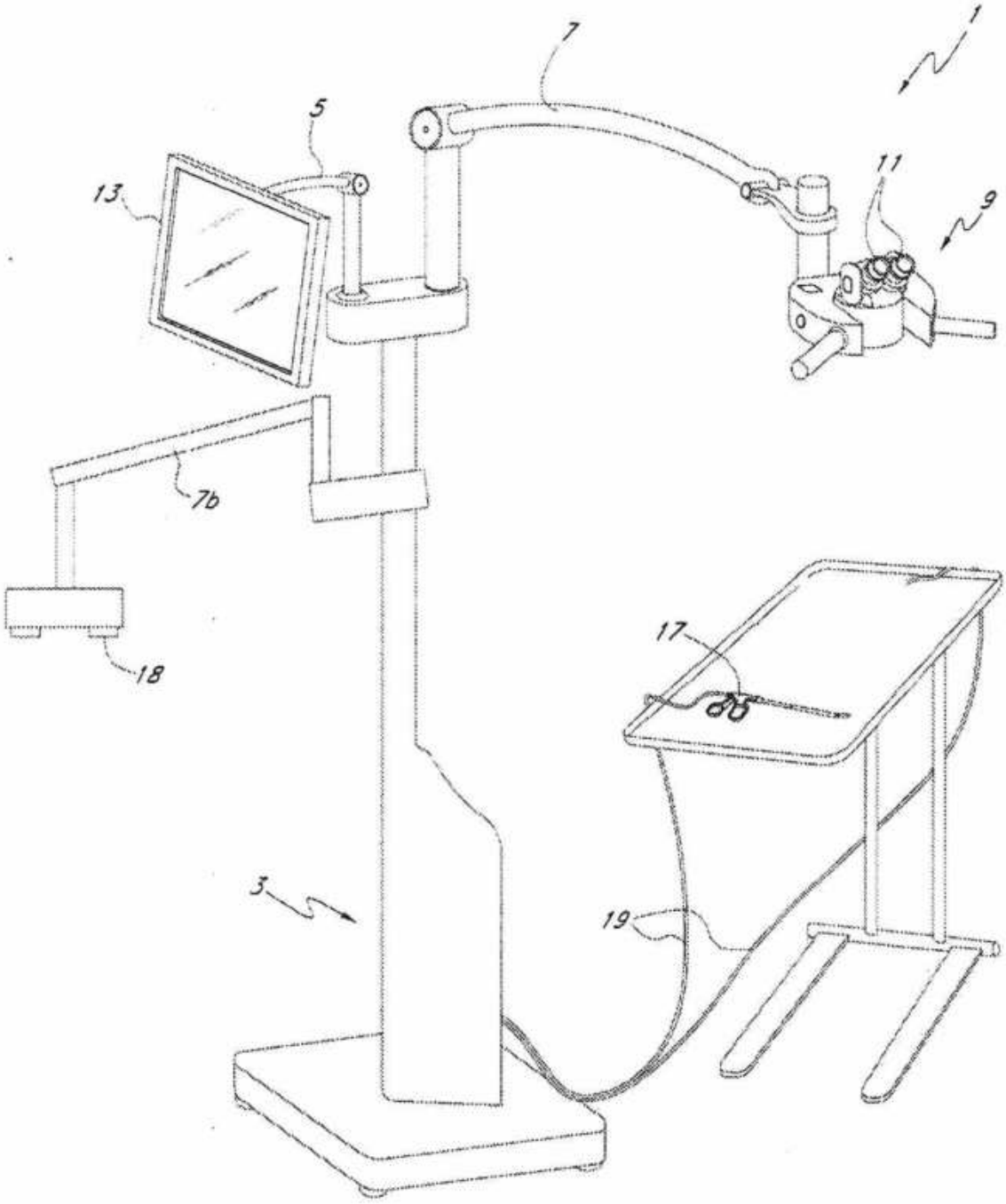


FIG. 1

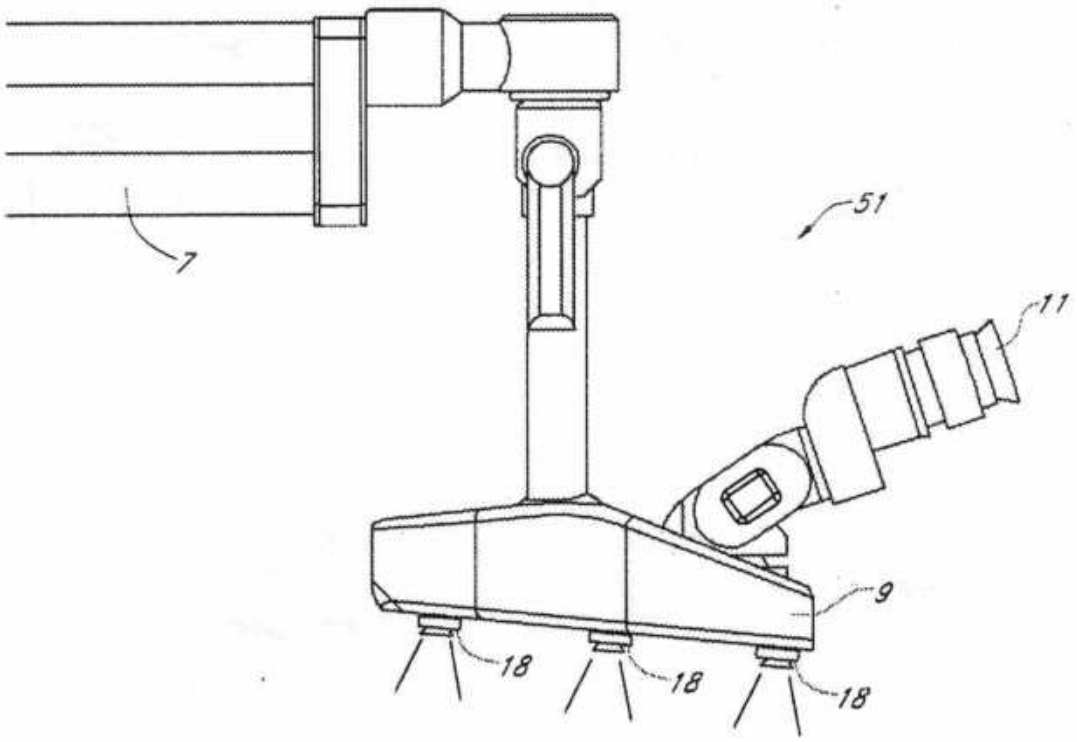


FIG. 2

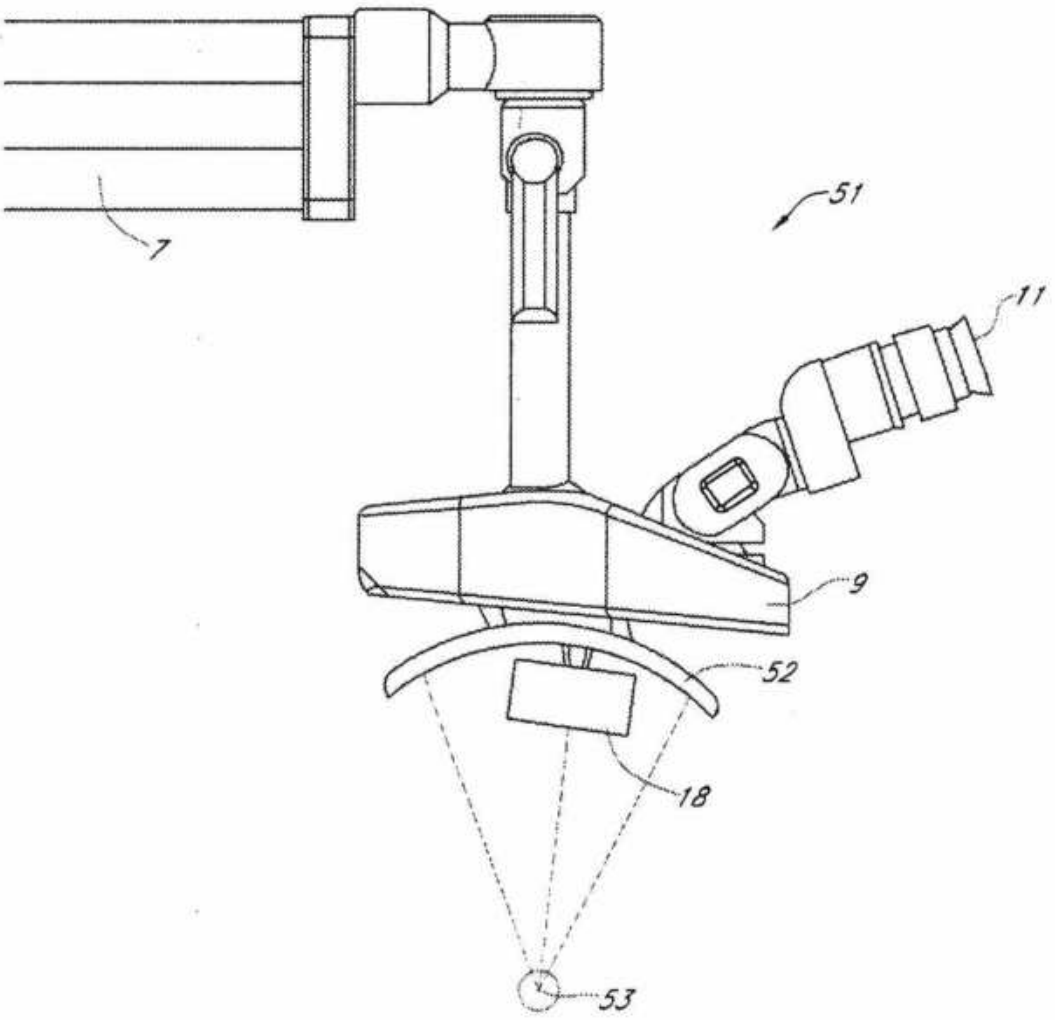
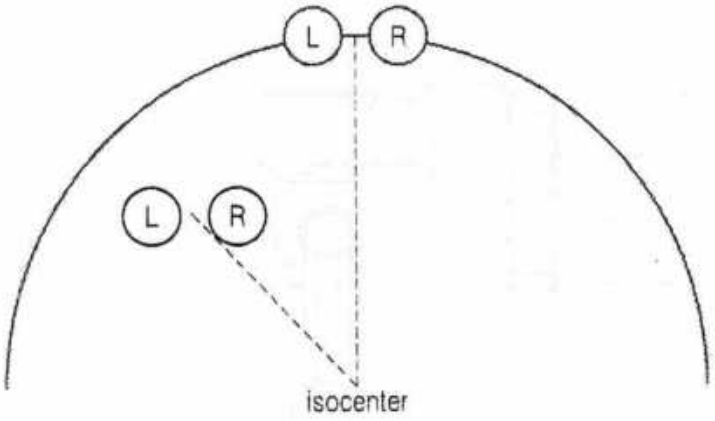


FIG. 3A



The display provides a horizon consistent with an ergonomically advantageous viewing position for the user. The isocenter is defined as the postion bewtween the two eyes parallel to the display's horizon.

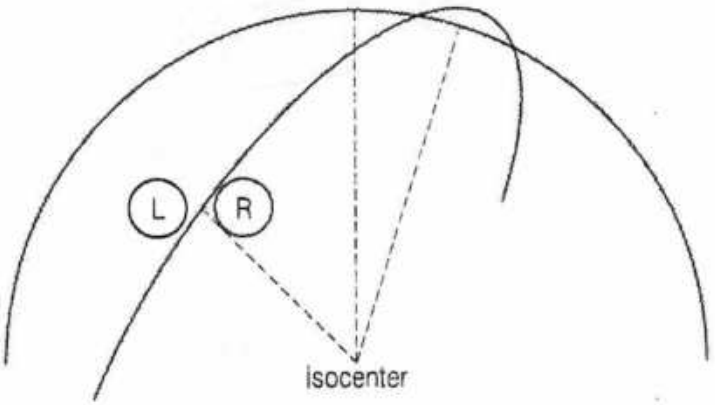


FIG. 3B

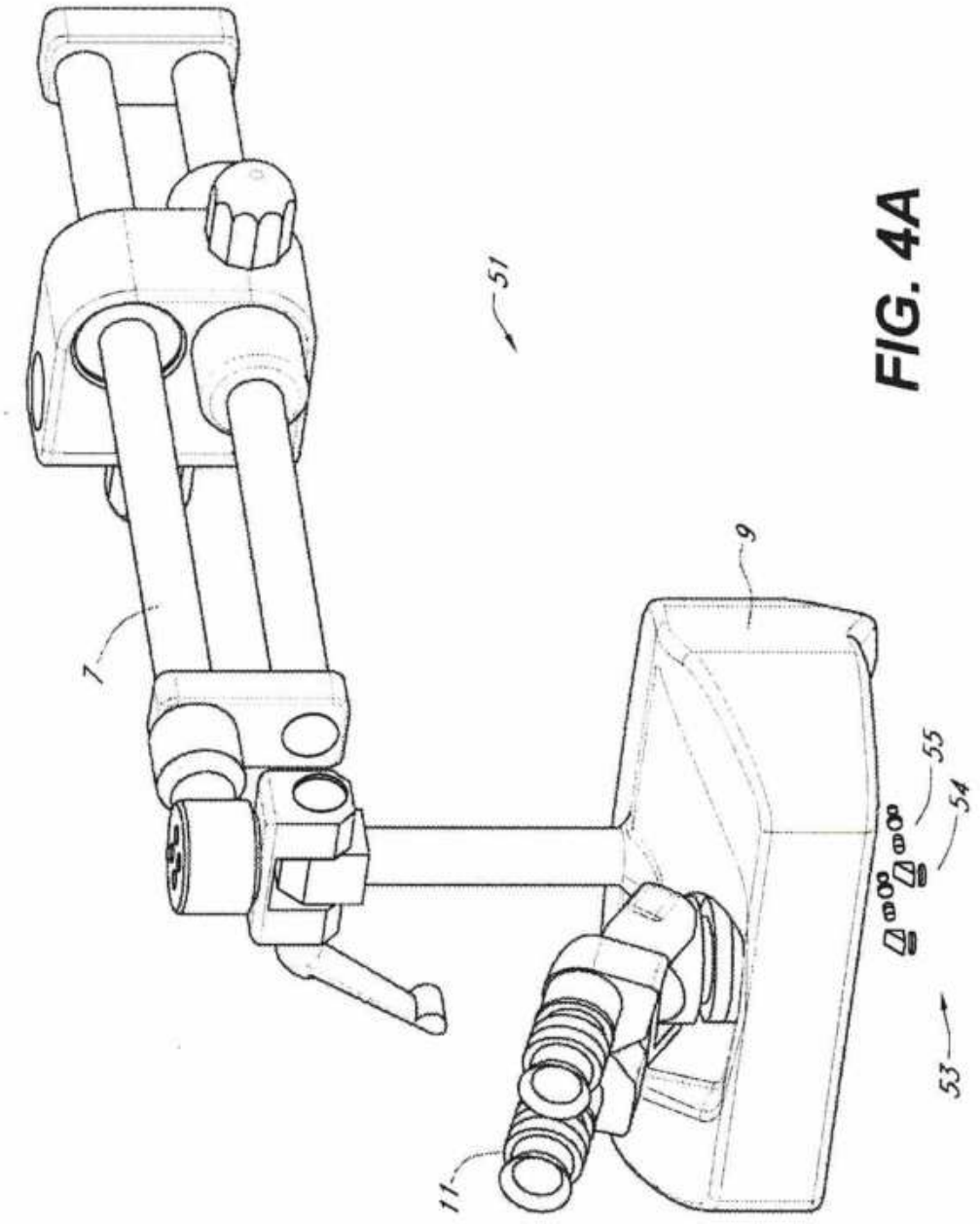


FIG. 4A

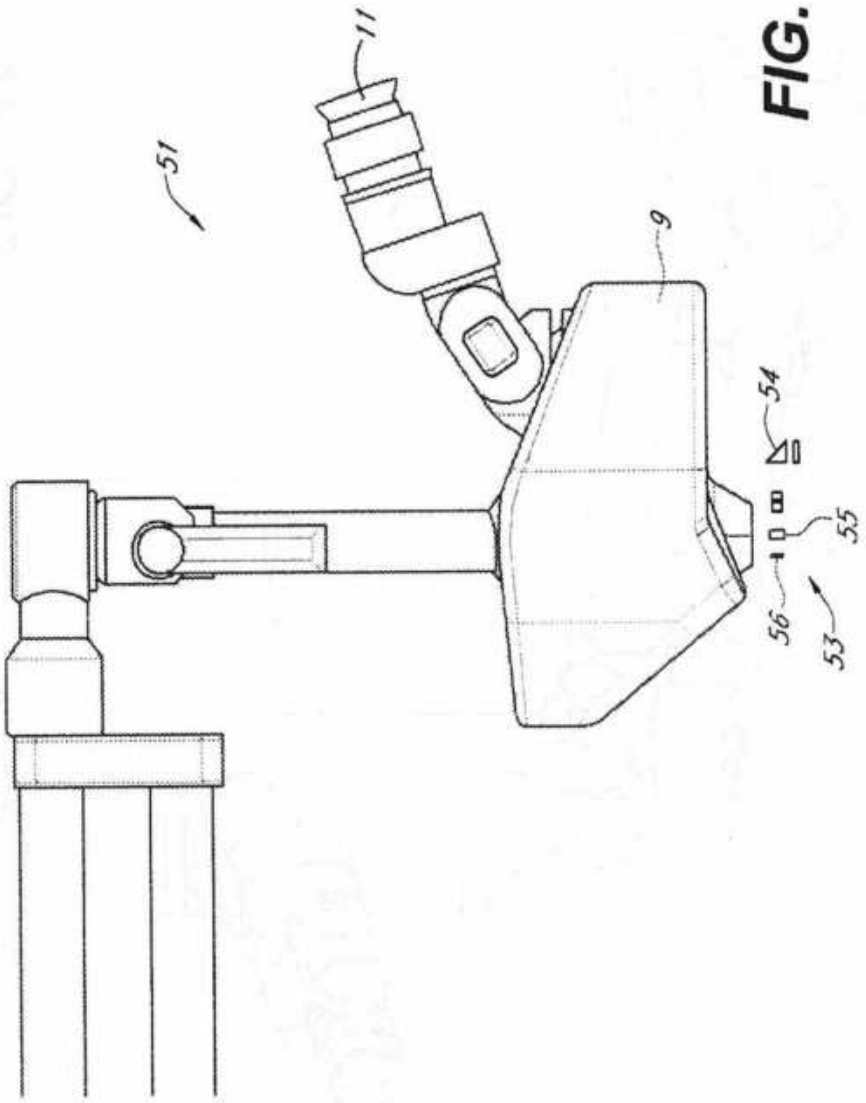


FIG. 4B

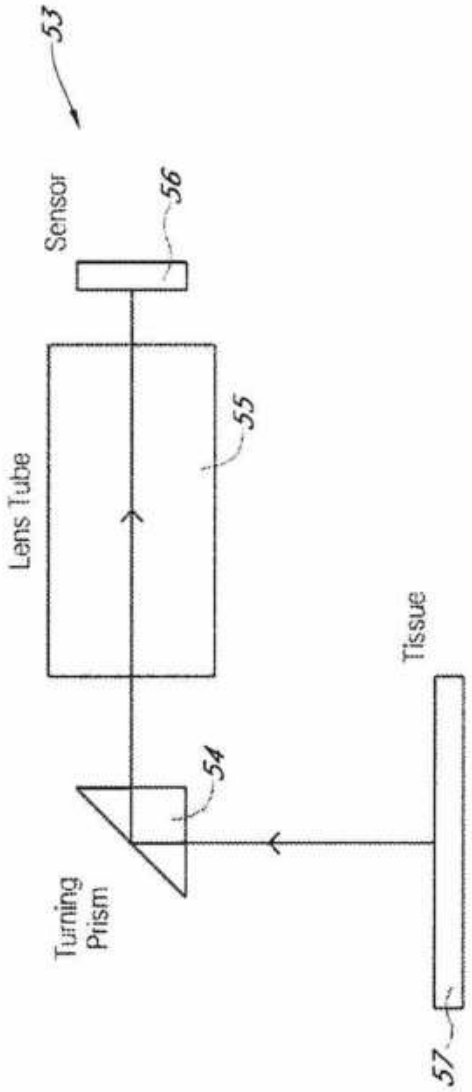


FIG. 5A

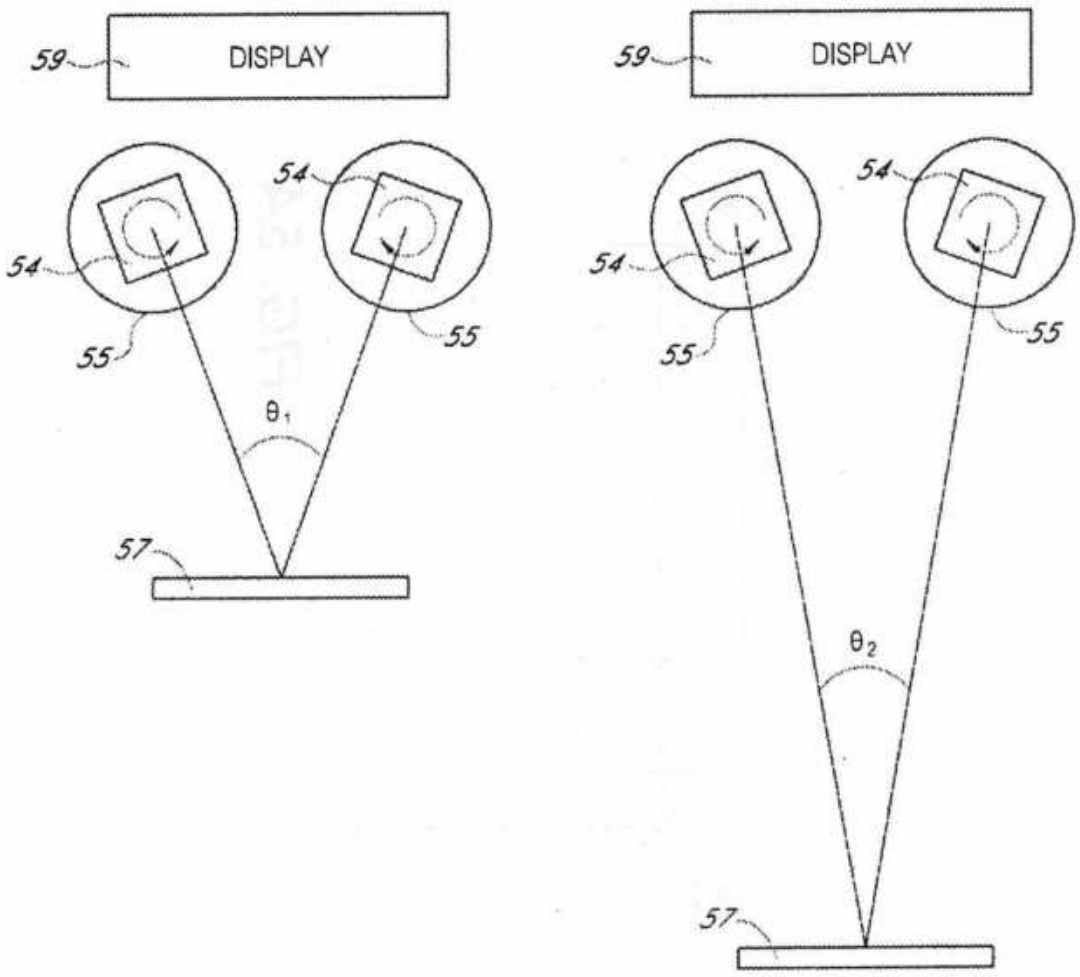


FIG. 5B

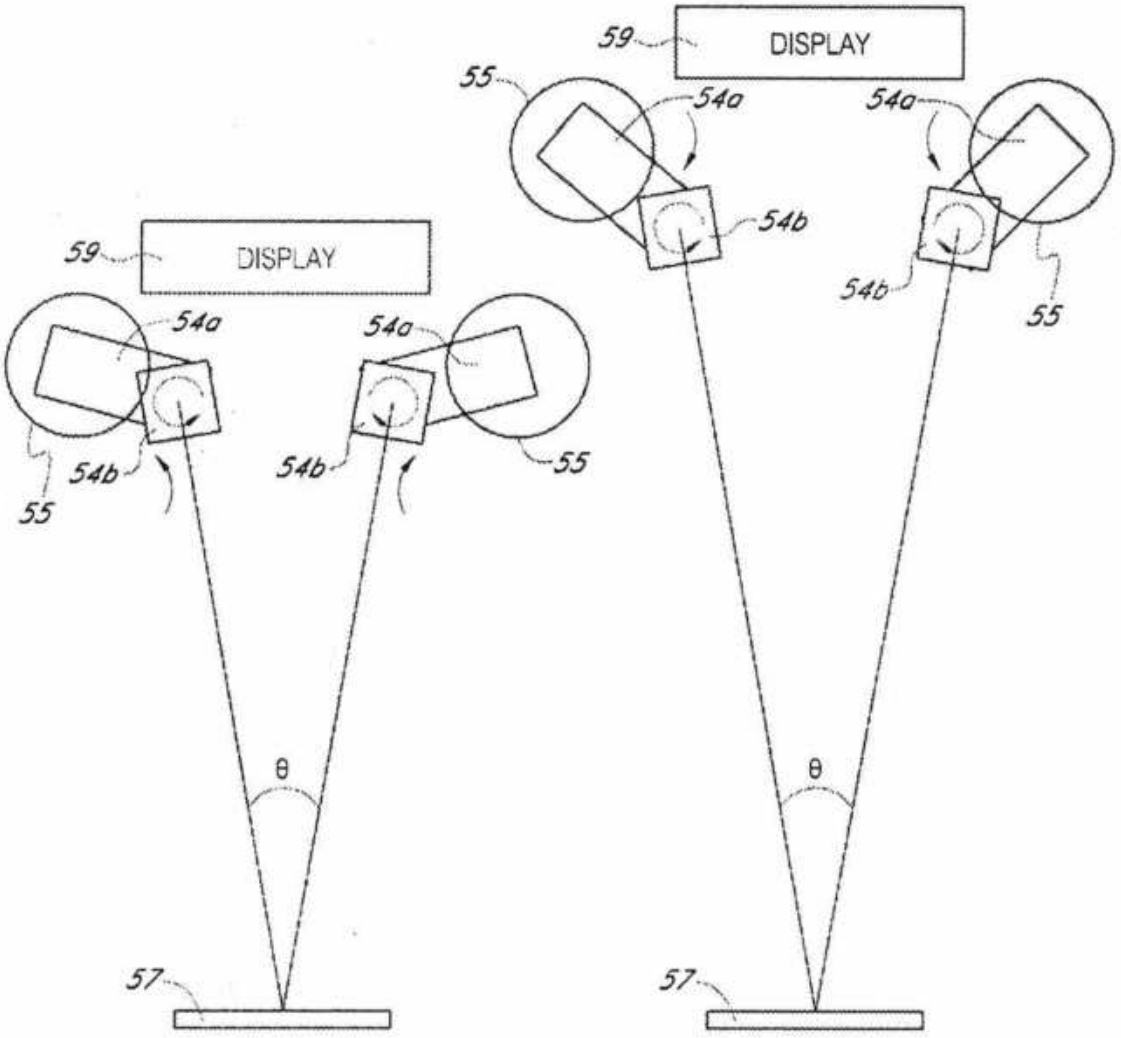


FIG. 5C

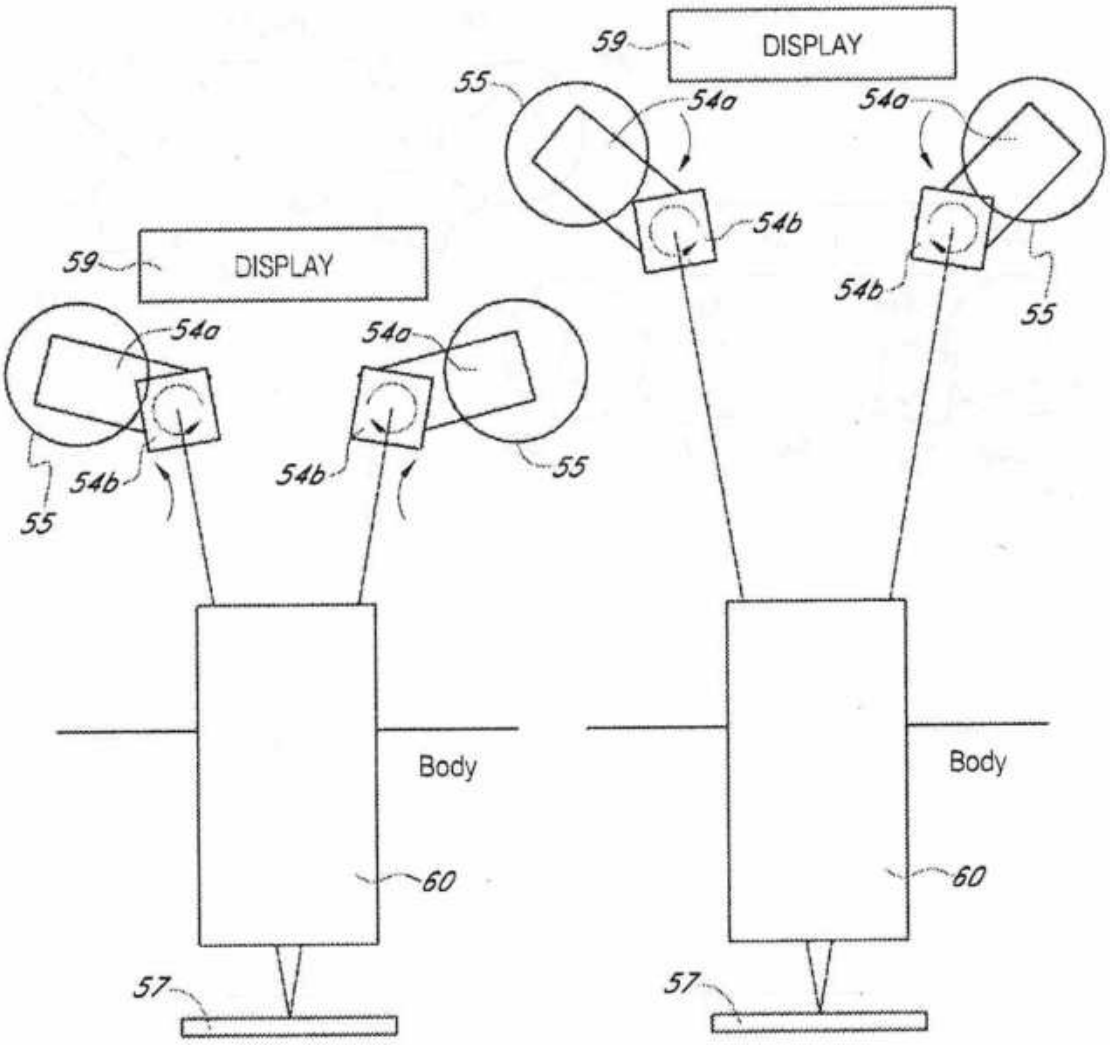

59
DISPLAY
55
54a
54a
54b
54b
55
59
DISPLAY
54a
54a
54b
54b
55
55
Body
60
57
Body
60
57

FIG. 5D

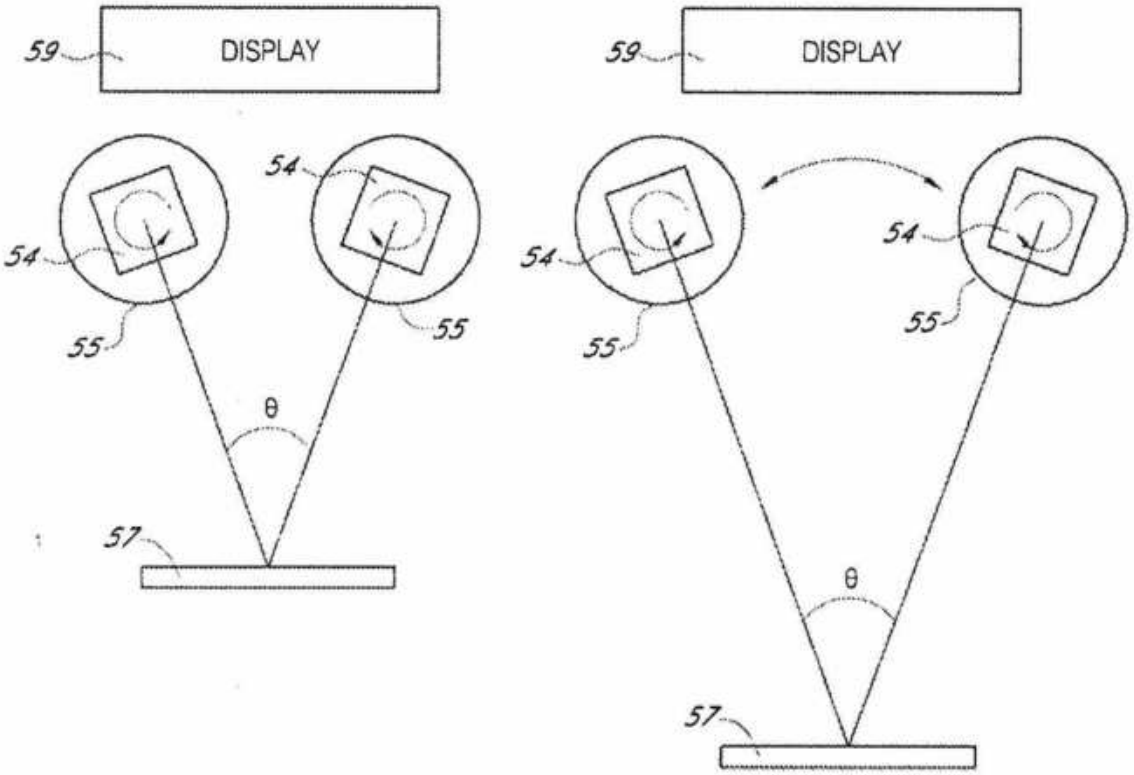


FIG. 5E

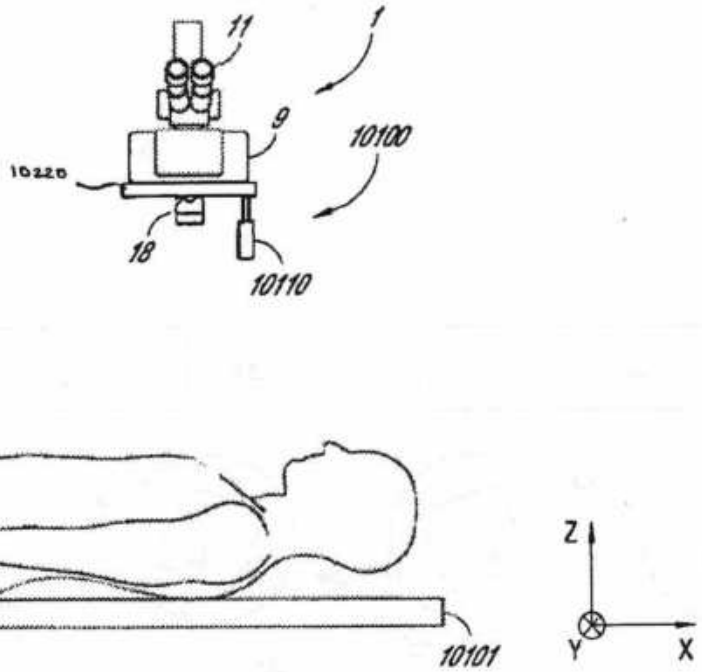

11
1
9
10100
10220
18
10110
10101
Z
Y
X

FIG. 6A

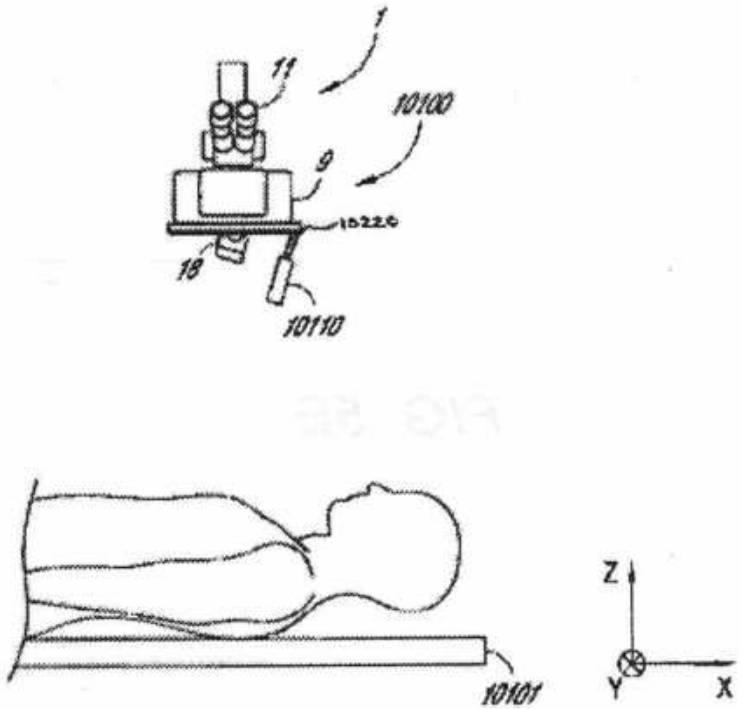

1
11
10100
9
10220
18
10110
10101
Z
Y
X

FIG. 6B

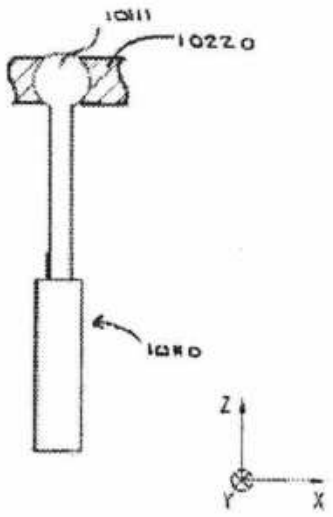


FIG. 6C

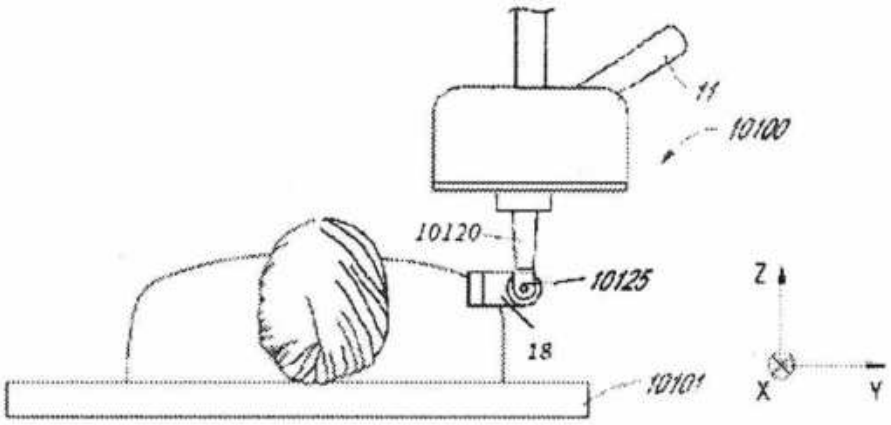


FIG. 7

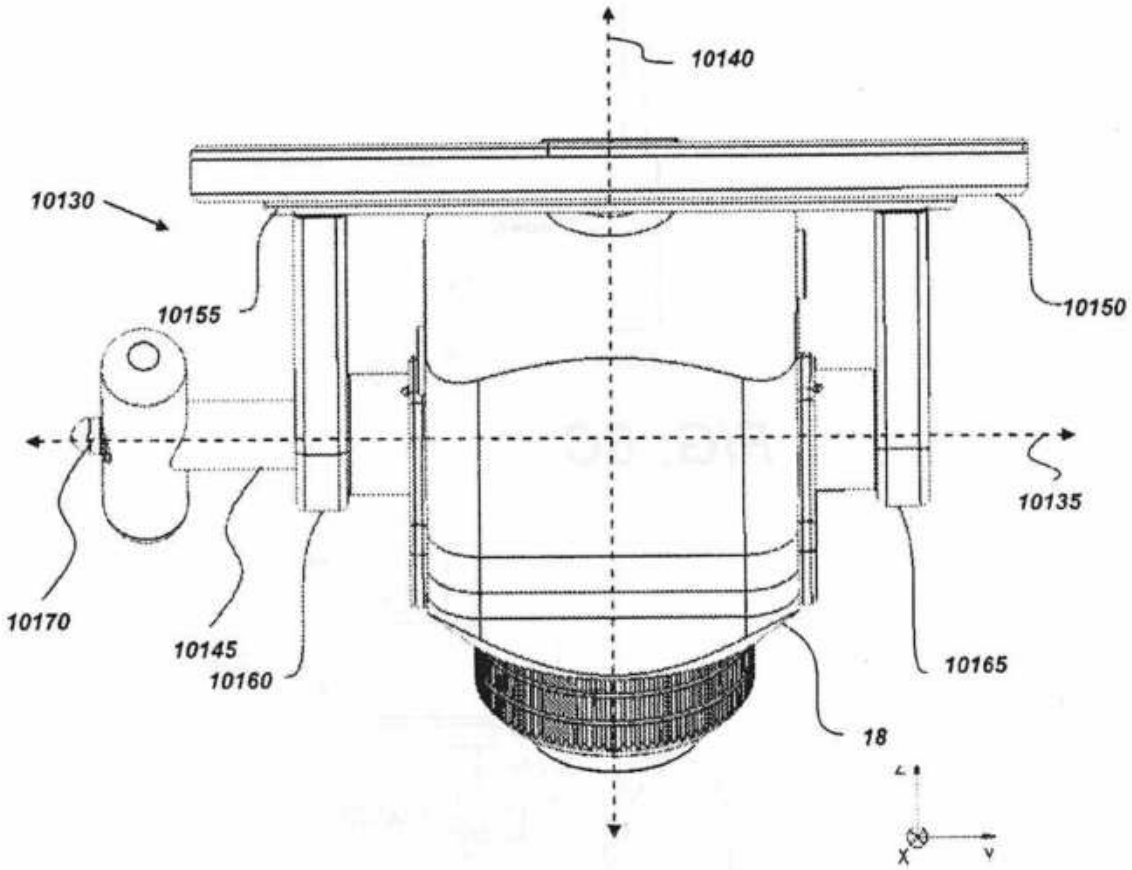


FIG. 8

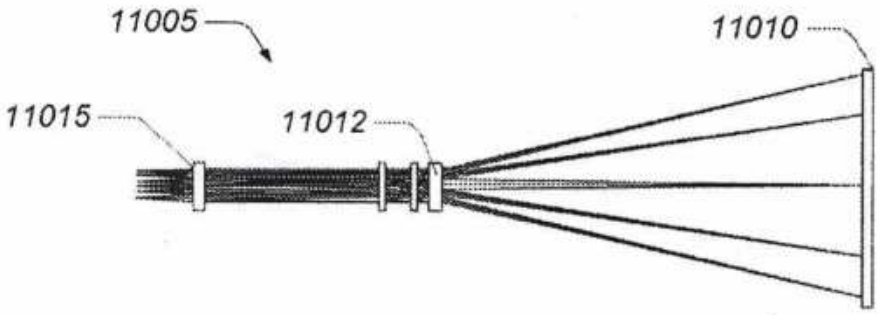

11005
11010
11015
11012

FIG. 9A

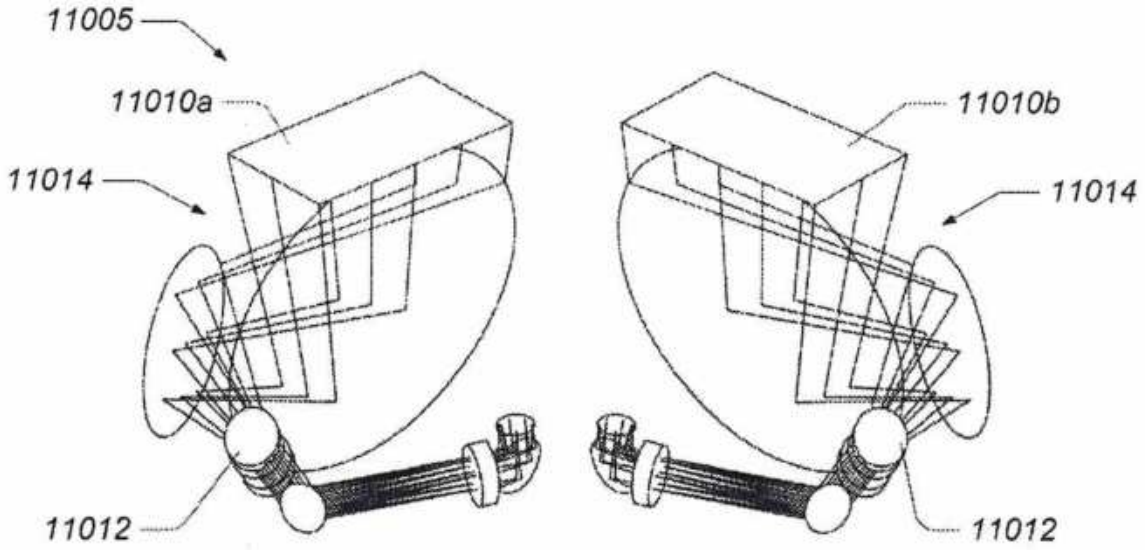

11005
11010a
11010b
11014
11014
11012
11012

FIG. 9B

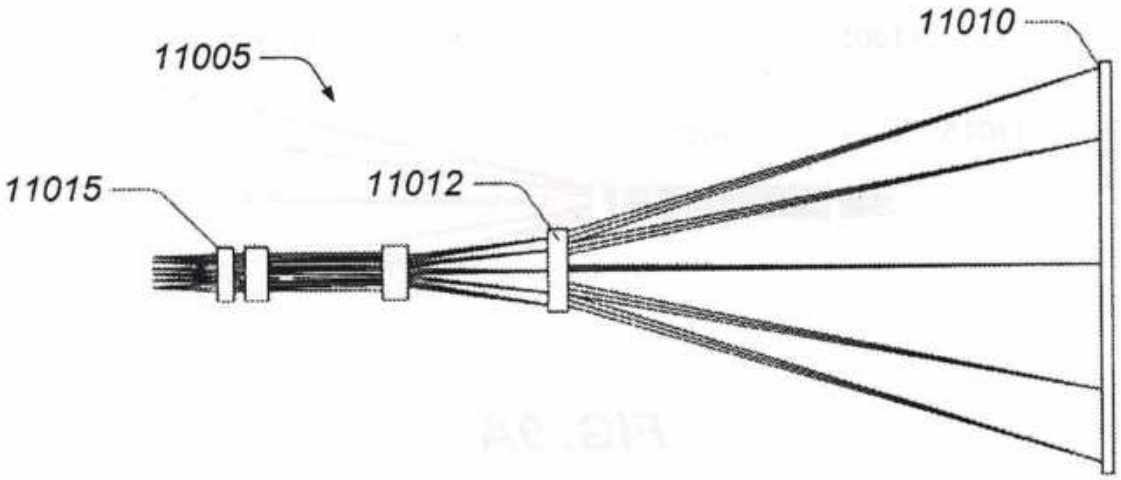


FIG. 9C

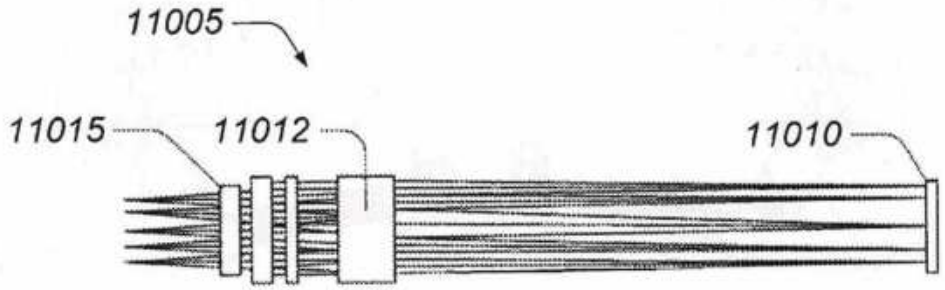


FIG. 9D

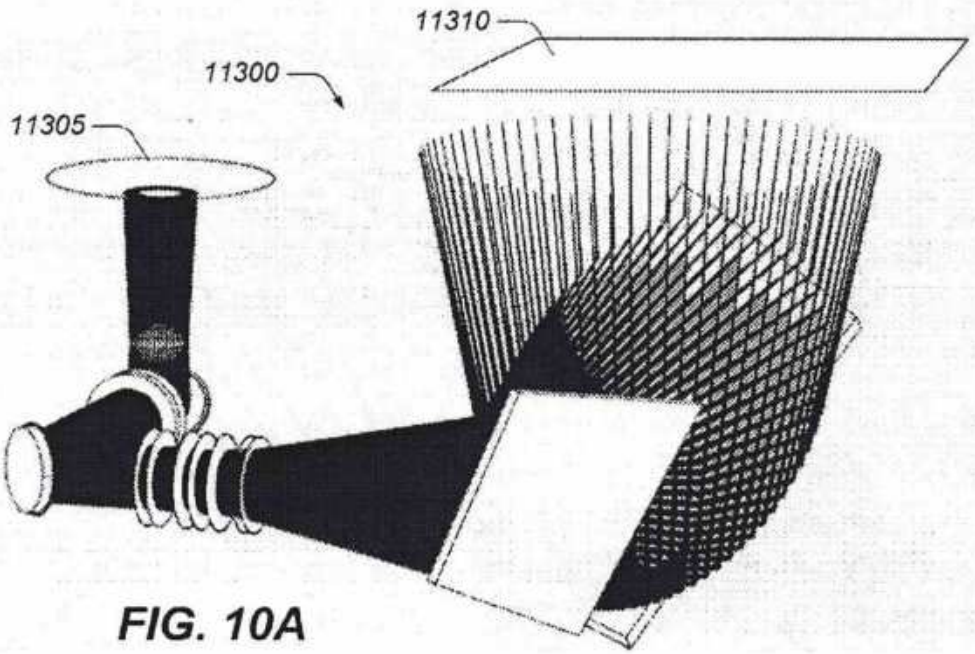


FIG. 10A

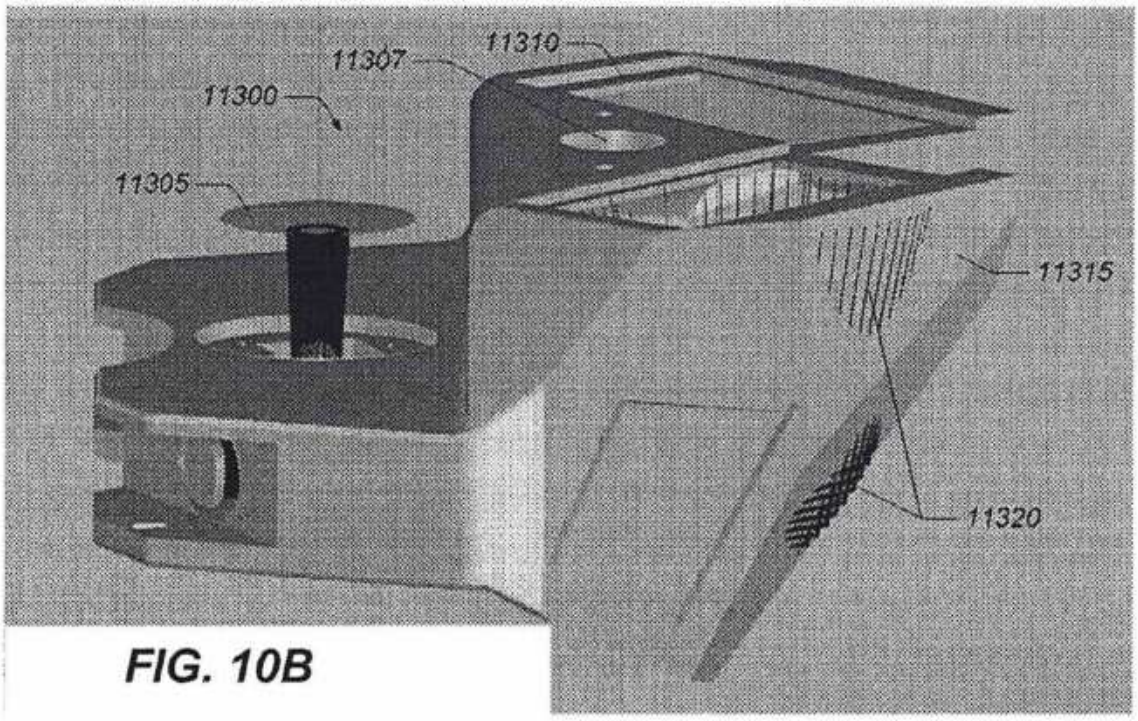


FIG. 10B

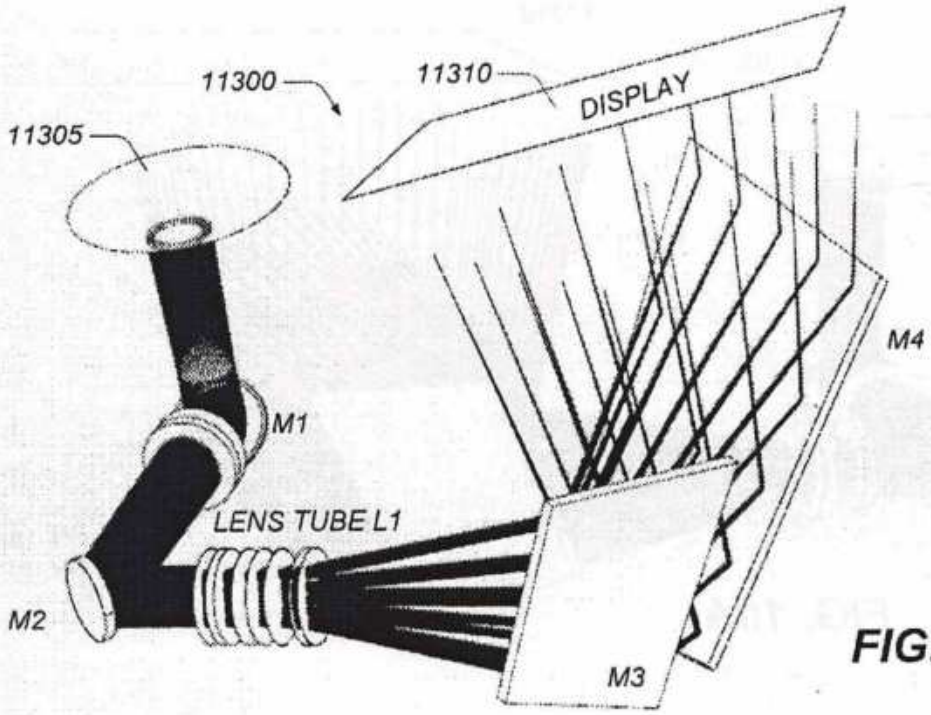


FIG. 10C

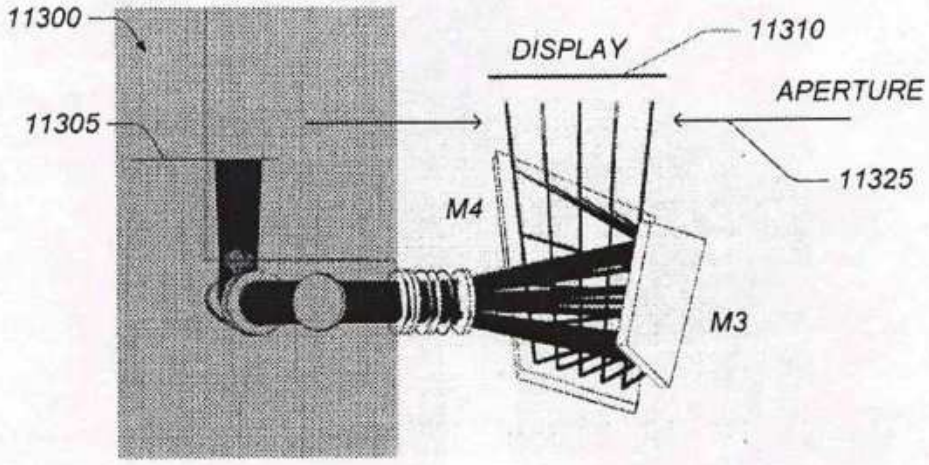


FIG. 10D

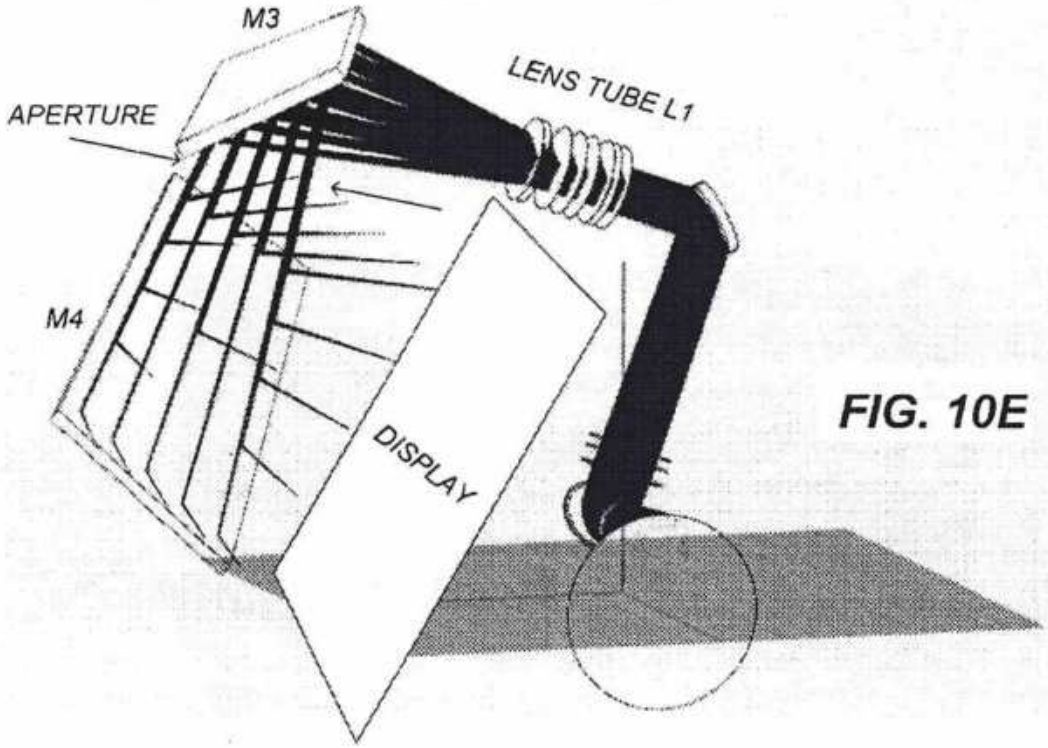


FIG. 10E

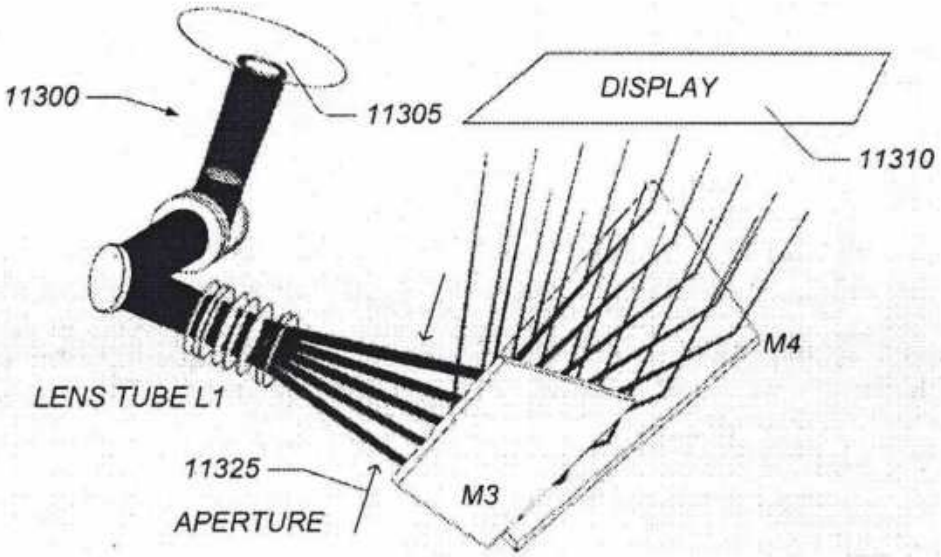


FIG. 10F

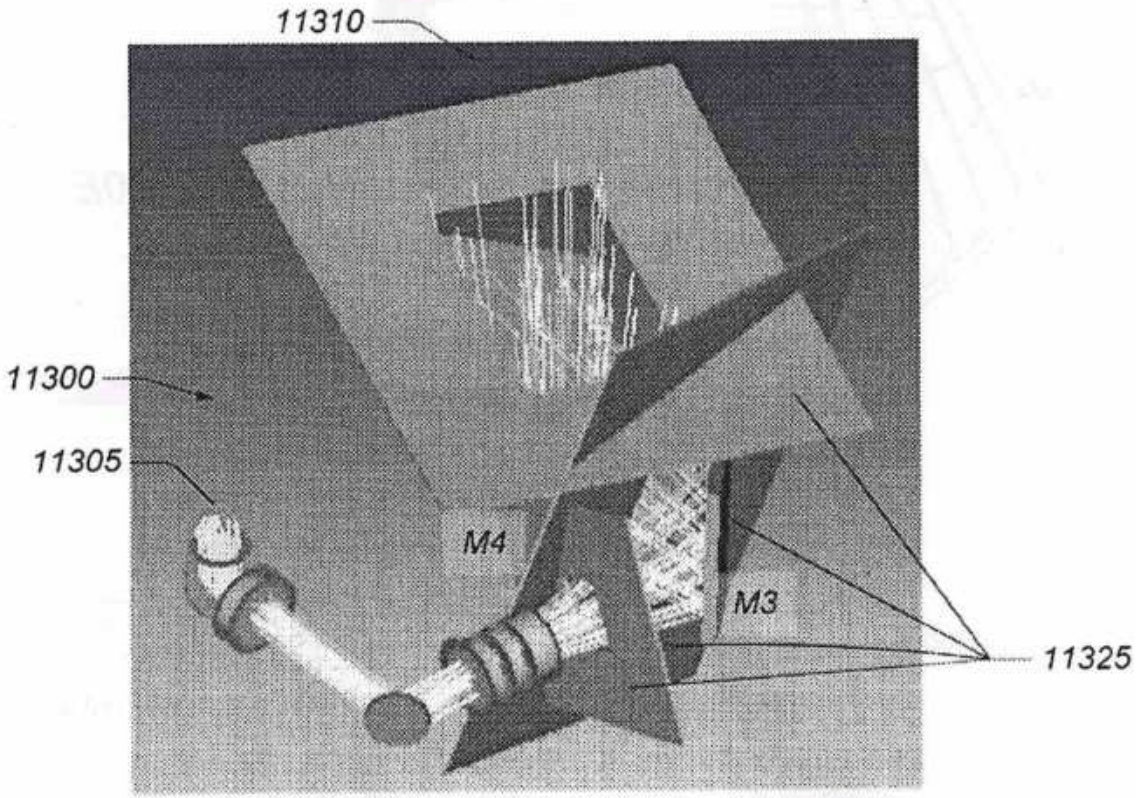


FIG. 10G

SURGICAL VISUALIZATION SYSTEMS AND DISPLAYS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of U.S. patent application Ser. No. 14/491,827, filed Sep. 19, 2014, which is incorporated herein by reference in its entirety and which claims the benefit of priority to U.S. Prov. App. No. 61/880,808, entitled "SURGICAL VISUALIZATION SYSTEMS", filed Sep. 20, 2013; to U.S. Prov. App. No. 61/920,451, entitled "SURGICAL VISUALIZATION SYSTEMS", filed Dec. 23, 2013; to U.S. Prov. App. No. 61/921,051, entitled "SURGICAL VISUALIZATION SYSTEMS", filed Dec. 26, 2013; to U.S. Prov. App. No. 61/921,389, entitled "SURGICAL VISUALIZATION SYSTEMS", filed Dec. 27, 2013; to U.S. Prov. App. No. 61/922,068, entitled "SURGICAL VISUALIZATION SYSTEMS", filed Dec. 30, 2013; and to U.S. Prov. App. No. 61/923,188, entitled "SURGICAL VISUALIZATION SYSTEMS", filed Jan. 2, 2014.

BACKGROUND

Field

Embodiments of the present disclosure relate to visualization systems and displays for use during surgery.

Description of Related Art

Some surgical operations involve the use of large incisions. These open surgical procedures provide ready access for surgical instruments and the hand or hands of the surgeon, allowing the user to visually observe and work in the surgical site, either directly or through an operating microscope or with the aide of loupes. Open surgery is associated with significant drawbacks, however, as the relatively large incisions result in pain, scarring, and the risk of infection as well as extended recovery time. To reduce these deleterious effects, techniques have been developed to provide for minimally invasive surgery. Minimally invasive surgical techniques, such as endoscopy, laparoscopy, arthroscopy, pharyngo-laryngoscopy, as well as small incision procedures utilizing an operating microscope for visualization, utilize a significantly smaller incision than typical open surgical procedures. Specialized tools may then be used to access the surgical site through the small incision. However, because of the small access opening, the surgeon's view and workspace of the surgical site is limited. In some cases, visualization devices such as endoscopes, laparoscopes, and the like can be inserted percutaneously through the incision to allow the user to view the surgical site.

The visual information available to a user without the aid of visualization systems and/or through laparoscopic or endoscopic systems contain trade-offs in approach. Accordingly, there is a need for improved visualization systems, for use in open and/or minimally invasive surgery.

SUMMARY

The systems, methods and devices of the disclosure each have innovative aspects, no single one of which is solely responsible for the desirable attributes disclosed herein.

In a first aspect, a medical apparatus is provided that includes a display housing and an opening in the display housing. The medical apparatus also includes an electronic display disposed within the display housing, the electronic display comprising a plurality of pixels configured to produce a two-dimensional image. The medical apparatus also includes a display optical system disposed within the display housing, the display optical system comprising a plurality of lens elements disposed along an optical path. The display optical system is configured to receive the two-dimensional image from the electronic display, produce a beam with a cross-section that remains substantially constant along the optical path, and produce a collimated beam exiting the opening in the display housing.

In some embodiments of the first aspect, the display optical system further comprises an optical redirection element configured to fold the optical path. In a further embodiment of the first aspect the optical redirection element comprises a mirror or a prism. In another embodiment of the first aspect, the display optical system is configured to direct light received from the electronic display to the opening in the display housing while reducing stray light.

In some embodiments of the first aspect, the display optical system further comprises a baffle configured to reduce stray light. In a further embodiment, the display optical system comprises less than or equal to four baffles. In a further embodiment, the display optical system comprises less than or equal to four mirrors. In a further embodiment, a first baffle is positioned between the electronic display and a first baffle along the optical path, the first mirror positioned prior to the plurality of lens elements along the optical path from the display to the opening. In another further embodiment, at least three baffles are positioned prior to the plurality of lens elements along the optical path from the display to the opening. In another further embodiment, at least two mirrors are positioned prior to the plurality of lens elements along the optical path from the display to the opening.

In some embodiments of the first aspect, the display optical system has an exit pupil and the electronic display is not parallel to the exit pupil. In some embodiments of the first aspect, the opening in the display housing comprises a mounting interface configured to mate with a binocular assembly for a surgical microscope. In a further embodiment, an exit pupil of the display optical system is of a same size or smaller than an entrance pupil of oculars in the binocular assembly.

In some embodiments of the first aspect, the medical apparatus further comprises a second electronic display and a second display optical system configured to provide a stereo view. In some embodiments of the first aspect, the medical apparatus further comprises processing electronics configured to communicate with the electronic display to provide images for the electronic display. In a further embodiment, the processing electronics are configured to receive images from one or more cameras on a surgical device. In a further embodiment, the processing electronics are configured to receive images from one or more cameras that provide a surgical microscope view.

In some embodiments of the first aspect, the optical path is less than or equal to 16.2 inches and a light-emitting portion of the electronic display has a diagonal measurement that is greater than or equal to 5 inches. In some embodiments of the first aspect, the optical path is less than or equal to 18.7 inches and a light-emitting portion of the electronic display has a diagonal measurement that is greater than or equal to 8 inches. In some embodiments of the first aspect, the display optical system further comprises a converging mirror. In some embodiments of the first aspect, the medical

apparatus further comprises a viewing assembly comprising an objective lens, beam positioning optics, and an ocular, the viewing assembly configured to receive the collimated beam exiting the opening in the display housing. In some embodiments of the first aspect, the electronic display has a diagonal light-emitting portion between 4 inches and 9 inches. In some embodiments of the first aspect, an optical path length from the electronic display to a last element of the display optical system is at least 9 inches. In a further embodiment, the optical path length from the electronic display to the last element of the display optical system is less than 20 inches.

In a second aspect, a medical apparatus is provided that includes a viewing assembly comprising a housing and an ocular, the ocular configured to provide a view an electronic display disposed in the housing. The medical assembly includes an optical assembly disposed on the viewing assembly, the optical assembly configured to provide a surgical microscope view of a surgical site. The optical assembly includes an auxiliary video camera and a gimbal configured to couple the auxiliary video camera to the viewing assembly and configured to change an orientation of the auxiliary video camera relative to the viewing assembly. The medical apparatus includes an image processing system in communication with the optical assembly and the electronic display, the image processing system comprising at least one physical processor. The image processing system is configured to receive video images acquired by the auxiliary video camera, provide output video images based on the received video images, and present the output video images on the electronic display so that the output video images are viewable through the ocular. The gimbal is configured to adjust a pitch of the auxiliary video camera between a first position and a second position, wherein the auxiliary video camera has a first viewing angle perpendicular to a floor in the first position and a second viewing angle that is within about 10 degrees of parallel to the floor in the second position.

In some embodiments of the second aspect, the gimbal comprises two pivots. In a further embodiment, a first pivot is configured to adjust a pitch of the auxiliary video camera and a second pivot is configured to rotate the auxiliary video camera around an axis perpendicular to the floor.

In some embodiments of the second aspect, the gimbal is configured to adjust a pitch of the auxiliary video camera between the first position and a third position, wherein the auxiliary video camera has a third viewing angle in the third position that is less than or equal to 180 degrees from the first viewing angle. In some embodiments of the second aspect, the gimbal is electronically controlled. In some embodiments of the second aspect, the optical assembly is configured to provide an oblique view of a portion of a patient. In a further embodiment, an orientation of the ocular of the viewing assembly is configured to remain stationary when an orientation of the auxiliary video camera changes to provide the oblique view of the portion of the patient.

In some embodiments of the second aspect, the gimbal is configured to smoothly adjust the viewing angle of the auxiliary video camera between the first position and the second position. In some embodiments of the second aspect, the auxiliary video camera comprises a stereo video camera and the ocular comprises a pair of oculars. In some embodiments of the second aspect, the medical apparatus further comprises a camera arm attached to the viewing assembly.

In a third aspect, a medical apparatus is provided that includes a display housing. The medical apparatus includes a plurality of electronic displays disposed within the display housing, each of the plurality of electronic displays comprising a plurality of pixels configured to produce a two-dimensional image. The plurality of electronic displays are configured to present superimposed images in a field of view of a person's eye.

In some embodiments of the third aspect, the medical apparatus further comprises a binocular viewing assembly coupled to the display housing. In some embodiments of the third aspect, at least one of the plurality of electronic displays comprises a transmissive display panel. In some embodiments of the third aspect, the superimposed images comprise a video of a first portion of a surgery site that is superimposed on a video of a second portion of the surgery site, the first portion contained within the second portion. In a further embodiment, the video of the first portion is magnified relative to the video of the second portion.

In some embodiments, a medical apparatus can include a camera having a field of view that can be designed to include a surgical site, wherein the camera is designed to provide a surgical microscope view of the surgical site. In some embodiments, the medical apparatus can include a binocular viewing assembly having a housing and a plurality of oculars, the plurality of oculars designed to provide views of at least one display disposed in the housing. In some embodiments, the medical apparatus can include an image processing system designed to receive images acquired by the camera and present the output video images on the at least one display. In some embodiments, the medical apparatus can include a movement control system designed to move the camera relative to the binocular viewing assembly, the movement control system having a control member operatively coupled to the movement control system to translate the camera relative to the binocular viewing assembly along at least a first axis and a second axis and to rotate the camera relative to the binocular viewing assembly.

In a fourth aspect a medical apparatus is provided wherein a movement control system can include a translation system having a moveable platform to which the camera is attached, the moveable platform being positioned between the binocular viewing assembly and the camera and being moveable relative to the binocular viewing assembly along at least a first axis and a second axis. In some embodiments, the translation system can include an electromechanical device operatively coupled to the moveable platform.

In some embodiments of the fourth aspect, the movement control system can include a pitch-yaw adjustment system having an electromechanical device to which the camera can be attached, the pitch-yaw adjustment system designed to rotate the camera relative to the binocular viewing assembly around an axis parallel to the first axis and rotate the camera around an axis parallel to the second axis. In some embodiments, the control member is operatively coupled to the movement control system via sensors designed to detect movement of the control member, the sensors in communication with components of the movement control system In some embodiments, the control member can be operatively coupled to the movement control system via a gimbal having one or more sensors designed to detect movement of the control member, the sensors in communication with one or more components of the movement control system.

In some embodiments of the fourth aspect, the movement control system can be attached to the binocular viewing assembly. In some embodiments, the movement control system can be attached to an articulated arm. In some embodiments, the camera can be attached to the movement control system via an arm. In some embodiments, the medical apparatus can include a control system for controlling one or more electromechanical devices operatively

coupled to the movement control system. In some embodiments, the control system can includes one or more pre-set positions for the movement control system

In a fifth aspect, a medical apparatus is provided that includes a display, a plurality of cameras and a processor, at least one of said cameras providing a surgical microscope view, said plurality of cameras comprising a first camera configured to image fluorescence in a surgical field and a second camera configured to produce a non-fluorescence image of said surgical field, a processor configured to receive video from said plurality of cameras and to display on said display a first fluorescence video from the first of said cameras and display a second non-fluorescence video from said second of said cameras.

In some embodiments of the fifth aspect, said first and second cameras have different spectral responses. In certain embodiments of the fifth aspect, one of the said first and second cameras is sensitive to infrared and the other is not.

BRIEF DESCRIPTION OF THE DRAWINGS

Throughout the drawings, reference numbers can be reused to indicate general correspondence between reference elements. The drawings are provided to illustrate example embodiments described herein and are not intended to limit the scope of the disclosure.

FIG. **1** illustrates an embodiment of the surgical visualization system having an imaging system that can be configured to provide imagery similar to a direct-view surgery microscope.

FIG. **2** illustrates an example surgical viewing system attached to an articulating arm, the system including one or more cameras mounted on a binocular viewing platform.

FIGS. **3**A and **3**B illustrate an example surgical viewing system that includes an isocenter positioning system attached to the binocular viewing platform.

FIGS. **4**A and **4**B illustrate an embodiment of a surgical visualization system having an optical imaging system mounted under the binocular viewing platform.

FIGS. **5**A-**5**E illustrate embodiments of optical imaging systems for use in a stereoscopic surgical viewing system, such as those illustrated in FIGS. **4**A and **4**B.

FIG. **6**A is a front view of an embodiment of a surgical visualization system, a movement control system, and an imager.

FIG. **6**B is a front view of the embodiment of FIG. **6**A with the movement control system and imager shifted.

FIG. **6**C is a partial section view of the embodiment of a movement control system of FIG. **6**A.

FIG. **7** is a side view of an embodiment of a surgical visualization system, a movement control system, and an imager.

FIG. **8** is a rear view of an embodiment of an embodiment of a movement control system.

FIGS. **9**A-**9**D illustrate example display optical systems configured to provide a view of a display or a pair of displays through oculars.

FIGS. **10**A-**10**G illustrate example display optical systems configured to deliver to oculars images of a display wherein light paths that would intersect a viewing assembly are reduced or eliminated through baffles.

DETAILED DESCRIPTION

The following description is directed to certain embodiments for the purposes of describing the innovative aspects of this disclosure. However, a person having ordinary skill in the art will readily recognize that the teachings herein can be applied in a multitude of different ways. The described embodiments may be implemented in any device or system that can be configured to provide visualization of a surgical site. Thus, the teachings are not intended to be limited to the embodiments depicted solely in the figures and described herein, but instead have wide applicability as will be readily apparent to one having ordinary skill in the art.

Surgical Visualization System

To provide improved visualization of a surgical site, a surgical device can be provided with multiple integrated cameras. Each of the cameras may capture a distinct view of the surgical site. In some embodiments, imagery from the plurality of cameras may be displayed to facilitate operation in a surgical site. Tiled, individual, and/or stitched imagery from the multiple cameras can provide the user with a view of the surgical site. The user can select the imagery to be displayed and the manner in which it is displayed for enhanced utility during surgery. As used herein, the term imagery and images includes video and/or images captured from one or more video cameras. Images from video are often referred to as video images or simply images. The term images may also refer to still images or snap shots. Video feed or video stream may also be used to describe the video images such as video images from a camera.

The video cameras may comprise, for example, CCD or CMOS sensor arrays or other types of detector arrays. A frame grabber may be configured to capture data from the cameras. For example, the frame grabber may be a Matrox Solios eA/XA, 4 input analog frame grabber board. Image processing of the captured video may be undertaken. Such image processing can be performed by, for example, the Matrox Supersight E2 with Matrox Supersight SHB-5520 with two Intel Six Core Xeon E5645 2.4 GHz processors with DDR3-1333SDRAM. This system can be designed to support eight or more camera inputs using two Matrox Solios eA/XA, 4 input, analog frame grabber boards. More or less cameras may be employed. In some implementations, a field programmable gate array ("FPGA") can be used to capture and/or process video received from the cameras. For example, the image processing can be performed by Xilinx series 7 FPGA boards. Other hardware devices can be used as well, including ASIC', DSP, computer processors, a graphics board, and the like. The hardware devices can be standalone devices or they can be expansion cards integrated into a computing system through a local computer bus, e.g., a PCI card or PCIe card.

FIG. **1** shows an example embodiment of a surgical visualization system **1**. As illustrated, the system **1** includes a console and electronics **3** from which three arms **5**, **7** and **7***b* extend. The first arm **5** has mounted to its distal end a viewing platform **9**. The viewing platform may include two oculars **11** and be configured similarly to a standard surgical microscope viewing platform. In some embodiments, however, unlike a conventional surgical microscope or a head mounted display the viewing platform **9** is not a direct view device where the surgeon or other user sees directly through the platform, e.g., an aperture in the platform. In some embodiments, regardless whether the user can view directly through the viewing platform, the surgical visualization system **1** can be configured to display video in a manner that the video displayed is decoupled from movement of the surgical microscope cameras such that a user can adjust the position and/or orientation of the surgical microscope cameras without moving the oculars **11** or the user adjusting position. As discussed in more detail below, the viewing

platform **9** may include displays that receive signals from cameras that the surgeon or user employs to view the surgical site.

In some embodiments, cameras can be mounted to the viewing platform **9** and the cameras can be configured to provide imagery of the surgical site. Accordingly, the cameras can be used to provide imagery similar to a conventional surgical microscope. For example, the cameras on the viewing platform **9** can be configured to provide a working distance, or a distance from the viewing platform **9** to the patient, that can vary using zooming. The virtual working distance can vary, where the working distance can be at least about 150 mm and/or less than or equal to about 450 mm, at least about 200 mm and/or less than or equal to about 400 mm, or at least about 250 mm and/or less than or equal to about 350 mm. The working distance can be selected and/or changed by the surgeon. In some embodiments, changing the working distance does not affect the position and/or orientation of the oculars **11** with respect to the user or surgeon. In some embodiments, the cameras mounted on the viewing platform **9** can be used to provide gesture recognition to allow a surgeon to virtually interact with imagery provided by the display using the surgeon's hands, a surgical tool, or both, as described in greater detail herein.

The second arm **5** has mounted to its distal end an input and display device **13**. In some embodiments, the input and display device **13** comprises a touchscreen display having various menu and control options available to a user. In some embodiments, the touchscreen can be configured to receive multi-touch input from ten fingers simultaneously, allowing for a user to interact with virtual objects on the display. For example, an operator may use the input device **13** to adjust various aspects of the displayed image. In various embodiments, the surgeon display incorporating a video camera providing a surgical microscope view may be mounted on a free standing arm, from the ceiling, on a post, or the like. The flat panel display touch screen **13** may be positioned on a tilt/rotate device on top of the electronics console.

A surgical tool **17** can be connected to the console **3** by electrical cable **19**. The surgical tool **17** includes, for example, a cutting tool, a cleaning tool, a device used to cut patients, or other such devices. In other embodiments, the surgical tool **17** may be in wireless communication with the console **3**, for example via WiFi (e.g., IEEE 802.11a/b/g/n), Bluetooth, NFC, WiGig (e.g., IEEE 802.11ad), etc. The surgical tool **17** may include one or more cameras configured to provide imagery, e.g., image and/or video data. In various embodiments, video data can be transmitted to a video switcher, camera control unit (CCU), video processor, or image processing module positioned, for example, within the console **3**. The video switching module may then output a display video to the viewing platform **9**. The operator may then view the displayed video through the oculars **11** of the viewing platform **9**. In some embodiments, the binoculars permit 3D viewing of the displayed video. As discussed in more detail below, the displayed video viewed through the viewing platform **9** may comprise a composite video formed (e.g., stitched or tiled) from two or more of the cameras on the surgical tool **17**.

In use, an operator may use the surgical tool **17** to perform open and/or minimally invasive surgery. The operator may view the surgical site by virtue of the displayed video in the viewing platform **9**. Accordingly, the viewing platform (surgeon display system) **9** may be used in a manner similar to a standard surgical microscope although, as discussed above, the viewing platform **9** need not be a direct view device wherein the user sees directly through the platform **9** to the surgical site via an optical path from the ocular through an aperture at the bottom of the viewing platform **9**. Rather in various embodiments, the viewing platform **9** includes a plurality of displays, such as liquid crystal or light emitting diode displays (e.g., LCD, AMLCD, LED, OLED, etc.) that form an image visible to the user by peering into the ocular. Accordingly, one difference, however, is that the viewing platform **9** itself need not necessarily include a microscope objective or a detector or other image-capturing mechanisms. Rather, the image data can be acquired via the cameras of the surgical tool **17**. The image data can then be processed by a camera control unit, video processor, video switcher or image processor within the console **3** and displayed imagery may then be viewable by the operator at the viewing platform **9** via the display devices, e.g., liquid crystal or LED displays, contained therein. In some embodiments, the viewing platform **9** can provide a view similar to a standard surgical microscope using cameras and displays and can be used in addition to or in conjunction with a standard surgical microscope optical pathway in the viewing platform. In certain embodiments, the viewing platform **9** can provide a surgical microscope view wherein changes in the viewing angle, viewing distance, work distance, zoom setting, focal setting, or the like is decoupled from movement of the viewing platform **9**. In certain embodiments, changes in the position, pitch, yaw, and/or roll of the imaging system **18** are decoupled from the viewing platform **9** such that the imaging system **18** can move and/or re-orient while the surgeon can remain stationary while viewing video through the oculars **11**.

The third arm **7***b* can include an imaging system **18** that can be configured to provide video similar to a direct-view surgery microscope. The imaging system **18** can be configured, then, to provide a surgical imaging system configured to provide an electronic microscope-like view that can comprise video of the work site or operational site from a position above the site (e.g., about 15-45 cm above the surgical site) or from another desired angle. By decoupling the imagers **18** from the display, the surgeon can manipulate the surgical imaging system to provide a desired or selected viewpoint without having to adjust the viewing oculars. This can advantageously provide an increased level of comfort, capability, and consistency to the surgeon compared to traditional direct-view operating microscope systems. In some embodiments, as described herein, the imagers **18** can be located on the viewing platform **9**, on a dedicated arm **7***b*, on a display arm **5**, on a separate post, a separate stand, supported from an overhead structure, supported from the ceiling or wall, or detached from other systems. The imagers **18** can comprise a camera configured to be adjustable to provide varying levels of magnification, viewing angles, monocular or stereo imagery, convergence angles, working distance, or any combination of these.

The viewing platform **9** can be equipped with wide field-of-view oculars **11** that are adjustable for refractive error and presbyopia. In some embodiments, the oculars **11**, or eyepieces, may additionally include polarizers in order to provide for stereoscopic vision. The viewing platform **9** can be supported by the arm **7** or **7***b*, such that it may be positioned for the user to comfortably view the display **13** through the oculars **11** while in position to perform surgery. For example, the user can pivot and move the arm **7** or **7***b* to re-orient and/or re-position the viewing platform **9**.

In some embodiments, the image processing system and the display system are configured to display imagery placed roughly at infinity to reduce or eliminate accommodation

and/or convergence when viewing the display. A display optical system can include one or more lenses and one or more redirection elements (e.g., mirrors, prisms) and can be configured to provide light from the display that can be imaged by a binocular viewing assembly comprising a pair of oculars, objectives, and/or turning prisms or mirrors. The display devices such as liquid crystal displays can be imaged with the objective and the pair of oculars and display optical system within the viewing platform **9**. The binocular assembly and display optical system can be configured to produce an image of the displays at infinity. Such arrangements may potentially reduce the amount of accommodation by the surgeon. The oculars can also have adjustments (e.g., of focus or power) to address myopia or hyperopia of the surgeon. Accordingly, the surgeon or other users may view the displays through the oculars without wearing glasses even if ordinarily prescription glasses were worn for other activities.

In some embodiments, the viewing platform **9** can include one or more imagers configured to provide electronic microscope-like imaging capabilities. FIG. **2** illustrates an example surgical imaging system **51** attached to an arm **7**, the system **51** including one or more cameras **18** mounted on a viewing platform **9**. The cameras **18** can be configured to provide imagery of a worksite. The image data can be presented on a display that the user can view using oculars **11** mounted on the viewing platform **9**. This design can be used to mimic other direct-view microscopes, but it can also be configured to provide additional capabilities. For example, the surgical imaging system **51** can be configured to have a variable working distance without adjusting the viewing platform **9** or the articulating arm **7**. The surgical imaging system **51** can be configured to provide image processing capabilities such as electronic zooming and/or magnification, image rotation, image enhancement, stereoscopic imagery, and the like. Furthermore, the imagery from the cameras **18** can be combined with imagery from cameras on the surgical device **17**. In some embodiments, the surgical imaging system **51** can provide fluorescence images.

Although the discussion considers images from surgical tools, numerous embodiments may involve at least one auxiliary video camera **18** and one or more other cameras that are not disposed on surgical tools but are disposed on other medical devices. These medical devices may include devices introduced into the body such as endoscopes, laparoscopes, arthroscopes, etc.

Accordingly, one or more displays such as the at least one display **13** included in the viewing platform **9** may be used to provide a surgical microscope view using one or more cameras such as the auxiliary video camera(s) **18** as well as to display views from one or more cameras located on such medical devices other than surgical tools. In some embodiments, cameras from a variety of sources, e.g., surgical tools and other medical devices, in any combination, may be viewed on the display(s) on the surgical platform together with the surgical microscope view from the auxiliary video cameras **18**. As described herein, the displays may provide 3D thus any of the images and graphics may be provided in 3D.

In various embodiments, a virtual touchscreen may be provided by the auxiliary video cameras **18** or other virtual touchscreen cameras mounted to the viewing platform **9**. Accordingly, in some embodiments a user may provide a gesture in the field of view of the auxiliary video cameras and/or virtual touchscreen cameras and the processing module can be configured to recognize the gesture as an input. Although the virtual display has been described in the context of the auxiliary video cameras **18**, other cameras, e.g., virtual reality input cameras, possibly in addition to the auxiliary video cameras **18** may be used. These cameras may be disposed on the viewing platform **9** or elsewhere, such as the third arm **7***b*. As described herein the displays may provide 3D thus the virtual reality interface may appear in 3D. This may increase the immersive quality of the viewing experience, enhancing the detail and/or realistic presentation of video information on the display.

In some embodiments, as illustrated in FIG. **3**A, the surgical imaging system **51** includes an isocenter positioning system **52** attached to the viewing platform **9**. The isocenter positioning system **52** can include a single track or guide configured to move and orient the cameras **18** such that they are substantially pointed at a single point **53**, the isocenter. In some embodiments, a second track or guide can be attached to the first guide in an orthogonal manner to provide movement along two dimensions while substantially maintaining the pointing angle towards the isocenter **53**. Other configurations can be used to provide isocenter pointing capabilities, such as articulating arms, electro-mechanical elements, curved friction plates, etc. In some embodiments, as illustrated in FIG. **3**B, the imaging system is configured to move in an isocenter manner. This can be used to enhance dexterity of the user of the system because hand-eye coordination is increased or maximized. Such enhanced dexterity can be vital for prolonged and/or difficult surgery. In the displayed embodiment, the horizons of the acquisition systems are configured to be horizontal to match the horizon of the display system and the user. As shown in FIG. **3**B, in various embodiments, a stereo imaging system may be maintained in a horizontal configuration as it is moved across a range of locations to avoid confusion for the user viewing the video from the stereo camera. By maintaining a common relative horizon between the display and the acquisition system, the user can relatively easily translate hand motion to manipulation of objects in the display, which may not be the case where translation of the acquisition is accompanied by a relative rotation between the display and the acquisition system.

In the embodiments illustrated in FIGS. **3**A and **3**B, the isocenter assemblies can be a part of the display system or a separate, independent system. For example, the viewing platform **9** can be mounted on a separate arm from the cameras **18**. Thus, the display and the image acquisition of the surgical imaging system can be decoupled, similar to the embodiment illustrated in FIG. **1**. By decoupling the isocenter cameras **18** from the display ergonomic benefits are provided such as, for example, the surgeon does not need to be looking through binoculars for an extended period of time or at an uncomfortable position or angle. In various embodiments, a common relative horizon for both the display and the acquisition system may also be employed.

In some embodiments, the distance between the surgical site of interest and the imagers, e.g., the working distance, can be at least about 20 cm and/or less than or equal to about 450 cm, at least about 10 cm and/or less than or equal to about 50 cm, or at least about 5 cm and/or less than or equal to about 1 m, although values outside this range are possible.

The user can interact with the surgical imaging system **51** to select a working distance, which can be fixed throughout the procedure or which can be adjusted at any point in time. Changing the working distance can be accomplished using elements on a user interface, such as a graphical user interface, or using physical elements such as rotatable rings, knobs, pedals, levers, buttons, etc. In some embodiments, the working distance is selected by the system based at least

in part on the cables and/or tubing being used in the surgical visualization system. For example, the cables and/or tubing can include an RFID chip or an EEPROM or other memory storage that is configured to communicate information to the surgical imaging system **51** about the kind of procedure to be performed. For an ENT/Head/Neck procedure, the typical working distance can be set to about 40 cm. In some embodiments, the user's past preferences are remembered and used, at least in part, to select a working distance.

In some embodiments, gross focus adjustment can be accomplished manually by positioning the cameras **18** and arm **7**. The fine focus adjustment can be done using other physical elements, such as a fine focusing ring, or it can be accomplished electronically.

In some embodiments, the magnification of the surgical imaging system **51** can be selected by the user using physical or virtual user interface elements. The magnification can change and can range between about 1× and about 6×, between about 1× and about 4×, or between about 1× and about 2.5×. Embodiments may be able to change between any of these such as between 2.5× and 6× or between 2.5× and 6×. Values outside these ranges are also possible. For example, the system **51** can be configured to provide magnification and demagnification and image inversion, with a range from about −2× to about 10×, from about −2× to about 8×, from about −2× to about 4×, from about −0.5× to about 4×, or from about −0.5× to about 10×. The surgical imaging system **51** can be configured to decouple zoom features and focus adjustments, to overcome problems with traditional operating room microscopes. In some embodiments, the surgical visualization system **51** can be used to provide surgical microscope views. In some embodiments, the surgical imaging system **51** can decouple instrument myopia by providing an electronic display instead of a direct view of a scene. The electronic displays can be configured to be focused at varying levels of magnification allowing the user to view the displays without adjusting the oculars between magnification adjustments. Moreover, in various embodiments, the oculars can be configured to provide continuous views at infinity. In some embodiments, however, the principal user of the surgical imaging system may select an accommodation level for the oculars, rather than using a relaxed view provided by the electronic displays. The electronic displays, in various embodiments, however, can remain in focus and the ocular adjustments do not affect the focus of the various video acquisition systems. Thus, adjustments by the principal user do not affect the views of the other users of the system viewing, for example, other displays showing the video, as the cameras/acquisition systems can remain focused. In some embodiments, the surgical imaging system **51** can be focused at a relatively close working distance (e.g., a distance with a relatively narrow depth of field) such that the image remains focused when moving to larger working distances (e.g., distances with broader depth of field). Thus, the surgical imaging system **51** can be focused over an entire working range, reducing or eliminating the need to refocus the system after magnification or zoom adjustments are made.

FIGS. **4**A and **4**B illustrate an embodiment of the surgical imaging system **51** having an optical system **53** mounted under the viewing platform **9**. As illustrated, the optical components are shown as free-standing to show the structure of the components, but in practice the optical components **53** will be mounted within or on a structure attached to the viewing platform. In some embodiments, the optical system **53** and/or the cameras **18** (discussed above) can be modular and can be selected and swapped for use with the surgical imaging system **51**. Paragraph [0489] from each of U.S. Prov. App. No. 61/880,808, U.S. Prov. App. No. 61/920,451, U.S. Prov. App. No. 61/921,051, U.S. Prov. App. No. 61/921,389, U.S. Prov. App. No. 61/922,068, and U.S. Prov. App. No. 61/923,188 is incorporated by reference herein.

The optical system **53** is configured to provide stereo image data to the imaging system **51**. The optical system **53** includes a turning prism **54** to fold the optical path underneath the viewing platform **9** to decrease the physical extent (e.g., length) of the imaging system under the viewing platform **9**.

In some embodiments, the optical system **53** comprises a Greenough-style system wherein the optical paths for each eye have separate optical components. In some embodiments, the optical system **53** comprises a Galilean-style system wherein the optical paths for each eye pass through a common objective. The Greenough-style system may be preferable where imaging sensors are being used to capture and convey the image data as compared to the Galilean-style system. The Galilean system can introduce aberrations into the imagery by virtue of the rays for each eye's optical path passing through a periphery of the objective lens. This does not happen in the Greenough-style system as each optical path has its own optics. In addition, the Galilean system can be more expensive as the objective used can be relatively expensive based at least in part on the desired optical quality of the lens and its size.

The optical system **53** can include two right-angle prisms **54**, two zoom systems **55**, and two image sensors **56**. This folding is different from a traditional operating room microscope because the optical path leads to image sensors rather than to a direct-view optical system.

In some embodiments, the optical system **53** can have a relatively constant F-number. This can be accomplished, for example, by varying the focal length and/or aperture of the system based on working distance and/or magnification. In one embodiment, as the focal length changes, the eye paths can move laterally apart (or together), the prisms **54** can rotate to provide an appropriate convergence angle, and the apertures can change their diameters to maintain the ratio of the focal length to the diameter a relatively constant value. This can produce a relatively constant brightness at the image sensor **56**, which can result in a relatively constant brightness being displayed to the user. This can be advantageous in systems, such as the surgical visualization systems described herein, where multiple cameras are being used and changing an illumination to compensate for changes in focal length, magnification, working distance, and/or aperture can adversely affect imagery acquired with other cameras in the system. In some embodiments, the illumination can change to compensate for changes in the focal length and/or the aperture so as to provide a relatively constant brightness at the image sensors **56**.

The optical assembly **53** can include a zoom system **55** configured to provide a variable focal distance and/or zoom capabilities. A Galilean-style stereoscopic system generally includes a common objective for the two eye paths. When this optical system is imaged with image sensors **56**, it can create aberrations, wedge effects, etc. that can be difficult to compensate for. In some embodiments, the surgical imaging system **51** can include a Galilean-style optical system configured to re-center at least one of the stereo paths to a central location through the objective lens, which can be advantageous in some applications.

In some embodiments, the real-time visualization system utilizes a Greenough-style system. This can have separate optical components for each stereo path. The optical assem-

bly **53** can be configured to provide variable magnification and/or afocal zoom and can be configured to operate in a magnification range from about 1× to about 6×, or from about 1× to about 4×, or from about 1× to about 2.5×.

The distal-most portion of the Greenough assembly **53** can be similar in functionality to an objective lens of a typical, direct-view operating room microscope with the working distance set approximately to that of the focal length. The working distance, and in some implementations the focal length, can be between about 20 cm and about 40 cm, for example. In some embodiments the work distance may be adjustable from 15 cm to 40 cm or to 45 cm. Other values outside these ranges are also possible. In some embodiments, the surgical imaging system **51** includes an opto-mechanical focus element configured to vary the focal length of a part of the optical assembly **53** or the whole optical assembly **53**.

FIGS. **5A-5E** illustrate embodiments of optical assemblies **53** for use in a stereoscopic surgical imaging system, such as those described herein with reference to FIGS. **4A-4B**. FIG. **5A** illustrates a side view of an example optical assembly **53** configured to use a turning prism **54** to fold an optical path from a tissue **57** to a sensor **56** along a lens train **55** that is situated near or adjacent to a viewing platform **9**. This can advantageously provide a relatively long optical path in a relatively compact distance.

FIG. **5B** illustrates a front view of an embodiment of an optical assembly configured to change a convergence angle in a stereoscopic imaging system. The prisms **54** can be the turning prism **54** illustrated in FIG. **5A**. The prisms **54** can be configured to rotate to change a convergence angle, and as a result, a convergence point and/or a working distance. The working distance, which can be a distance from the prisms **54** to the target **57** (e.g., tissue), can be user-selectable or adjustable. In various embodiments, with increased working distance to the target **57**, the convergence angle can decrease. Conversely, when the working distance gets smaller, the convergence angle can increase (e.g., $\theta1>\theta2$). This can be advantageous where the lens path **55** is fixed and the working distance is adjustable. The stereo imagery can then be viewed on the display **59** by a user.

FIG. **5C** illustrates a front view of an embodiment of an optical assembly **53** that is configured to maintain a substantially constant convergence angle. The optical assembly **53** can include two prisms **54***a* and **54***b* for each optical path, wherein the prisms **54***a*, **54***b* can move and/or rotate. For example, when the working distance decreases the first set of prisms **54***a* can rotate towards one another to decrease an effective distance between the second set of prisms **54***b*. The second set of prisms **54***b* can, in turn, rotate to compensate for the changed angle so as to converge on the common target. The second set of prisms **54***b* can direct the light to the first set of prisms **54***a* which can then direct the light down the fixed lens paths **55** (e.g., fixed in their position relative to the viewfinder). By providing a relatively fixed convergence angle, a change in working distance may not require refocusing for the user. Maintaining a constant convergence angle, especially a comfortable angle, may reduce the strain on the user such as a surgeon performing a prolonged, arduous procedure.

FIG. **5D** illustrates a front view of an embodiment of an optical assembly **53** configured to provide a substantially narrow convergence angle to be able to view stereoscopic imagery through a narrow insertion tube **60** (e.g., a tube partially inserted into a body during a procedure). A similar assembly **53** can be used as described with reference to FIG. **5C**, and the convergence angle can be maintained substantially constant or at least sufficiently narrow to view through the insertion tube **60**.

FIG. **5E** illustrates a front view of an embodiment of an optical assembly **53** configured to provide a substantially constant convergence angle by moving the lens paths **55** laterally, e.g., toward or away from one another. The prisms **54** can be made to have a substantially constant orientation (e.g., no rotation for changing working distances) and compensation for changing working distance can be accomplished by translating the optical paths laterally to separate or join the optical paths. The translation of the optical paths can be accomplished using any suitable means including, for example, electro-mechanical actuators, slides, articulating arms, etc. This can simplify the optical assembly compared to the embodiments having two sets of prisms as only one set of prisms may be used when the lens paths are configured to move.

The embodiments of the optical assembly **53** which are configured to maintain a sufficiently narrow convergence angle can be advantageous as they allow stereo access to narrow surgical entries by allowing the angle to decrease and avoid clipping one of the stereo paths. For example, the left and right lens paths can move closer to one another and the prisms can adjust to the proper convergence angle for that distance. As another example, the left and right lens paths can remain fixed and there can be sets of prisms for each path configured to direct the light along the lens paths while maintaining a substantially constant convergence angle. In some embodiments, maintaining a constant convergence angle can be visually helpful to the user when zoom changes, e.g., because the changing depth cues do not confuse the user's eye and/or brain. In addition, constant convergence may induce less stress on the user.

Movement Control System

FIGS. **6A-C** illustrate embodiments of components of a movement control system **10100** that can be configured to allow an operator of the surgical visualization system **1**, such as a medical professional or assistant, to control the movement of one or more imagers **18**. Such imagers may comprise cameras that provide a surgical microscope view through the oculars **11** or eyepieces of the binocular display unit **9**. In various embodiments, the movement control system can enable the imagers **18** to be moved without changing the positioning of oculars **11**, and thus an operator can remain in an ergonomic position while changing the view provided by the imager **18**. The imager **18** can be on the binocular display unit **9** or located elsewhere such as on a separate platform or articulated arm. Additionally, unlike conventional articulated optical systems which are generally unwieldy, complex, and have the potential for introducing optical aberrations, use of the movement control system **10100** with the surgical visualization system **1** can result in a simplified system with greater optical clarity and range of movement. It should be appreciated by one of skill in the art that, while the description of the movement control system **10100** is described herein in the context of medical procedures, the movement control system **10100** can be used for other types of visualization and imaging systems. Movement of the imagers **18** can be performed prior to and/or during the activity, such as surgical procedures, dental procedures, and the like. Movement of the imagers **18** can advantageously allow a medical professional or other operator to alter the view through oculars **11**, for example, to provide different surgical microscope-like electronic visualizations which might be beneficial during the course of a medical procedure or for different surgical procedures.

In some embodiments, control of the movement of the imager **18** can be achieved using a single control member such as **10110**. This provides the advantage of allowing single-handed operation of the movement control system **10100** which can, for example, allow a medical professional to move one or more imagers **18** using only one hand while using a second hand for other tasks such as performing surgical techniques. It should be appreciated by one of skill in the art that, while the description of the movement control system **10100** is described herein in the context of medical procedures, the movement control system **10100** can be used for other types of visualization and imaging systems.

Operation

As illustrated in FIGS. **6**A-C, in some embodiments, the control member, such as a joystick, **10110** can be used to translate the imager **18**, adjust the pitch, yaw, and/or roll of the imager **18**, and/or adjust the working distance of the imager **18**. In some embodiments, the oculars **11** can remain immobile when translating the imager **18**, adjusting the pitch, yaw, and/or roll of the imager **18**, and/or adjusting the working distance of the imager **18**. The ability for a single control member **10110** to control translation, adjustments to pitch and/or yaw, and/or adjustments to the working distance can beneficially simplify operation of the device as an operator need not release the control member **10110** to control multiple aspects of its operation. For example, an operator can translate the imager **18** and subsequently adjust the pitch and/or yaw without having to release the control member **10110** thereby increasing ease-of-use of the system and enhancing efficiency when using this system.

As shown in FIG. **6**C, one or more control members of the movement control system **10100**, such as control member **10110**, and/or one or more imager arms (see FIG. **7**) can be attached to a component of the movement control system **10100** using various types of joints and/or can be remote from the movement control system **10100** such as a remote joystick or toggle. In some embodiments, the control member **10110** can include a joint for attachment to the movement control system **10100**. For example, as shown in the illustrated embodiment, control member **10110** can include joint **10111**. In some embodiments, one or more of the joints can include components for detecting movement of the control member and/or an imager arm. For example, one or more of the joints can include one or more sensors for detecting rotation and/or translation of the control member and/or the imager arm about the joint. The signals from these sensors can be used to control other components of the movement control system, such as one or more electromechanical components.

For purposes of this disclosure, rotation about joints, such as joint **10111**, around the x-axis is hereinafter termed "pitch" or "tilt" and rotation about joints, such as joint **10111**, around the y-axis is hereinafter termed "yaw" or "pan."

As shown in the illustrated embodiment, the joint **10111** can be spherical joints received in a socket formed in the member **10220** thereby forming a ball-and-socket attachment. As should be apparent to one of ordinary skill in the art, other types of mounting mechanisms may be used for attaching control member **10110** as well as an imager arm to components of the movement control system **10100**. For example, joints such as gimbals can be used which limit the rotational degrees of freedom about the gimbal. Other types of joint can be used depending on the types of movement the movement control system is designed to allow. For example, if only pitch is needed without yaw, one can use a joint having a single rotational degree of freedom. In some embodiments, the control member **10110** can be positioned remotely from the movement control system **10100**.

General Embodiment

With continued reference to FIGS. **6**A and **6**B, in some embodiments, the movement control system **10100** can be attached to an attachment structure, such as binocular display unit **9**, and support one or more imagers **18**. As shown in the illustrated embodiment, the movement control system **10100** can be oriented generally underneath the binocular display unit **9** and in some embodiments can be sized such that the movement control system **10100** does not extend significantly beyond the outer housing of the binocular display unit **9**. This can advantageously provide a smaller form factor thereby reducing the likelihood that the movement control system **10100** will interfere with the medical professionals and assistants during a medical procedure. In other embodiments, the attachment structure can be other components of the surgical visualization system **1** such as, but not limited to, a dedicated articulating arm or a display arm. In some embodiments, the movement control system **10100** can extend significantly beyond the outer housing of the binocular display unit **9** or any other platform to which it is attached. This can be advantageous in situations where a greater degree of movement of the imagers **18** is desired or in embodiments where the control member **10110** is located above the attachment point between the movement control system **10100** and binocular display unit **9**.

With continued reference to FIGS. **6**A and **6**B, as discussed in part above, the movement control system **10100** can be configured to allow translation of one or more attached imagers **18** along a plane relative to the binocular display unit **9**. In some embodiments, the binocular display unit **9** can be immobile while the one or more imagers **18** are translated. For example, when attached to the binocular display unit **9** with the movement control mechanism **10100** parallel to an operating table **10101**, the one or more imagers **18** can be translated along a plane parallel to the operating table **10101**. As shown in the illustrated embodiment, the movement control system **10100** can be translated along both the x-axis and the y-axis (which projects perpendicularly through the sheet). This can advantageously allow the medical professional to position the view of oculars **11** for comfortable viewing by the surgeon thereby reducing physical strain on the surgeon during long procedures.

In some embodiments, defining an imager **18** centered on the movement control system **10100** (as shown in FIG. **6**A) as having an x-axis, y-axis, and z-axis coordinate of zero, the movement control system **10100** can have a range of translation relative to the binocular display unit **9**, of approximately ±500 mm along the x-axis and y-axis at full extension, approximately ±400 mm along the x-axis and y-axis at full extension, approximately ±300 mm along the x-axis and y-axis at full extension, approximately ±200 mm along the x-axis and y-axis at full extension, or approximately ±100 mm along the x-axis and y-axis at full extension. In some embodiments, full extension along one axis can be greater than full extension along the other axis. For example, in some embodiments, full extension along the x-axis may be approximately ±175 mm whereas the y-axis extension can be three-quarters full extension of the x-axis, one-half full extension of the x-axis, one-quarter full extension of the x-axis, or any other ratio between unity and zero. In some embodiments, the range of translation relative to the binocular display unit **9** along the y-axis can be approximately ±87.5 mm. This can be advantageous in cases where allow-

ing the y-axis to have a full range of motion may interfere with the medical professional and/or assistants.

These ratios can be reversed such that the range of translation of the x-axis can be three-quarters full extension of the y-axis, one-half full extension of the y-axis, one-quarter full extension of the y-axis, or any ratio between unity and zero. Additionally, in some embodiments, the imager **18** can translate further in the "positive" direction than the "negative" direction. For example, along the x-axis, the imager **18** may move from −100 mm to 500 mm. Ranges of motion outside these ranges are also possible. As should be apparent to one of ordinary skill in the art, the maximum translation relative to the binocular display unit **9** along the x-axis and y-axis can be chosen to provide a balance between greater maneuverability, the yaw and/or pitch angles, working distances, size constraints, and other such factors.

As described in part above and as will be discussed in greater detail below, in some embodiments, translation of the imagers **18** can be performed by translating one or more control members, such as control member **10110**, in the desired direction. In some embodiments, the control member **10110** can be electrically coupled to the movement control system **10100** to provide translation via an electromechanical system utilizing stepper motors, linear motors, or the like. For example, a joint of the control member **10110** can include components for detecting translation of the control member **10110**. The signals from these sensors can be used to control other components of the movement control system, such as one or more electromechanical components such as stepper motors, linear motors, or the like to translate the imager **18**. The electromechanical components can be coupled to a moveable platform to which the imager **18** can be attached. In some embodiments, the control member **10110** can be physically connected to the movement control system **10100** without any electromechanical assistance.

As should be appreciated by one of ordinary skill in the art, the movement control system **10100** need not translate solely along a plane parallel to the operating table **10101** or the x-y plane as set forth in the illustrated embodiment. In some embodiments, the plane of translation can be defined by the orientation of the mount to which the movement control system **10100** is connected. In some embodiments, the movement control system **10100** can be configured for non-planar translation and/or translation along more than one plane. In some embodiments, for example, a tip and tilt stage provides angular motion. A rotary stage can also be used to provide rotary motion.

With continued reference to FIGS. **6A** and **6B**, as described in part above, the movement control system **10100** can be configured to allow rotation of the one or more attached imagers **18** about a joint which can be attached to components of the movement control system **10100** and/or remotely from the movement control system **10100**. In some embodiments, the movement control system **10100** can be designed to allow the control member, such as control member **10110**, as well as the imager **18** and/or imager arm to "pitch" or "tilt" and "yaw" or "pan" relative to the binocular display unit **9**. In some embodiments, the binocular display unit **9** can be immobile while the "tilt" and "yaw" or "pan" of the one or more imagers **18** are adjusted. Pitch or yaw can allow the imager **18** to have a line of sight that is centered (e.g., focused) on the surgical site after the imager **18** is translated. This can advantageously allow the medical professional or assistant to adjust the viewing angle during a medical procedure. This can be beneficial in circumstances where a medical professional is unable to adequately view an object due to another element obstructing the view. Under such circumstances, a medical professional can translate the imager **18** and adjust the viewing angle of the imager **18** such that the same general area is viewed from a different angle.

In some embodiments, defining an imager **18** in a perpendicular orientation to the movement control system **10100** (as shown in FIG. **6A**) as having an a pitch and yaw of zero (i.e., as shown in FIG. **6A**), the movement control system **10100** can allow both pitch and yaw adjustments relative to the binocular display unit **9** within the range of approximately ±60 degrees each, by approximately ±50 degrees each, by approximately ±40 degrees each, by approximately ±30 degrees each, by approximately ±20 degrees each, or approximately ±10 degrees each. In some embodiments, the pitch and yaw can have different adjustment ranges. For example, in some embodiments, the yaw can have an adjustment range of approximately ±40 degrees whereas the pitch can have an adjustment range of approximately three-quarters that of the yaw, one-half that of the yaw, one-quarter that of the yaw, or any other ratio between unity and zero. In some embodiments, the pitch can have an adjustment range of approximately ±20 degrees.

The adjustment range of yaw and pitch can correspond to the distance at full extension along both the x-axis and the y-axis. For example, in some embodiments, the pitch and yaw can be chosen such that the imager **18** can remain centered on the surgical site when the movement control system **10100** is fully extended in any direction. In some embodiments, the working distance between the imager **18** and the surgical site can be approximately 200 mm, with a range of translation along the x-axis of approximately ±175 mm, and a range of translation along the y-axis of approximately ±87.5 mm. In order to remain centered on the surgical site, the pitch adjustment range can be ±20 degrees and the yaw adjustment range can be ±40 degrees. As such, because the full extension need not be the same in both directions, the pitch and yaw adjustment ranges can also be different to match the differences in extension. In other embodiments, such as those in which the working distance can be adjusted, the pitch and yaw adjustment range can be chosen such that the imager **18** can remain centered on the surgical site when the movement control system **10100** is fully extended in any direction at at least one working distance. For example, in embodiments where the working distance can be adjusted between approximately 200 mm and 400 mm, the pitch and yaw adjustment range can be approximately ±20 degrees and approximately ±10 degrees respectively to allow centering at a working distance of 400 mm.

Additionally, in some embodiments, the imager **18** can adjust further in a "positive" angle than a "negative" angle. For example, the yaw may range from −5 degrees to 15 degrees.

As described in part above and as will be discussed in greater detail below, in some embodiments, increasing or decreasing the pitch and/or yaw of the imagers **18** relative to the binocular display unit **9** can be achieved by increasing or decreasing the pitch and/or yaw of the one or more control members, such as control member **10110**. In some embodiments, the control member **10110** can be electrically coupled to the movement control system **10100** to provide pitch and yaw via an electromechanical system utilizing stepper motors, linear motors, or the like. For example, a joint of the control member **10110** can include components for detecting pitch and/or yaw of the control member **10110**. In some embodiments, the joint of the control member **10110** can be

gimbals which can detect pitch and/or yaw of the control member **10110**. The signals from these sensors can be used to control other components of the movement control system, such as one or more electromechanical components such as stepper motors, linear motors, or the like to adjust the pitch and/or yaw of the imager **18**. As should be appreciated by one of ordinary skill in the art, in some embodiments, the movement control system **10100** can be configured to allow rotation along other axes such as the z-axis. In some embodiments, the control member **10110** can be physically connected to the movement control system **10100** without any electromechanical assistance.

Additionally, in some embodiments, the movement control system **10100** can be configured to adjust the working distance between the imagers **18** and the surgical site. In some embodiments, the binocular display unit **9** can remain immobile while the working distance of the imagers **18** are adjusted. In some embodiments, the working distance can range from between approximately 1 m to approximately 10 mm, from between approximately 800 mm to approximately 50 mm, from between approximately 600 mm to approximately 100 mm, or from between approximately 400 mm to approximately 200 mm. In some embodiments, the control member **10110** can be electrically coupled to the movement control system **10100** to provide working distance adjustment via an electromechanical system utilizing stepper motors, linear motors, or the like. For example, a joint of the control member **10110** can include components for detecting rotation of the control member **10110** about the longitudinal axis. The signals from these sensors can be used to control other components of the movement control system, such as one or more electromechanical components such as stepper motors, linear motors, or the like to adjust the pitch and/or yaw of the imager **18**. In some embodiments, the control member **10110** can be physically connected to the movement control system **10100** without any electromechanical assistance.

In some embodiments, the movement control system **10100** can include a translation system for translating an imager **18** and/or an imager arm, a pitch-yaw adjustment system for adjusting the pitch and/or yaw of the imager **18** and/or an imager arm, a control member, such as control member **10110**, and one or more imager arms to which the imager **18** can be attached. In some embodiments, a working distance adjustment system can be included which can allow adjustments in working distance of the imager **18** and/or an imager arm. It should be appreciated by one of ordinary skill in the art that the translation system, the pitch-yaw adjustment system, and/or the working distance adjustment system can be used separately or in any combination.

Operation of the translation, pitch-yaw adjustment, and/or working distance adjustment systems can be performed using a control member, such as control member **10110**. In some embodiments, control member **10110** can be operatively coupled to the translation, pitch-yaw adjustment, and/or working distance adjustment systems. For example, as described above, in some embodiments, the control member can be coupled to an electromechanical system for controlling the translation, pitch-yaw adjustment, and/or working distance adjustment systems. The control member can be directly attached to a component of the movement control system **10100** or can be remotely positioned (e.g., a toggle or joystick on a separate module). In some embodiments, the control member can be coupled directly to the translation, pitch-yaw adjustment, and/or working distance adjustment systems such that no electromechanical devices are used. In some embodiments, the operator can be given the option of controlling the translation, pitch-yaw adjustment, and/or working distance adjustment systems with or without electromechanical devices. For example, the operator can control the translation, pitch-yaw adjustment, and/or working distance adjustment systems without electromechanical devices for certain portions of a procedure and use such electromechanical devices for controlling the translation, pitch-yaw adjustment, and/or working distance adjustment systems during other portions of a procedure. As another example, in some embodiments coarse control of the movement control system **10100** can be achieved without use of electromechanical devices whereas fine control of the movement control system **10100** can be achieve with use of electromechanical devices, vice-versa, or a combination of the two.

In some embodiments, the movement control system **10100** can include a control system which controls functions of the electromechanical devices. In some embodiments, the electromechanical components can be programmed such that the electromechanical components can orient the translation, pitch-yaw adjustment, and/or working distance adjustment systems in certain positions based on the operator's input. For example, the electromechanical components can be programmed such that it goes to reverts back to a pre-set or previous position upon receiving a command from the operator. As another example, the electromechanical components can be programmed such that an operator can specify a desired position for the imager **18** and the control system can control the electromechanical devices coupled to the translation, pitch-yaw adjustment, and/or working distance adjustment systems orient the imager **18** in the desired position.

With reference to FIG. **7**, in some embodiments, the imager arm **10120** and the imager **18** can be attached such that the imager **18** can be directed towards the side of the head of a patient. For example, in some embodiments, the imager **18** can be attached to the imager arm **10120** using a yoke **10125** which can be designed to allow for coarse and/or fine control of pitch, yaw, and/or roll of the imager **18**. In some embodiments, the yoke **10125** can have one or more pivots which can be configured to allow the imager **18** to have a viewing angle parallel to the operating room floor such that an operator can view the side of the head. In some embodiments, the yoke **10125** can be configured to allow the imager **18** to rotate such that the imager can be directed to a portion of the back of the head.

In some embodiments, the imager **18** can be positioned on a movement control system **10130** providing at least two rotational degrees of freedom and/or at least one translational degree of freedom. In some embodiments, movement control system **10130** can provide two rotational degrees of freedom and at least two translation degrees of freedom. For example, as shown in FIG. **8**, the movement control system **10130** can allow for rotation along axis **10135** of the movement control system **10130** and/or along axis **10140** (which can be parallel with the z-axis). Moreover, as shown in the illustrated embodiment, the movement control system can allow translation along both the x-axis and y-axis. In some embodiments, apparatus **10130** can provide at least one translational degree of freedom.

As shown in the illustrated embodiment, the movement control system **10130** can include a one or more control members, such as control member **10145**. Control member **10145** can be positioned such that the longitudinal axis of the control member **10145** is parallel with and/or collinear with axis **10135**. This can advantageously allow the imager **18** to be rotated about axis **10135** by rotating the control

member **10145**. In some embodiments, the control member **10145** can be mechanically coupled to the imager **18**. In some embodiments, the control member **10145** can be coupled to the imager **18** via an electromechanical system. For example, the control member **10145** can include sensors for detecting rotation of the control member **10145** and use data received from the sensors to rotate the imager **18** via electromechanical components such as stepper motors, linear motors, or the like.

As shown in the illustrated embodiment, the movement control system **10130** can include a first plate element **10150** and a second plate element **10155** which can be rotatable coupled. The second plate element **10155** can include first and second supports **10160**, **10165** to which the imager **18** can be attached. In some embodiments, the first and second plate elements **10150**, **10155** can be rotatable coupled such that the axis of rotation of the two plate elements **10150**, **10155** is parallel and/or collinear with axis **10140**.

In some embodiments, the control member **10145** can include one or more switches and/or actuators **10170** for controlling movement of the device. For example, the actuator **10170** can be coupled to mechanisms which can unlock the apparatus **10130** such that the movement control system **10130** can be manipulated to rotate and/or translate the imager **18**. In some embodiments, the switches and/or actuators can be coupled to an electromechanical system to rotate and/or translate the movement control system **10130**.

Optical Systems for Displays

FIGS. 9A-9D illustrate example display optical systems **11005** configured to provide a view of displays **11010** through oculars (not shown) that receive light from the last lens **11015** in the display optical system **11005**. The display optical system **11005** forms an exit pupil at or near the entrance pupil of the surgeon binoculars. These pupils are closely matched, for example, in size and shape. In some embodiments, the exit pupil of the display optical system **11005** can be the same size or smaller than the entrance pupil of oculars used to view the display. The oculars form an exit pupil that is matched (e.g., in size and shape) to the entrance pupil of the surgeon's eye(s). In some embodiments, the display optical system **11005** is configured to produce a beam that has a relatively constant cross-section between the first lens element **11012** and the last lens element **11015**, where the cross-section is relatively small. Advantageously, this allows the display optical system **11005** to be included in a relatively small or compact package and use relatively small optical elements. In some embodiments, the last lens **11015** collimates the beam leaving the display optical system **11005**. The termination of the rays shown in FIG. 11A to the left of lens **11015** is the exit pupil of the display optical system **11005**. In some embodiments, the exit pupil of the display optical system **11005** is configured to be the same size or smaller than, and positioned at the same location, as an entrance pupil of a binocular viewing assembly configured to allow a user to view the display **11010**.

The lenses in the display optical system **11005** form a highly color-corrected view of the display by forming the exit pupil in a position favorably disposed for the user and the binoculars. A combination of singlets and bonded lenses provide such correction. The display optical system **11005** may be designed to provide such correction while keeping a small beam column or ray bundle, which permits adding mirrors and obtaining a compact package. In various embodiments, producing an undistorted image can be difficult without such a group of lenses designed properly to provide such correction. This correction includes both color correction as well as distortion correction.

The display optical system **11005** advantageously allows a relatively small, compact lens assembly to provide a view of a relatively large display **11010**. The display optical system **11005** can be configured to work with displays **11010** of varying sizes, including, without limitation, displays with a diagonal that is less than or equal to about 0.86 in. (22 mm), at least about 0.86 in. (22 mm) and/or less than or equal to about 10 in., at least about 1 in. and/or less than or equal to about 9 in., at least about 2 in. and/or less than or equal to about 8 in., or at least about 4 in. and/or less than or equal to about 6 in. The display may, for example, have a diagonal of about 5 inches or about 8 inches in some embodiments. The total optical path length of the display optical system **11005** can be less than or equal to about 9 in., at least about 9 in. and/or less than or equal to about 20 in., at least about 10 in. and/or less than or equal to about 19 in., at least about 14 in. and/or less than or equal to about 18 in. The display optical system **11005** can include lenses, mirrors, prisms, and other optical elements configured to direct and manipulate light along an optical path. The display optical system **11005** can be used in conjunction with a primary display, a surgeon display, an assistant display, possibly other displays, or any combination of these.

The example display optical system **11005** illustrated in FIG. 9A has a total optical path length of about 16.2 in. (412 mm). It is configured to provide an image of a 5 in. display **11010**. The display optical system **11005** can include a lens **11012** configured to direct the light from the display **11010** along a path wherein light from the display **11010** is directed along a path with a relatively narrow cross-section. In various embodiments, the light received from the display is initially substantially reduced in beam size for example by the lens **11012** or lenses closest to the display and a more narrow beam is produced. In certain embodiments, for example, the lens **11012** or lenses closest to the display collect light at an angle (half angle) in excess of 20°, 25°, 30° and reduce the beam size of the light. This design is advantageous because it allows for the elements in the display optical system **11005** to be relatively small and compact. In some embodiments, the cross-section of the optical beam after the lens **11012** in the display optical system **11005** can be configured to be relatively constant. This configuration allows folding or redirecting mirrors present in the optical path to remain small.

FIG. 9B illustrates a binocular display optical system **11005** configured to provide a view of stereo displays **11010***a*, **11010***b* through a pair of oculars. The binocular display optical system **11005** can be based on the optical design illustrated in FIG. 9A, and can include one or more elements **11014** in the optical path before the lens **11012** to reduce the physical size of the optical system while maintaining the length of the optical path. These elements can include mirrors, prisms, and/or other optical elements configured to redirect the light from the displays **11010***a*, **11010***b* to the lens **11012**. In some embodiments, the elements **11014** include curved mirrors which redirect the optical path and converge the rays from the displays **11010***a*, **11010***b*. In some embodiments, the elements **11014** include mirrors or prisms (for example that may have planar reflecting surface) that do not substantially affect the convergence of the light rays, but redirect the optical path. In some embodiments, because of the shape of the beam incident on the reflective surface, for example, mirror, the reflective surface or cross-section of the mirror is non-circular, and is, for example, elliptical. Accordingly, in various embodiments the cross-section of the mirror or other reflective surface is possibly being longer in one direction than in another, for

example, orthogonal direction. These elements may fold the optical path to provide for a more compact system. Such a system may therefore have an optical path length from display to ocular that is longer than the length and/or width of the viewing platform of the combination thereof.

In some embodiments, the display optical system **11005** can include at least four mirrors, or less than or equal to four mirrors. In certain implementations, two mirrors can be used to fold the optical path from the display **11010** to the exit pupil, the two mirrors positioned between the first lens **11012** and the display **11010**. In some embodiments, the display optical system **11005** includes at least four lenses or less than or equal to four lenses.

The example display optical system **11005** illustrated in FIG. **9**C has a total optical path length of about 18.7 in. (475 mm). It is configured to provide an image of an 8 in. display **11010**. The display optical system **11005** can include a lens **11012** configured to direct the light from the display **11010** along a path wherein light from the display **11010** is directed along a path with a relatively narrow cross-section, allowing for the display optical system **11005** to be relatively small and compact. In some embodiments, the cross-section of the optical beam after the lens **11012** in the display optical system **11005** (e.g., to the exit pupil prior to the entrance to a binocular viewing assembly) can be configured to be relatively constant. This configuration allows folding or redirecting mirrors present in the optical path to remain small. The display optical system **11005** can be configured to be used in conjunction with a display **11010** with a relatively high resolution.

The example display optical system **11005** illustrated in FIG. **9**D has a total optical path length of about 9.3 in. (237 mm). It is configured to provide an image of a smaller display, in this case a 0.9 in. (22 mm) display **11010**. Because the display is much smaller than the display in the embodiments described in connection with FIGS. **9**A-**9**C, the optical path can be much shorter and may fit into a smaller space. The display optical system **11005** can include a lens **11012** configured to direct the light from the display **11010** along a path wherein light from the display **11010** is directed along a path with a relatively narrow cross-section, allowing for the display optical system **11005** to be relatively small and compact. In some embodiments, the cross-section of the optical path after the lens **11012** in the display optical system **11005** can be configured to be relatively constant. This configuration allows folding or redirecting mirrors present in the optical path to remain small. Based at least in part on the relatively short optical path length, the display optical system **11005** can be configured to be used in conjunction with a secondary display or an assistant display.

FIGS. **10**A-**10**G illustrate example display optical systems **11300** configured to provide a view of a display **11310**, the display optical system **11300** having an exit pupil **11305** wherein light paths that would intersect a viewing assembly housing **11315** are reduced or eliminated through baffles or apertures **11320**, where a baffle includes a panel with an aperture. FIG. **10**A illustrates an example embodiment of a display optical system **11300** comprising a display **11310**, with other optical components configured to direct the light from the display **11310** to the exit pupil **11305**. The light paths are traced with black lines to show the periphery of the bundle of light paths from the display **11310** to the exit pupil **11305**. FIG. **10**B shows this same display optical system **11300** as situated in an example viewing assembly housing **11315**. When the display optical system **11300** is configured in this way, portions of the light **11320** from the display **11310** are outside of the housing **11315**, which leads to light being reflected and/or scattered off the sidewalls of the housing along the path to the exit pupil **11305**. This can lead to undesirable results, such as degradation in the quality of the image of the display **11310** viewed with an ocular, for example, by reducing contrast. The display optical systems **11300** can be configured to provide a collimated beam at the exit pupil **11305** such that a binocular viewing assembly comprising an objective and oculars can mate to the viewing assembly housing **11315** and view the display **11310**.

In some embodiments, one or more baffles or apertures **11325** can be incorporated into the display optical system **11300** to reduce or eliminate the amount of light that intersects with the housing **11315**. The apertures may be disposed to reduce the view of the sidewalls by the ocular, thereby reducing the light collected that is reflected off the sidewalls. FIG. **10**C illustrates an example embodiment of the display optical system **11300** without any apertures. The display optical system includes mirrors M1, M2, M3, and M4 to redirect the light path within the viewing assembly. The mirrors M1, M2, M3, and M4 fold the optical path such that the display optical system **11300** can be contained in a more compact housing having a smaller footprint. Additionally in various embodiments, the mirrors M1, M2, M3, and M4 fold the optical path wraps around a supporting column configured to support the housing on an arm. In various embodiments the column is a conduit for electrical signals, power, and illumination fibers. Electronics boards, for example, with FPGAs, etc., can be disposed on the top of the display. Such a configuration may be useful because signal integrity (e.g. of MIPI2 signal) can be preserved with short cable routing. An opening **11307** for the support column about which the optical path is wrapped is visible in FIG. **10**B. The display optical system includes lenses in lens tube L1 to shape (e.g., collimate) the light path along the path from the display **11310** to the exit pupil **11305**. The lens tube L1 can be used to maintain a relatively narrow optical passageway that contains substantially all of the light travelling from the display **11310** to the exit pupil **11305**. FIG. **10**D illustrates the example embodiment of the display optical system **11300** from FIG. **10**C with an aperture **11325** added between the mirror M4 and the display **11310**. FIG. **10**E illustrates the example embodiment of the display optical system **11300** from FIG. **10**C with an aperture **11325** added between the minor M3 and the final mirror M4. FIG. **10**F illustrates the example embodiment of the display optical system **11300** from FIG. **10**C with an aperture **11325** added between the lens tube L1 and the mirror M3.

FIG. **10**G illustrates the example embodiment of the display optical system **11300** from FIG. **10**C, with apertures **11325** added at all the locations illustrated in FIGS. **10**D to **10**F, between the lens tube L1 and the minor M3, between the minor M3 and the minor M4, and between the minor M4 and the display **11310**. Simulations of the performance of this configuration have shown that the radiant intensity of unwanted light, e.g., light that arrives after being reflected or scattered from the inner housing of the housing **11315**, have been reduced by about 3.6× while the radiant intensity at the exit pupil **11305** from the display **11310** has been substantially held constant which substantially means that there is less than a 10% change in the radiant intensity.

In some embodiments, the display optical system **11300** can include at least four baffles or less than or equal to four baffles. In certain implementations, four baffles can be included in the optical path between the first lens and the display **11310**. In some implementations, two minors can be included in the optical path between the first lens and the display **11310**. In some embodiments, the optical path can

include, in order from the display **11310**, a first baffle, a first mirror, a second baffle, a second mirror, and a third baffle prior to the first lens.

In some embodiments, the display can be a curved surface, for example either a projection display or recent generation of flexible LCD or OLED displays having high-resolution (e.g., in excess of 300 ppi). A curved display may provide two advantages: the imaging optics for the display can be less complex than for flat panels, and the cone or numerical aperture of each picture element in the display can be directed towards the viewing optics and in the periphery of the display, thereby providing a brighter image less subject to vignetting.

In some embodiments, the display can be a volumetric display comprising two or more transmissive display panels having a single backlight wherein the transmissive display panels are stacked to provide different planes of focus for a surgeon. The transmissive displays can be active matrix liquid crystal displays ("AMLCD") or other types of transmissive displays. The backlight can be a fluorescent lamp, LEDs, or other suitable light source. By having displays positioned in different focal planes, image data from different focal planes may be presented to the surgeon with relatively less image processing and/or compression compared to a system which combines data from multiple focal planes into a single image. In some embodiments, a number of cameras can be positioned at varying depths or having varying focal distances such that the displays at different focal planes are configured to display image data from cameras positioned or focused at different depths to create a display that assists the surgeon in identifying positions of features within displayed images.

The display can show, as an overlay, pre-operative CT, MR, or other 3D image datasets from, for example, conventional surgical navigation systems (e.g., the Medtronic StealthStation or Treon, Stryker Surgical Navigation System, or Brainlab, among others). In various embodiments, in addition to images, the display can additionally provide numerical data and/or text. For example, in various embodiments, the display can overlay information such as distance or tool measurements, transparent tool renderings, camera identification information (e.g., the portion of the composite image attributable to a specific optical sensor may generate an identifying border around that portion), up/down orientation, elapsed time, and/or one or more still images captured from one or more optical sensors from a previous time in the operation. The tracking system can provide 5-DOF (degrees of freedom) or 6-DOF position and orientation information to conventional surgical navigation systems. Other information, graphic, alpha numeric, or otherwise, can be provided.

The tool image can be magnified with respect to the wide-field view image, and change in image scaling will occur as the tool is moved in and out. In some embodiments, a visual metaphor for embodiments of the display is that of a hand-held magnifying glass for inspecting and doing work on a smaller region of a larger workpiece, while seeing the larger workpiece with lower magnification (if any) in more peripheral regions of the visual field to provide situational awareness. Tool images, for example, can be superimposed on the background image thereby blocking that portion of the background image. In various embodiments, the tool images may be stereo.

In some embodiments fluorescence information can be displayed. Cameras that image in different wavelengths, such as infrared, could image the surgical site or objects contained therein. In some embodiments, features could be made to fluoresce, for example, by injecting fluorescent chemical and illuminating the area with light the will induce fluorescence. Such a technique may be useful to identify and/or highlight the location and/or boundaries of specific features of interest such as tumors, etc. The fluorescence or other wavelength of interest may be detected by the one or more cameras imaging the surgical field such as one or more camera providing a surgical microscope view. In some embodiments, images produced by fluorescence or other wavelengths of interest are superimposed on one or more images from other camera(s). Filtering could be provided to remove unwanted wavelengths and possibly increase contrast. The filter can remove excitation illumination. In some embodiments emission image content, (e.g., fluorescing tissue) can be parsed and superimposed on image content that is not emitting (e.g., tissue that is not fluorescing), or vice versa. In various embodiments, such as where the fluorescing wavelength is not visible (e.g., for fluorescence in the infrared), an artificial color rendition of the fluorescing content can be used in place of the actual fluorescing color so as to enable the fluorescing tissue to be visible.

Various modifications to the implementations described in this disclosure may be readily apparent to those skilled in the art, and the generic principles defined herein may be applied to other implementations without departing from the spirit or scope of this disclosure. Thus, the claims are not intended to be limited to the implementations shown herein, but are to be accorded the widest scope consistent with this disclosure, the principles and the novel features disclosed herein.

Certain features that are described in this specification in the context of separate embodiments also can be implemented in combination in a single embodiment. Conversely, various features that are described in the context of a single embodiment also can be implemented in multiple embodiments separately or in any suitable sub-combination. Moreover, although features may be described above as acting in certain combinations and even initially claimed as such, one or more features from a claimed combination can in some cases be excised from the combination, and the claimed combination may be directed to a sub-combination or variation of a sub-combination.

What is claimed is:

1. A medical apparatus comprising:

a camera having a field of view that can be configured to include a surgical site, wherein the camera is configured to provide a surgical microscope view of the surgical site;

a binocular viewing assembly comprising a housing and a plurality of oculars, the plurality of oculars configured to provide views of at least one display disposed in the housing;

an image processing system configured to receive images acquired by the camera and present the output video images on the at least one display; and

a movement control system configured to move the camera relative to the binocular viewing assembly, wherein the movement control system comprises a control system configured to control at least one electromechanical device operatively coupled to the movement control system, the at least one electromechanical device configured to orient at least one of a translation, pitch-yaw adjustment, and/or working distance adjustment system based on operator input, the at least one electromechanical device configured to orient the camera to a position specified by an operator, wherein the movement control system comprises a control member that is operatively coupled to the movement control system

via a gimbal having one or more sensors configured to detect movement of the control member, the one or more sensors in communication with one or more components of the movement control system.

2. The medical apparatus of claim 1, wherein the movement control system comprises a translation system comprising a moveable platform to which the camera is attached, the moveable platform being positioned between the binocular viewing assembly and the camera and being moveable relative to the binocular viewing assembly along at least a first axis and a second axis.

3. The medical apparatus of claim 2, wherein the translation system further comprises the at least one electromechanical device, the at least one electromechanical device operatively coupled to the moveable platform.

4. The medical apparatus of claim 1, wherein the movement control system comprises a pitch-yaw adjustment system comprising the at least one electromechanical device to which the camera is attached, the pitch-yaw adjustment system configured to rotate the camera relative to the binocular viewing assembly around an axis parallel to a first axis and rotate the camera around an axis parallel to a second axis.

5. The medical apparatus of claim 1, wherein the movement control system is attached to the binocular viewing assembly.

6. The medical apparatus of claim 1, wherein coarse control of the movement control system can be achieved without use of the at least one electromechanical device, whereas fine control of the movement control system can be achieved with use of the at least one electromechanical device.

7. The medical apparatus of claim 1, wherein the at least one electromechanical device is programmed to revert the camera back to a pre-set or previous position upon receiving a command from the operator.

* * * * *

US010722102B2

(12) **United States Patent**
Hygelund et al.

(10) **Patent No.: US 10,722,102 B2**
(45) **Date of Patent: Jul. 28, 2020**

(54) **ENDOSCOPE FIELD STOP ENCODING SYSTEM AND METHOD**

(71) Applicant: **ARTHREX, INC.**, Naples, FL (US)

(72) Inventors: **John Hygelund**, Santa Barbara, CA (US); **David D'Alfonso**, Gaviola, CA (US); **Bruce Laurence Kennedy**, Santa Barbara, CA (US)

(73) Assignee: **ARTHREX, INC.**, Naples, FL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 375 days.

(21) Appl. No.: **15/695,997**

(22) Filed: **Sep. 5, 2017**

(65) **Prior Publication Data**

US 2019/0069760 A1 Mar. 7, 2019

(51) **Int. Cl.**
A61B 1/00 (2006.01)
A61B 1/04 (2006.01)

(52) **U.S. Cl.**
CPC ***A61B 1/00059*** (2013.01); ***A61B 1/00006*** (2013.01); ***A61B 1/00009*** (2013.01); ***A61B 1/00039*** (2013.01); ***A61B 1/00045*** (2013.01); ***A61B 1/00055*** (2013.01); ***A61B 1/00105*** (2013.01); ***A61B 1/042*** (2013.01); ***A61B 1/0002*** (2013.01); ***A61B 1/00057*** (2013.01); ***A61B 1/00062*** (2013.01); ***A61B 2560/0475*** (2013.01); ***A61B 2562/08*** (2013.01)

(58) **Field of Classification Search**
CPC A61B 90/94; A61B 90/96; A61B 1/00062
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,233,416	A	8/1993	Inoue	
5,392,067	A *	2/1995	Konno	H04N 5/357 348/65
5,896,166	A	4/1999	D'Alfonso et al.	
6,092,722	A	7/2000	Heinrichs et al.	
6,293,911	B1 *	9/2001	Imaizumi	A61B 1/00009 600/160
6,638,212	B1	10/2003	Oshima	
6,712,756	B1	3/2004	Kura et al.	
6,770,027	B2	8/2004	Banik et al.	

(Continued)

FOREIGN PATENT DOCUMENTS

JP	S56158632	12/1981
JP	6161841	7/2017

(Continued)

OTHER PUBLICATIONS

"Fundamentals of Bar Code Information Theory", by T. Pavlidis, J. Swartz and Y.P. Wang, IEEE Computer, Apr. 1990, pp. 74-86

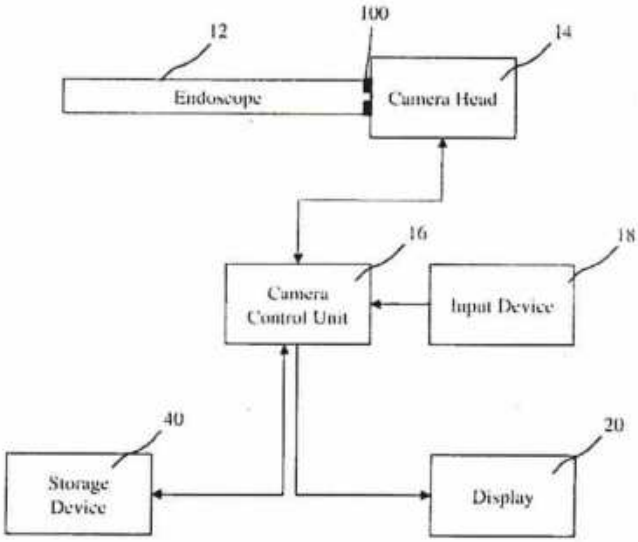
(Continued)

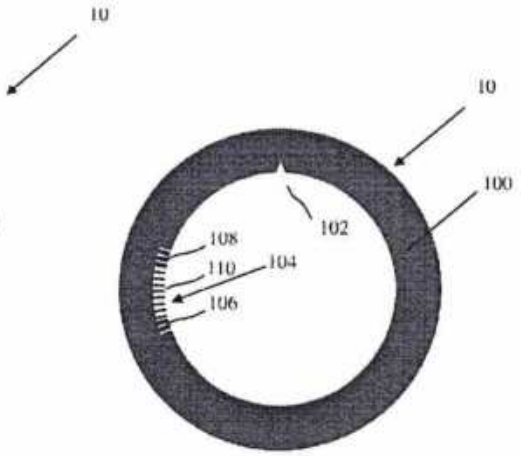
Primary Examiner — John P Leubecker
Assistant Examiner — Minqiao Huang
(74) *Attorney, Agent, or Firm* — Karish & Bjorgum, PC

(57) **ABSTRACT**

An endoscopic camera system has an endoscope having a field stop encoded with endoscope information; a camera head coupleable to the endoscope, the camera head generating image data including the endoscope information; and a camera control unit coupleable to the camera head to receive image data from the camera head; and wherein the camera control unit is configured to analyze the endoscope information to identify the endoscope coupled to the camera head.

25 Claims, 8 Drawing Sheets





(56) **References Cited**

U.S. PATENT DOCUMENTS

7,282,026	B2	10/2007	Ogawa	
7,289,139	B2	10/2007	Amling et al.	
8,266,129	B2	9/2012	Shimizu et al.	
8,373,748	B2	2/2013	Pang et al.	
8,537,210	B2	9/2013	Omori	
9,060,674	B2	6/2015	Amling	
9,438,897	B2	9/2016	Barreto et al.	
9,603,512	B2	3/2017	Hoeg et al.	
10,350,001	B2 *	7/2019	Collins	A61B 90/94
2004/0030221	A1	2/2004	Ogawa	
2004/0186351	A1 *	9/2004	Imaizumi	A61B 1/00009 600/160
2009/0124855	A1	5/2009	Urakawa	
2010/0141744	A1	6/2010	Amling et al.	
2015/0309284	A1 *	10/2015	Kagawa	G02B 23/2453 348/76
2017/0007095	A1	1/2017	Kutsuma et al.	
2018/0242828	A1 *	8/2018	Shiga	H04N 5/232123
2019/0053693	A1	2/2019	Koiso et al.	

FOREIGN PATENT DOCUMENTS

WO	2016040131	3/2016
WO	2017072950	5/2017

OTHER PUBLICATIONS

"Waveform Recognition With Application to Bar Codes", by E. Joseph and T. Pavlidis, Proc. IEEE SMC Aug.1991, pp. 129-134.
"A Robust Software Barcode Reader Using the Hough Transform", by Ruben Muniz, et al., IEEE, Sep. 1999, pp. 313-319.
Annex to form PCT/ISA/206 Communication Relating to the Results of the Partial International Search—for PCT Application No. PCT/US2018/048322, dated Dec. 12, 2018, 13 pages.
International Search Report and Written Opinion, dated Apr. 10, 2019.

* cited by examiner

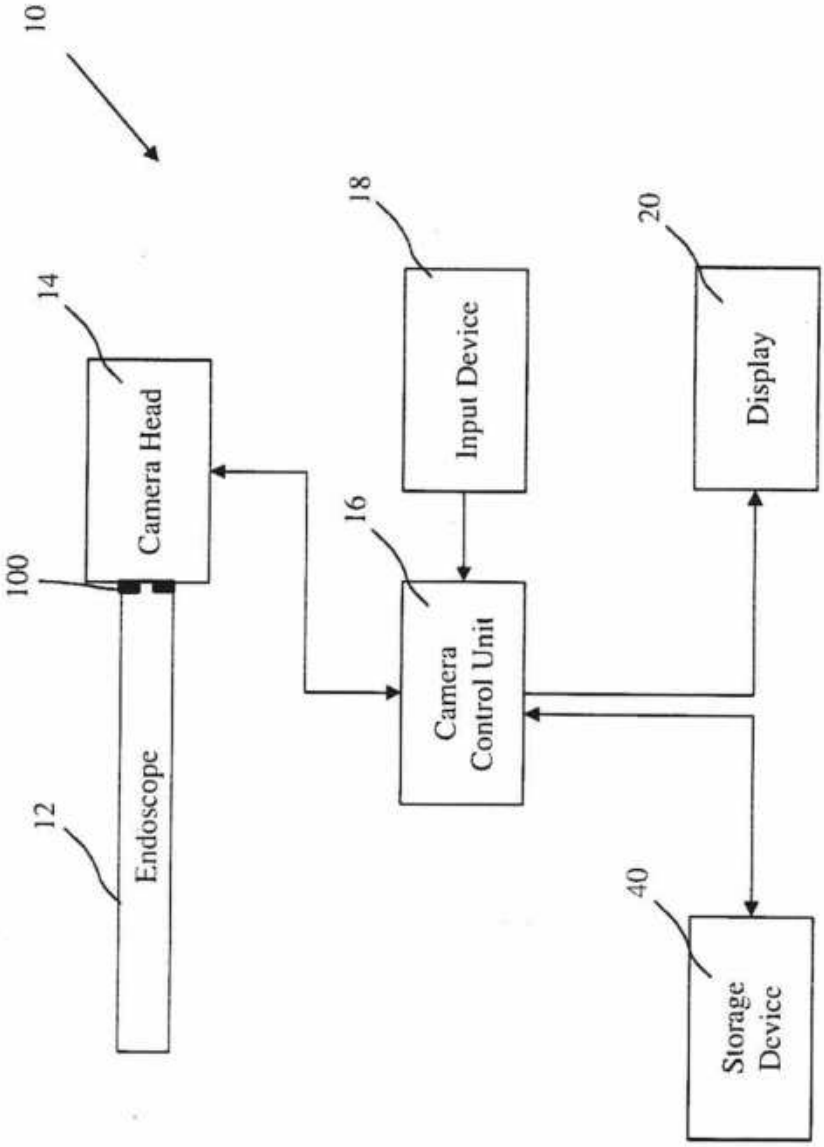

10
18
20
14
Input Device
Display
Camera Head
16
100
Camera Control Unit
Endoscope
12
40
Storage Device

FIG. 1

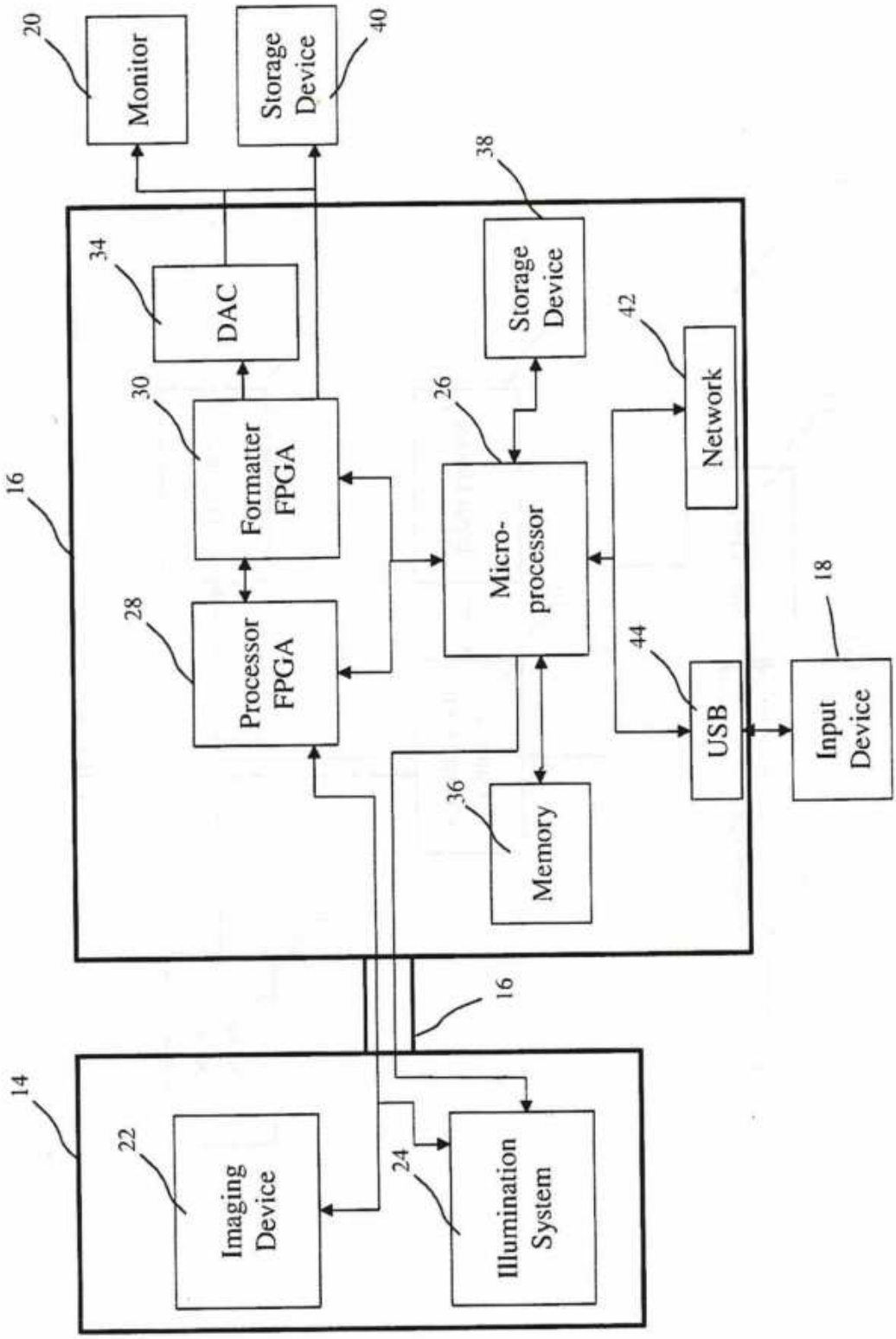

20
Monitor
Storage Device
40
38
34
DAC
Storage Device
42
Network
30
Formatter FPGA
26
16
Micro-processor
28
Processor FPGA
18
44
USB
Input Device
36
Memory
16
14
22
Imaging Device
24
Illumination System

FIG. 2

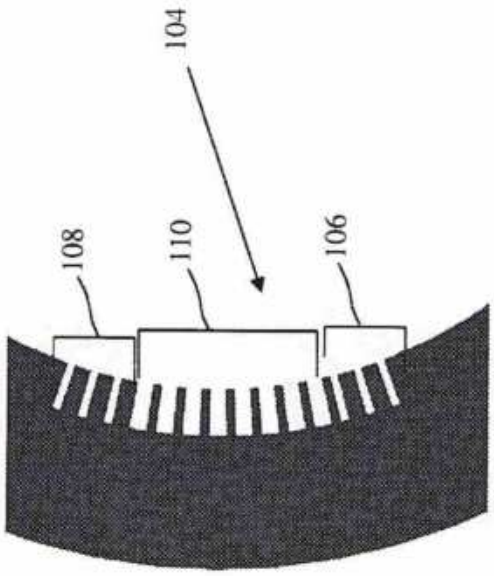


FIG. 3B

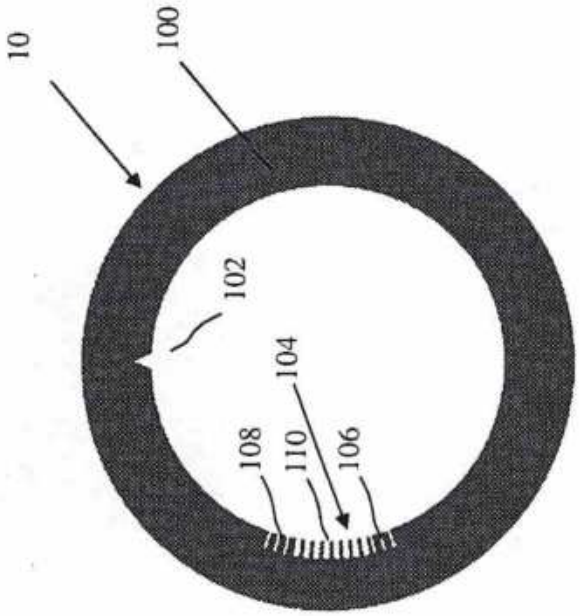


FIG. 3A

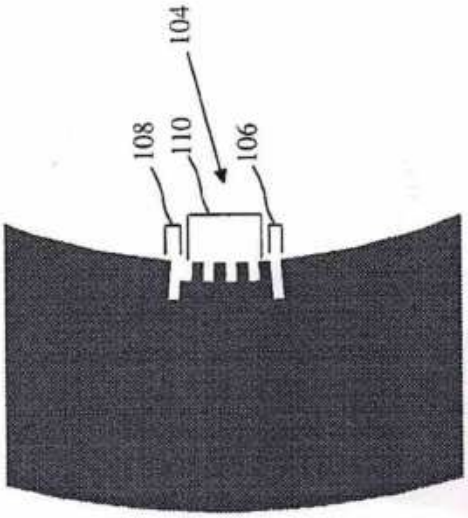


FIG. 4B

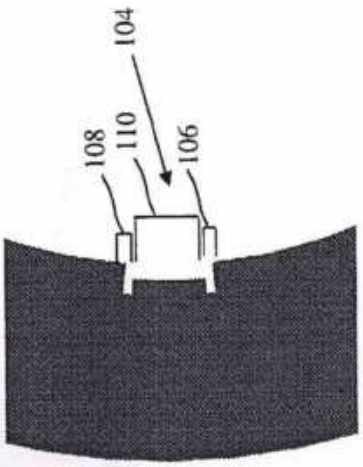


FIG. 4D

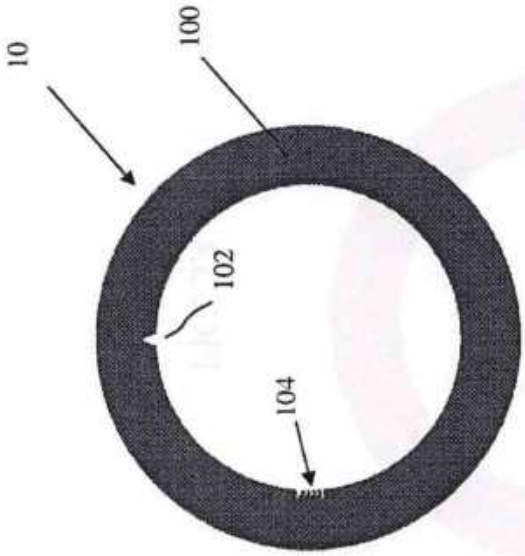


FIG. 4A

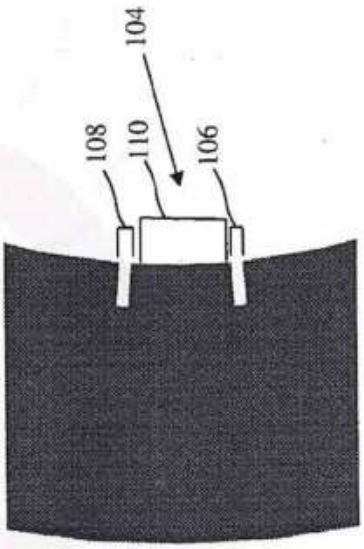


FIG. 4C

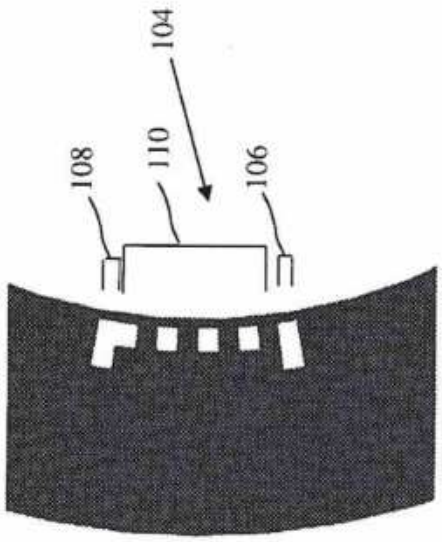


FIG. 5B



FIG. 5D

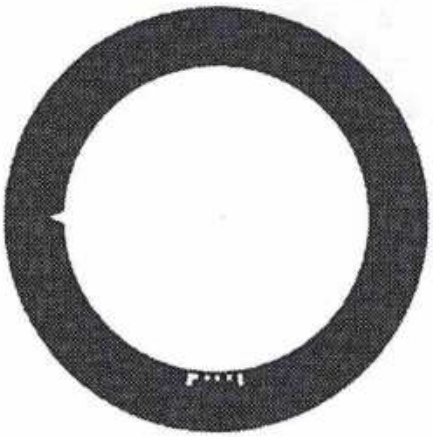


FIG. 5A



FIG. 5C

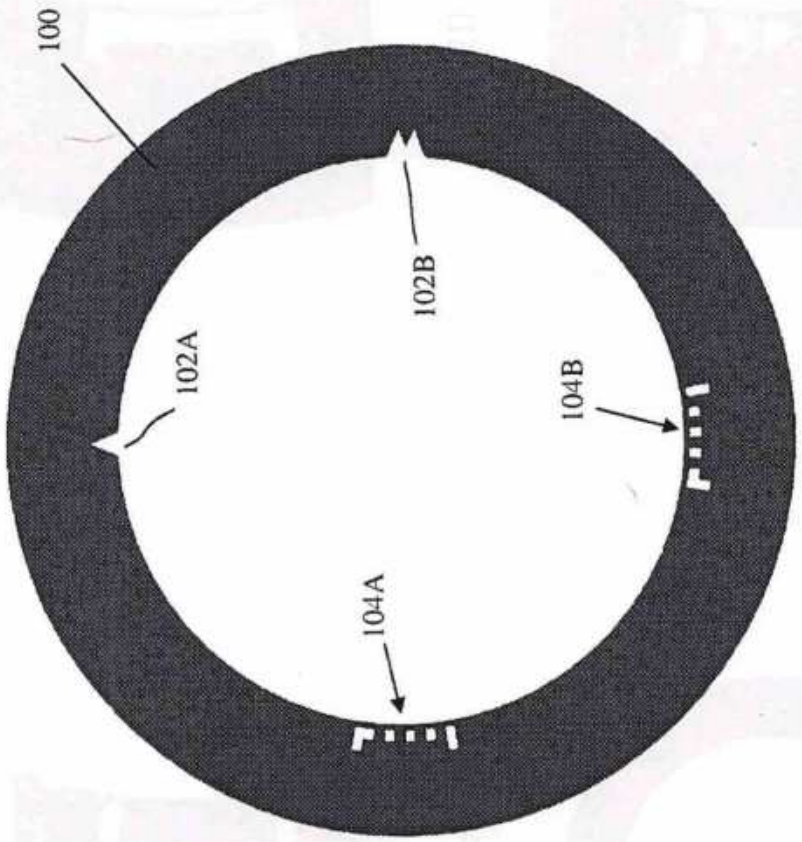


FIG. 6

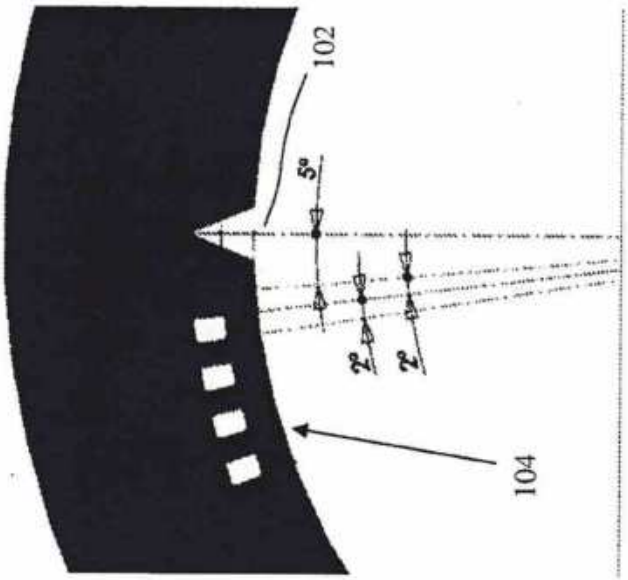


FIG. 7B

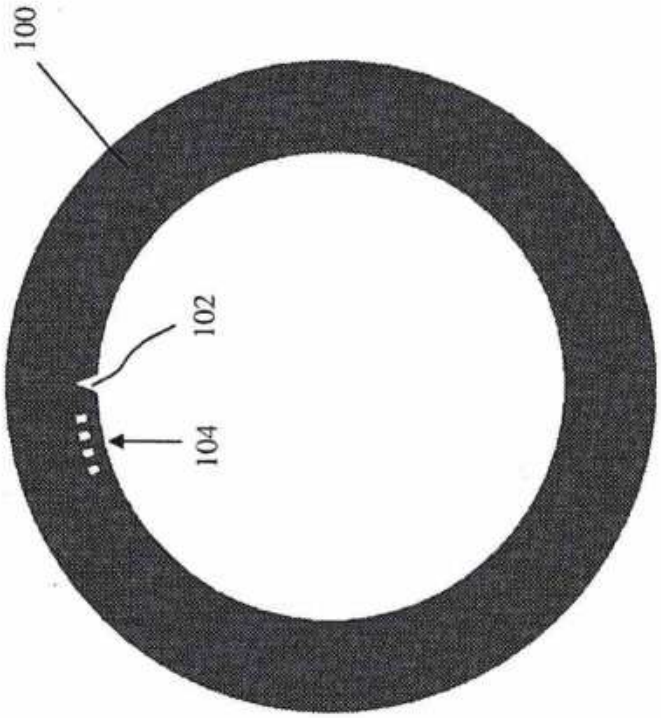


FIG. 7A

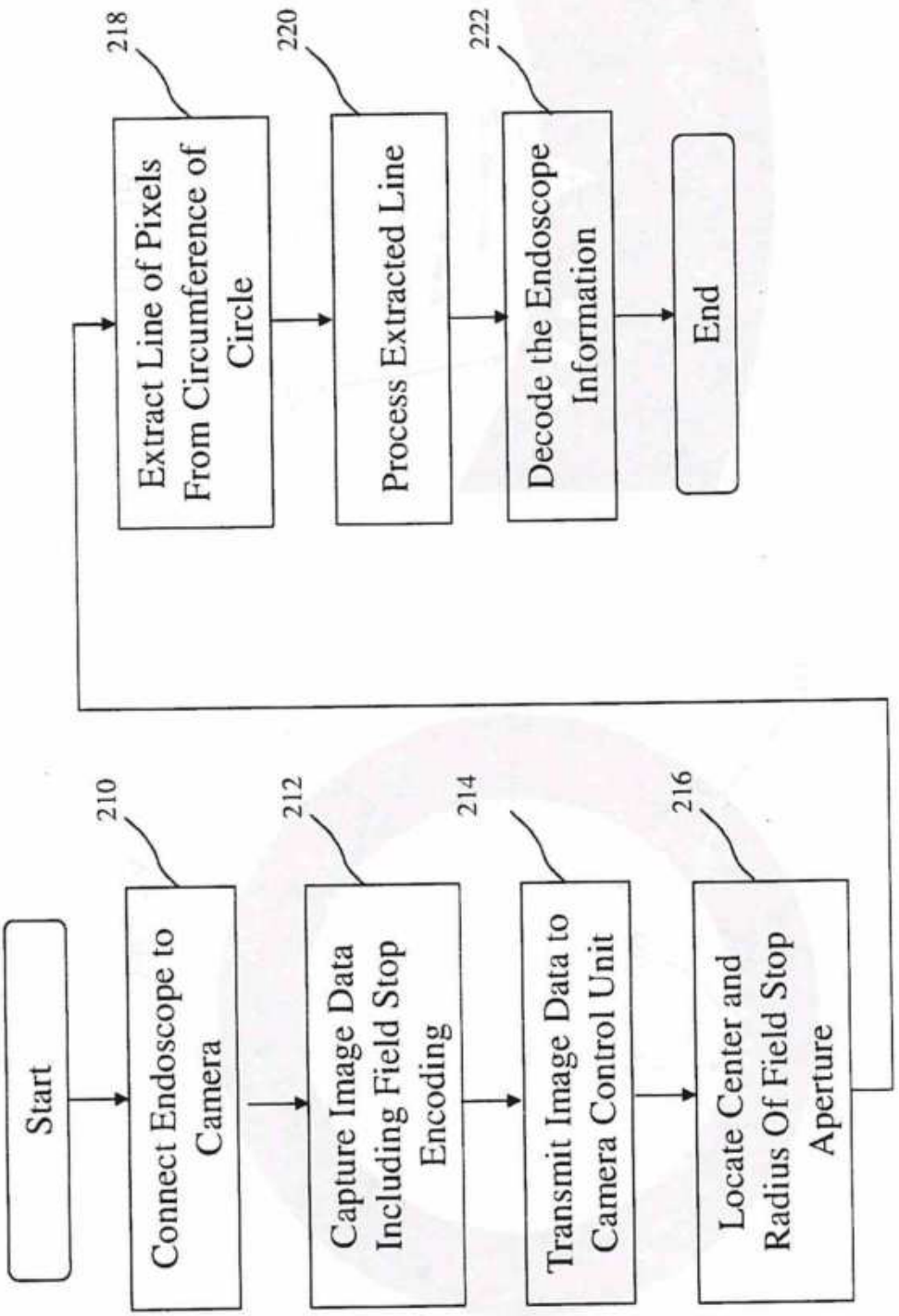

Start
Connect Endoscope to Camera
210
Capture Image Data Including Field Stop Encoding
212
Transmit Image Data to Camera Control Unit
214
Locate Center and Radius Of Field Stop Aperture
216
Extract Line of Pixels From Circumference of Circle
218
Process Extracted Line
220
Decode the Endoscope Information
222
End

FIG. 8

ENDOSCOPE FIELD STOP ENCODING SYSTEM AND METHOD

BACKGROUND

The present invention relates to devices used in endoscopic surgery and, more particularly, to endoscopic devices with field stop encoding allowing automatic identification of an endoscope that is coupled to an endoscopic video camera.

Endoscopic camera systems provide a surgeon with a view of an area of the body being worked on without the necessity of fully opening up the area, thereby allowing for less invasive surgical procedures. Generally, these devices consist of a camera head coupled to an endoscope and a camera control unit. Different endoscopes are used depending on the area of the body being worked on and the procedures being performed. Likewise, optimal camera settings are different depending on the endoscope being used, the area of the body being worked on and the procedures being performed. It would be desirable to have a system for automatically determining the endoscope being used for optimizing one or more settings for the display or processing of images that improves upon the prior art.

SUMMARY

The present disclosure relates to an endoscopic camera system, which is usable with multiple different endoscopes. A field stop of the endoscope is encoded with detectable endoscope information for customization of the camera system based on the endoscope being used.

In an exemplary embodiment, the endoscopic camera system has an endoscope having a field stop encoded with endoscope information; a camera head coupleable to the endoscope, the camera head generating image data including the endoscope information; and a camera control unit coupleable to the camera head to receive image data from the camera head; and wherein the camera control unit is configured to analyze the endoscope information to identify the endoscope coupled to the camera head. The endoscope information may include an endoscope type. Additionally, the endoscope information may include a unique endoscope identification number.

The system may be usable with more than one endoscope and the endoscope information in each of the plurality of endoscopes may have a same start feature and a same end feature. The field stop may be encoded with endoscope information using notches or slots having varying widths. The field stop may also be encoded with endoscope information using notches or slots having varying lengths. The field stop may be encoded with endoscope information at more than one location. Optionally, the field stop has a direction of view indicator and the camera control unit infers location of the direction of view indicator from the locations of the endoscope information.

The camera control unit may automatically adjust operational settings of the camera head in accordance with the endoscope coupled to the camera head. Optionally, the camera control unit automatically adjusts the operational settings of the camera control unit in accordance with the endoscope coupled to the camera head.

In a further exemplary embodiment of the present invention, the system has a memory coupled to the camera control unit and the camera control unit obtains endoscope usage information from the memory. The camera control unit may also track endoscope usage and send endoscope usage information to the memory.

In a further exemplary embodiment, the present invention is directed to a method of communicating endoscope information from an endoscope having a field stop to a camera head, and communicating endoscope information from the camera head to a camera control unit comprising the steps of: coupling the camera head to the endoscope; generating image data with the camera head including the endoscope information encoded in the field stop; transmitting the image data from the camera head to the camera control unit; and analyzing the image data from the camera head to identify the endoscope coupled to the camera head.

The method may also have the step of validating whether the endoscope is appropriate for use with the camera head. Optionally, the method has the step of storing endoscope usage information in a storage device. Optionally, the method has the step of modifying image data processing based upon the identified endoscope. Optionally, the method has the step of modifying image data display based upon the identified endoscope. Optionally, the method has the step of modifying a light setting based upon the identified endoscope.

The method may also have the step of comparing image data characteristics of the endoscope with saved image characteristics of an identified endoscope type. The method may also have the step of encoding endoscope information in the field stop. The step of encoding endoscope information in the field stop may include manufacturing holes, slots or notches of varying widths in the field stop and the step of analyzing the image data to identify the endoscope may include scanning the image data for contrast of pixels in a known image location.

In a further exemplary embodiment, the present invention is directed to an endoscope imaging system having an endoscope with a field stop encoded with endoscope information. The system may also have a camera head with an image sensor generating image data including the endoscope information from the field stop. The system may also have a camera control unit receiving image data from the camera head, the camera control unit being configured to analyze the image data to identify the endoscope. Optionally, the endoscope information is encoded as a plurality of holes, slots or notches in the field stop. Optionally, the endoscope information is encoded in a plurality of locations in the field stop. Optionally, the encoded information is digitally removed from an image presented to a user.

These and other features are described below.

BRIEF DESCRIPTION OF THE DRAWINGS

The features, aspects and advantages of the present invention will become better understood with regard to the following description, appended claims and accompanying figures wherein:

FIG. **1** is a schematic diagram of a camera system according to an embodiment of the present invention;

FIG. **2** is a schematic diagram of a camera control unit and camera head usable in the camera system of FIG. **1**;

FIGS. **3**A and **3**B illustrate field stops with encoded endoscope information according to a first embodiment of the present invention;

FIGS. **4**A, **4**B, **4**C and **4**D illustrate field stops with encoded endoscope information according to a second embodiment of the present invention;

FIGS. **5**A, **5**B, **5**C and **5**D illustrate field stops with encoded endoscope information according to a third embodiment of the present invention;

FIG. **6** illustrates a field stop with encoded endoscope information according to a fourth embodiment of the present invention;

FIGS. **7**A and **7**B illustrate a field stop with encoded endoscope information according to a fifth embodiment of the present invention; and

FIG. **8** is a block diagram showing an example of how encoded endoscope information is obtained according to an embodiment of the present invention.

DETAILED DESCRIPTION

In the following description of the preferred embodiments, reference is made to the accompanying drawings which show by way of illustration specific embodiments in which the invention may be practiced. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts. It is to be understood that other embodiments may be utilized and structural and functional changes may be made without departing from the scope of the present invention.

With reference to FIGS. **1** and **2**, an endoscopic camera system **10** according to an embodiment of the present invention has at least one endoscope **12** connectable to a camera head **14**. The camera head **14** is connectable to a camera control unit **16** ("CCU"). The camera head **14** and camera control unit **16** may be connected via wire or wirelessly. The camera control unit **16** is also connectable to at least one input device **18** such as a mouse, keyboard, touchpad, or touchscreen monitor. Additionally, the camera control unit is connectable to a display **20**.

As shown in FIG. **2**, the camera head **14** has an imaging device **22** which may include NTSC/PAL, single chip, three chip, standard definition, high definition, ultra high definition, CCD and CMOS devices. The camera head may also have an illumination system **24**. The camera head **12** may also have memory for storing camera data, camera control unit processing data or other information. The camera head **12** may also have a user input means such as buttons to control aspects of image capture.

As shown in FIG. **2**, the camera control unit **16** contains a microprocessor **26** for interfacing with user input devices **18**, a signal processing circuit **28**, a signal formatting circuit **30**, digital to analog converters **34** and memory **36**. The camera control unit **16** runs program applications providing for a variety of capabilities. For example, the camera control unit **16** may provide for a live feed of the image generated by the camera head **14** to be displayed through the display **20**. Additionally, the camera control unit **16** may provide image capture functionality allowing for images generated by the camera head **14** to be saved to a storage device, such as an internal storage device **38** or a storage device **40** external to the camera control unit. The captured images may be annotated and/or edited and displayed through the display **20**.

In an embodiment, the camera control unit **16** also has at least one network interface **42** which may be a wired interface such as Ethernet, or a wireless network connection that allows for the camera control unit to access a network. Optionally, the network interface **42** allows the camera control unit **16** to access the Internet and servers for storing and processing information.

In an embodiment, the external storage device **40** may be, for example, a flash memory storage device or a hard disk storage device, and may be connected to the camera control unit **14** through a USB connection **44** or firewire connection (not shown). In an embodiment, a program application for the camera control unit, or data relevant to a particular patient, surgeon or endoscope, is stored on the external storage device **40** and may be used to quickly configure the camera control unit for future sessions. Preferably, the camera control unit **16** can save images and video in different formats and to different places (e.g. internal memory, an external memory, or to a remote location over the Internet). Additionally, the external storage device **40** may be a server and may be connected to the camera control unit the network interface **42**.

With reference to FIGS. **3** and **4**, the endoscope **12** has a field stop **100** to control unwanted stray light. The field stop **12** produces a round aperture in the field of view. Also included in the field stop **12** is a visual orientation marker **102** to help a user track a direction of view. The visual orientation marker **102** may be aligned with a light post (not shown) connected to the endoscope. The field stop **100** may be a small black metal mask with an aperture placed at a specific location in the optical path on the inside of the endoscope **12**. The visual orientation marker **102** may be, for example, a small triangular notch at the edge of the aperture.

In an embodiment of the present invention, information features **104** for specific endoscopes are placed in an inner edge of the field stop. The information features **104** may be recognized by an image processing algorithm that scans an image received from a camera head to identify the aperture of the field stop, using the contrast of the pixels and their approximate known location.

A ring of pixels just outside the field stop aperture (in the mask) is extracted. The ring of pixels is then analyzed to locate the orientation notch as well as the information features **104**. Optionally, in an embodiment, the information features **104** have start features **106** and end features **108** that are the same for each endoscope so that an algorithm can determine where endoscope data **110** begins and ends.

In an embodiment, the endoscope data **110** is encoded between the start and stop features **106**, **108**. The endoscope data may be encoded using, for example, a narrow notch or a wide notch constituting "bits" of data. A "bit" may also be, for example, a short notch or a long notch. Although the present specification refers to use of notches, it will be understood that slots, holes or other detectable shapes may be used to encode information into the field stop. In additional embodiments, the encoding may be done with other optically detectable means, such as, for example, a colored marking or a fluorescent phosphor.

The bits are interpreted as a 1 or a 0 as effectively a binary code. In an embodiment, the endoscope data **110** is between about 4 and about 24 "bits" between the start and stop features **106**, **108**. In a more preferred embodiment, the endoscope data **110** is about 8 "bits" between the start and stop feature **106**, **108**. Although described herein as a binary system, it is also possible that shapes may be used to encode more than two values. For example, a notch may have three or four different lengths or widths and may thereby be used to encode four or five different values. This allows fewer notches to encode more information.

In a preferred embodiment, two or more copies of the information features **104** are provided at different positions on the field stop **100** so that endoscope information may still be obtained even if one set of information features **104** are oriented off an edge of a video image. Moreover, if the locations of the multiple copies of the information features **104** is known, then that information may be used to infer the location of the orientation notch **102**.

A field stop aperture according to a first exemplary embodiment of the present invention is shown in FIGS. **3**A

and 313. In this embodiment, a notch of one degree in width is considered to be a value of zero and a notch of two degrees in width is considered to be a value of one. A bit is oriented every three degrees with each bit being separated by one to two degrees of field stop. In this embodiment, the start feature **106** constitutes three zero bits and the end feature **108** constitutes three zero bits. In between the start feature **106** and the end feature **108**, are eight notches for endoscope data (shown as ones). The eight notches for endoscope data may be used to identify 256 different types of endoscopes. In this exemplary embodiment, the depth of the notches equal the depth of the orientation notch **102** which may allow the algorithm used to detect the orientation notch to detect the identifying features.

A field stop aperture according to a second exemplary embodiment of the present invention is shown in FIGS. **4**A through **4**D. In this embodiment, the presence of a notch of one degree is considered to be a value of zero and the lack of a notch is considered to be a value of one and there is no separation between bits. Optionally, the presence of a notch may be considered to be a value of one and the lack of a notch may be considered a value of zero. In this embodiment, the start feature **106** and the end feature **108** each constitute one long notch having a depth equal to the depth of the orientation notch **102**. In between the start feature **106** and the end feature **108**, are up to eight notches for endoscope data (shown as ones). The eight notches for endoscope data may be used to identify 256 different types of endoscopes. In this exemplary embodiment, the depth of the endoscope data notches equals one half of the depth of the orientation notch **102**. FIG. **4**B shows a field stop with endoscope data encoded with eight alternating ones and zeros. FIG. **4**C shows a field stop encoded with all endoscope data bits encoding a one. FIG. **4**D shows a field stop encoded with all endoscope data bits encoding a zero.

A field stop aperture according to a third exemplary embodiment of the present invention is shown in FIGS. **5**A through **5**D. In this embodiment, the presence of a notch of two degrees is considered to be a value of zero, the lack of a notch is considered to be a value of one and there is no separation between bits. In this embodiment, the start feature **106** and the end feature **108** each constitute one long notch having a depth equal to the depth of the orientation notch **102**. In between the start feature **106** and the end feature **108**, are up to eight notches for endoscope data (shown as ones). The eight notches for endoscope data may be used to identify 256 different types of endoscopes. In this exemplary embodiment, the depth of the endoscope data notches equal one half of the depth of the orientation notch **102**. However, this embodiment differs from the second exemplary embodiment in that the notches do not interrupt the inner diameter edge of the field stop. By not interrupting the inner diameter edge, the information features **104** are less likely to confuse an algorithm used for finding the orientation notch **102**. FIG. **5**B shows a field stop encoded with eight endoscope data bits of alternating ones and zeros. FIG. **5**C shows a field stop encoded with eight endoscope data bits all encoding a one. FIG. **5**D shows a field stop encoded with eight endoscope data bits all encoding a zero.

A field stop aperture according to a fourth exemplary embodiment of the present invention is shown in FIG. **6**. In this embodiment, the field stop aperture is encoded with two orientation notches **102**A and **102**B 90 degrees apart. Additionally, the field stop aperture is encoded with two of the same information features **104**A and **104**B positioned 90 degrees apart. In an additional embodiment, the endoscope data bits in each of the information features are complements of each other. In additional embodiments, any number of orientation notches and information features **104** can be placed in the field stop.

A field stop aperture according to a fifth exemplary embodiment of the present invention is shown in FIGS. **7**A and **7**B. In this embodiment, the presence of a notch of two degrees is considered to be a value of zero, the lack of a notch is considered to be a value of one and there is no separation between bits. In this embodiment, there are no start features or end features and the depth of the endoscope data notches equal one half of the depth of the orientation notch **102**. In this embodiment, the endoscope data **110** is positioned a predetermined distance (five degrees) from the orientation notch **102**. By positioning the endoscope data **100** a predetermined distance from the orientation notch, an algorithm for obtaining the endoscope information does not need to use start features or end features to locate the data.

As shown in FIG. **8**, the present invention is also directed to a method for extracting endoscope information from a field stop image. An endoscope is initially coupled to a camera head, box **210**. The camera head then captures image data, including endoscope information encoded in the field stop, box **212**. Preferably, an image is captured during a white balance operation. The white balance operation may be initiated automatically when an endoscope is connected to a camera head. Alternatively, a user may manually initiate a white balance. Optionally, upon connection of an endoscope to the camera head, the camera control unit causes display of a message instructing the user to initiate a white balance operation. Capturing a screen image during a white balance operation ensures that the image is predominantly white, correctly exposed and that the image fills the entire endoscope field of view. The image data is transmitted to a camera control unit, box **214**.

Optionally, the captured image is converted from RGB to gray scale. Removing color simplifies later processing. Optionally, a smoothing filter is applied to remove noise. The smoothing filter cutoff is chosen so as to avoid damaging detail of the identification information while removing unwanted noise. A Gaussian filter can be implemented as a separable low pass with sharp cutoff to remove unwanted noise. Image contrast may be increased to accentuate the black and white differences in the image.

A Hough Circle Transform is performed to locate the center (x_{center}, y_{center}) and radius (r) of the field stop circle, box **216**. A one dimensional line of pixels is extracted from the circumference of the concentric circle with radius $r+x$ where x is chosen so that the line fully intersects the code features in the field stop image, box **218**. The one dimensional line of pixels is then processed using a standard linear barcode decoding algorithm, box **220**. Standard barcode decoding algorithms may be found in, for example, T. Pavlidis, J. Swartz, and Y. P. Wang, "Fundamentals of bar code information theory," IEEE Computer, pp. 74-86, April 1990, E. Joseph and T. Pavlidis, "Waveform recognition with applications to bar codes," in Proc. IEEE SMC 1991 Con&, 1991, pp. 129-134, R. Muniz, L. Junco and A. Otero, "A robust software barcode reader using the Hough transform," International Conference on Information Intelligence and Systems, Bethesda, Md., USA, pp. 313-319, November 1999, the entire contents of each of which are incorporated herein by reference in their entirety. The endoscope information is then decoded, box **222**. The endoscope information may include, for example, a model number, a serial number, a field of view and an angle of view.

Once endoscope information is obtained, the endoscope information can be used to reference image processing, light

settings, or display settings in a memory in the camera control unit or in a memory accessible by the camera control unit. The image processing, light settings, or display settings may be automatically implemented by the camera control unit. Also, for example, the image for a particular endoscope may be automatically magnified to a predetermined magnification. Also, for example, the operational settings of the camera head may be automatically adjusted for the specific endoscope. Also, for example, optimal light source settings may be automatically selected for the particular endoscope. Endoscope information can also be used to prevent the use of incompatible endoscopes. For example, if a scope is used that is not validated for use with a given camera system, the camera control unit **16** may cause a warning to be displayed to a user on the display **20**.

Additionally, the camera system can record and present usage statistics on which endoscopes are used, with which surgeries, and for how long. This data may be stored in a storage accessible to different camera control units so that the data may be updated when a particular endoscope is used in different locations with different camera heads and camera control units. This data can help surgeons keep records of which endoscopes were used in each procedure. Reliability of endoscopes can be more accurately tracked. Manufacturing, sales, and design may benefit from the data to make the most often used products, rather than relying on sales history.

Endoscope usage information is advantageous because usage time may affect the reliability and health of an endoscope. Once an endoscope is identified, target calibration can be used to gauge the health of the endoscope. For example, optimal light and exposure settings for a given type of endoscope may be compared with light and exposure settings used with the actual endoscope to determine whether the endoscope is functioning properly. The data may also be used to determine the health of different camera heads. For example, if the same endoscope is used with different camera heads and the usage requires very different light and exposure settings, then investigation of the camera heads may be warranted.

The information features **104** may be digitally removed from the image prior to presenting the image to a user and prior to archiving of the image. Removal of the encoded information features **104** from the image may be advantageous to avoid confusing a user.

The present invention is advantageous, because while the method requires physical modification of the field stop, the invention does not require the addition of any components nor direct communication of identification information between an endoscope and a camera head or camera control unit. Moreover, each endoscope may be encoded with a specific identifier so that information about that specific endoscope may be tracked.

There is disclosed in the above description and the drawings, a surgical imaging system and method for processing surgical images that fully and effectively overcomes the disadvantages associated with the prior art. However, it will be apparent that variations and modifications of the disclosed embodiments may be made without departing from the principles of the invention. The presentation of the preferred embodiments herein is offered by way of example only and not limitation, with a true scope and spirit of the invention being indicated by the following claims.

Any element in a claim that does not explicitly state "means" for performing a specified function or "step" for performing a specified function, should not be interpreted as a "means" or "step" clause as specified in 35 U.S.C. § 112.

What is claimed is:

1. An endoscopic camera system comprising:

an endoscope having a field stop encoded with endoscope information using at least one of: a plurality of holes, a plurality of notches, and a plurality of slots;

a camera head coupleable to the endoscope, the camera head generating image data including the endoscope information; and

a camera control unit coupleable to the camera head to receive image data from the camera head; and

wherein the camera control unit is configured to analyze the endoscope information to identify the endoscope coupled to the camera head.

2. The endoscopic camera system of claim **1** wherein the endoscope information comprises an endoscope type.

3. The endoscopic camera system of claim **1** wherein the endoscope information comprises at a unique endoscope identification number.

4. The endoscopic camera system of claim **1** wherein a width of the holes, notches and slots can be varied.

5. The endoscopic camera system of claim **1** wherein a length of the holes, notches and slots can be varied.

6. The endoscopic camera system of claim **1** wherein the camera control unit automatically adjusts operational settings of the camera head in accordance with the endoscope coupled to the camera head.

7. The endoscopic camera system of claim **1** wherein the camera control unit automatically adjusts the operational settings of the camera control unit in accordance with the endoscope coupled to the camera head.

8. The endoscopic camera system of claim **1** further comprising a memory coupled to the camera control unit and wherein the camera control unit obtains endoscope usage information from the memory.

9. The endoscopic camera system of claim **8** wherein the camera control unit tracks endoscope usage and sends endoscope usage information to the memory.

10. The endoscopic camera system of claim **1** wherein the field stop is encoded with endoscope information at a plurality of locations.

11. The endoscopic camera system of claim **10** wherein the field stop further comprises a direction of view indicator and wherein the camera control unit infers location of the direction of view indicator from the locations of the endoscope information.

12. A method of communicating endoscope information from an endoscope having a field stop to a camera head, and communicating endoscope information from the camera head to a camera control unit comprising the steps of:

coupling the camera head to the endoscope;

generating image data with the camera head including the endoscope information encoded in the field stop with at least one of: a plurality of holes, a plurality of notches and a plurality of slots;

transmitting the image data from the camera head to the camera control unit; and

analyzing the image data from the camera head to identify the endoscope information encoded in the field stop to identify the endoscope coupled to the camera head.

13. The method of claim **12** further comprising a step of validating whether the endoscope is appropriate for use with the camera head.

14. The method of claim **12** further comprising a step of storing endoscope usage information in a storage device.

15. The method of claim **12** further comprising a step of modifying image data processing based upon the identified endoscope.

16. The method of claim 12 further comprising a step of modifying image data display based upon the identified endoscope.

17. The method of claim 12 further comprising a step of modifying a light setting based upon the identified endoscope.

18. The method of claim 12 further comprising a step of comparing image data characteristics of the endoscope with saved image characteristics of an identified endoscope type.

19. The method of claim 12 further comprising a step of encoding endoscope information in the field stop.

20. The method of claim 19 wherein the step of encoding endoscope information in the field stop further comprising manufacturing a plurality of holes, slots or notches of varying widths in the field stop and the step of analyzing the image data to identify the endoscope further comprises scanning the image data for contrast of pixels in a known image location.

21. The method of claim 12 wherein the method further comprises a step of removing the encoded endoscope information from the image data.

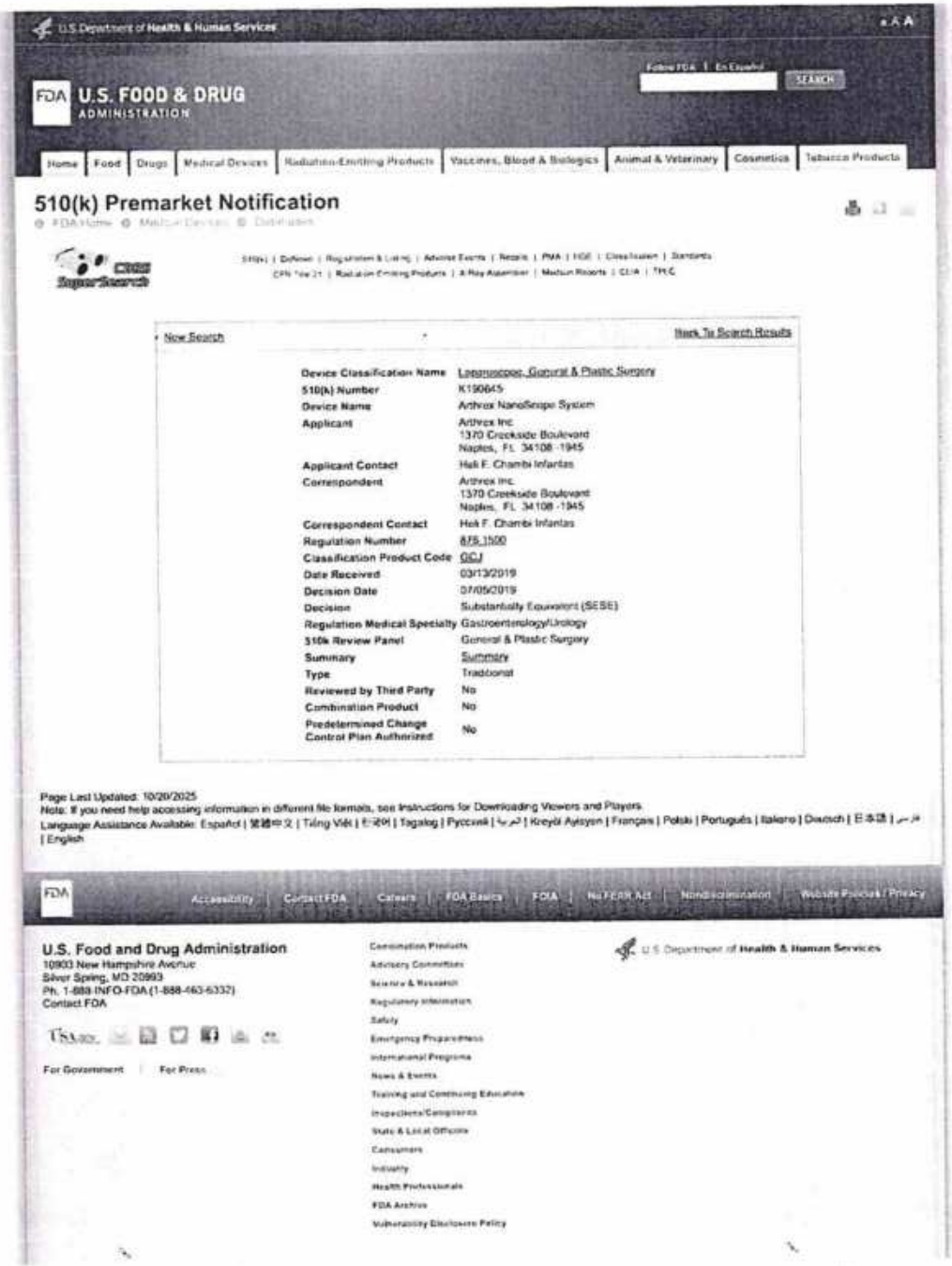
22. An endoscope imaging system comprising an endoscope having a field stop encoded with endoscope information using at least one of: a plurality of holes, a plurality of notches, and a plurality of slots.

23. The endoscope imaging system of claim 22 further comprising a camera head comprising an image sensor generating image data including the endoscope information from the field stop.

24. The endoscope imaging system of claim 23 further comprising a camera control unit receiving image data from the camera head, the camera control unit being configured to analyze the image data to identify the endoscope.

25. The endoscope imaging system of claim 22 wherein the endoscope information is encoded in a plurality of locations in the field stop.

* * * * *



U.S. Department of Health & Human Services

FDA U.S. FOOD & DRUG ADMINISTRATION

Follow FDA | En Español

SEARCH

Home | Food | Drugs | Medical Devices | Radiation-Emitting Products | Vaccines, Blood & Biologics | Animal & Veterinary | Cosmetics | Tobacco Products

510(k) Premarket Notification

FDA Home > Medical Devices > Databases

510(k) | Q-Submission | Regulations & Listing | Adverse Events | Recalls | PMA | HDE | Classification | Standards | CFR Title 21 | Radiation-Emitting Products | X-Ray Assembler | Medical Imaging | CLIA | TPLC

New Search | Back To Search Results

Device Classification Name	Laparoscope, General & Plastic Surgery
510(k) Number	K190845
Device Name	Arthrex NanoScope System
Applicant	Arthrex Inc 1370 Creekside Boulevard Naples, FL 34108-1945
Applicant Contact	Heli F. Chambi Infantas
Correspondent	Arthrex Inc 1370 Creekside Boulevard Naples, FL 34108-1945
Correspondent Contact	Heli F. Chambi Infantas
Regulation Number	876.1500
Classification Product Code	GCJ
Date Received	03/13/2019
Decision Date	07/05/2019
Decision	Substantially Equivalent (SESE)
Regulation Medical Specialty	Gastroenterology/Urology
510k Review Panel	General & Plastic Surgery
Summary	Summary
Type	Traditional
Reviewed by Third Party	No
Combination Product	No
Predetermined Change Control Plan Authorized	No

Page Last Updated: 10/20/2025

Note: If you need help accessing information in different file formats, see Instructions for Downloading Viewers and Players.

Language Assistance Available: Español | 繁體中文 | Tiếng Việt | 한국어 | Tagalog | Русский | العربية | Kreyòl Ayisyen | Français | Polski | Português | Italiano | Deutsch | 日本語 | فارسی | English

FDA | Accessibility | Contact FDA | Careers | FDA Basics | FOIA | No FEAR Act | Nondiscrimination | Website Policies / Privacy

U.S. Food and Drug Administration
10903 New Hampshire Avenue
Silver Spring, MD 20993
Ph. 1-888-INFO-FDA (1-888-463-6332)
Contact FDA

For Government | For Press

Combination Products
Advisory Committees
Science & Research
Regulatory Information
Safety
Emergency Preparedness
International Programs
News & Events
Training and Continuing Education
Inspections/Compliance
State & Local Officials
Consumers
Industry
Health Professionals
FDA Archive
Vulnerability Disclosure Policy

U.S. Department of Health & Human Services

Cryo System Work Station (1.1) Probe compatable with extra cylinder

King George's Medical University UP, Lucknow

Common Equipment Cell

Email: ce@kgmcindia.edu

Reference No. Date:

PROPRIETARY/ SPECIFIC BRAND GOODS CERTIFICATE

1	Item/ Type/ Model No. required along with specification	Combined Cryo Workstation with Radio frequency Energy Source with Endocut and Argon Plasma Coagulator
2	If the item a spare part attachment or accessory for an existing equipment **Yes / No (If yes, provide details)**	No
3	Name of the manufacturers/supplier of the item proposed by the indenter	**M/S Erbe Elektromedizin GmbH**, Waldhorenlestrasse 17, D-72072, Tubingen, Germany **(OEM)** **M/S Pee Vee Enterprises** Lucknow – **Authorized Supplier**
4	Are they sole manufacturers/ sold distributors of the Item **Yes / No**	Yes, Proprietary In Nature- Sole Manufacturers
5	If there any other item with similar/equivalent specification available in the market to meet the job requirement envisaged. Yes / No (If Yes, explain why those alternatives cannot be procured and provide a comparative analysis of the functional advantages/cost-effectiveness of the recommended item)	No
6	Efforts made to locate alternative sources of supply or use of substitutes	As per best of our knowledge offered configuration of various integrated Energy & Cryo technologies by single OEM are not available on GeM Portal.
7	Why open tender can't be resorted to, for locating alternative source.	Proprietary In Nature as both Cryo System with Energy Source with Endocut and Argon Plasma are positioned together in form of Cryo Work Station to perform various pulmonary procedures.
8	Are the proprietary items certified to have reasonable rates? **Yes / No (Attach supporting documents, if applicable)**	Yes – The proposed estimated value is in compliance of Purchase Orders issued by various accounts such as AIIMS Raipur, AIIMS Mangalagiri, Dr. RMLIMS Lucknow.
9	Any other justification for procuring the item from a single source	Combined Cryo Workstation comprises of Cryo technologies with flexible Cryo Probes, Radio Frequency Energy Source with Argon Plasma Energy

I hereby certify that the above item is required to be procured on a proprietary/single-source basis, as the specified brand is the only known source that meets our functional requirements. Given the unique advantages of this brand, an open tender process would not serve any meaningful purpose in this case and can justifiably be waived.

(Strike out whoever is not applicable)

Head of Department

Dr. Suyash Kant
Professor & Head
Department of Respiratory Medicine
King George's Medical University UP, Lucknow
Founder & President, Pulmonary Rehabilitation Society

King George's Medical University UP, Lucknow

Common Equipment Cell

Email: ce@kgmcindia.edu

Reference No. Date:

Proprietary Article Certificate in the following form is to be provided by the Ministry/Department before procuring the goods from a single source under the provision of sub Rule 166 (i) and 1 66 (iii) as applicable.

(I) **The indented goods are manufactured by** M/s Erbe Elektromedizin GmbH, Waldhorenlestrasse 17, D-72072, Tubingen, Germany

Authorized Distributor: M/S Pee Vee Enterprises, 2137/M(8), Canal Road, Indralok Colony, Krishna Nagar, Lucknow

(II) **No other make or model is acceptable for the following reasons:**

It comprises of Cryo technologies with flexible Cryo Probes, Radio Frequency Energy Source with Argon Plasma Energy to perform Biopsies, Recanalization and devitalization.
Supportive for homeostasis of bleeding tissues and devitalization of pathological tissues and stops bleeding.
Non-contact technology (APC + Cryo)

(III) **Concurrence of finance wing to the proposal vide: .....**

(IV) **Approval of the competent authority vide: .....**

(Signature with date and designation of the indenting officer)

Dr. Santosh Kumar
Professor
Department of Respiratory Medicine
King George's Medical University UP, Lucknow

Dr. R. A. S. Kushwaha
Professor
Department of Respiratory Medicine
King George's Medical University UP, Lucknow

Letter of Authority

Date: 25.09.2026

To,
The Finance Officer,
King George's Medical University UP,
Shahmina Road, Chowk, Lucknow, UP- 226003

Dear Sir,

Erbe Medical India Pvt. Ltd, is a 100% subsidiary of Erbe Elektromedizin GmbH Germany who are established and reputable manufacturers of **Electrosurgical Diathermy Units, Advanced Vessel Sealing, Cryo System and other energy solutions viz. Argon Plasma, Waterjet, Smoke Evacuators, Viron X Imaging System and Accessories**. We have our manufacturing at **Erbe Elektromedizin GmbH, Waldhorenlestrasse 17, D-72072, Tubingen, Germany.**

This letter is intended to authorize **M/s Pee Vee Enterprises, 2137/M(8), Canal Road, Indralok Colony, Krishna Nagar, Lucknow 226023** to quote, negotiate and conclude the contract with your institution for the above mentioned products and their accessories originally manufactured by us.

No company or firm individual other than **M/s Pee Vee Enterprises, 2137/M(8), Canal Road, Indralok Colony, Krishna Nagar, Lucknow 226023**, are authorized to tender and conclude the contract for all the goods manufactured by us.

We further guarantee that in the event we change our dealer / Indian agent, we will continue to provide all the services as assured in the tender document and are also as required by the concerned Principal/Director of respective medical college/ Institute as the case may be, through our new dealer / Indian Agent or directly as may be required.

This Authority Letter is valid till **31.12.2027** and will be renewed if required.

Yours Truly
For Erbe Medical India Pvt Ltd

Yash Sharma

Erbe Medical India Pvt. Ltd. New Delhi

Yash Sharma
Tender & Distribution Coordinator

Dr. Rajiv S. Kushwaha Professor Department of Respiratory Medicine King George's Medical University UP Lucknow

Dr. Surya Kant Professor & Head Department of Respiratory Medicine George's Medical University UP Lucknow

Dr. Sarvesh Kumar Professor Department of Respiratory Medicine King George's Medical University UP Lucknow

Dr. Rajiv Garg Professor Department of Respiratory Medicine King George's Medical University UP Lucknow

Erbe Medical India Private Limited

Corporate & Registered office:
Unit No. 393-396, 3rd Floor,
Office Block, Vegas Mall
Sector -14, NSIT, Dwarka
New Delhi – 110078
GSTIN – 07AABCE7430L1ZK

Deutsche Bank AG
Current Acc. No. 5006846000
SWIFT Code: DEUT0916CNN
CIN U33119DL2007PTC429896

Warehouse:
Lower Ground Floor
Sector – 19, Dwarka
New Delhi – 110075
Phone: +91 11 41009808

Branch offices:
Kolkata
Bengaluru
Chennai
Pune

Contact Information:
Web: www.erbe-india.com
E-Mail: erbe@erbe-india.com
Phone: +91 8920936829 (10AM-6PM)
Erbe Care WhatsApp:
+91 8448874998

erbe
power your performance

Proprietary Certificate

To whom it may concern

VIO®3, APC 3, ERBECRYO® 2

This is to certify that the combination of above-mentioned products is a proprietary solution, manufactured by the Erbe Group with Headquarter at Waldhoernlestrasse 17, 72072 Tuebingen, Germany. We are the only manufacturer of these products, and they are not manufactured by any other company elsewhere in the world.

The following modes are proprietary for Erbe VIO®3:



The flexile cryoprobes (20402-401, -402, -410 and -411) are proprietary for the connection with the ERBECRYO® 2 and shall not be connected to any other products.

Date 2025-02-25

Joel Sigle, Business Manager APAC

Joel Sigle

Erbe Elektromedizin GmbH Waldhoernlestraße 17 72072 Tuebingen Germany

Dr. Rajiv Garg
Professor
Department of Respiratory Medicine
King George's Medical University UP, Lucknow

Dr. Santosh Kumar
Professor
Department of Respiratory Medicine
King George's Medical University UP, Lucknow

Dr. Surya Kant
Professor & Head
Department of Respiratory Medicine
King George's Medical University UP, Lucknow
Director & President, Pulmonary Rehabilitation Society

Proprietary Certificate

To whom it may concern

Erbe FiAPC Probes

This is to certify that the listed FiAPC Probes are proprietary products, manufactured by Erbe Elektromedizin GmbH, Waldhoernlestrasse 17, 72072 Tuebingen, Germany and these product are not manufactured elsewhere.

Article No.	Catalogue Description
20132-220	FiAPC probe 1500 A, ø 1.5 mm, flexible, length 1.5 m
20132-221	FiAPC probe 2200 A, ø 2.3 mm, flexible, length 2.2 m
20132-222	FiAPC probe 2200 A, ø 3.2 mm, flexible, length 2.2 m
20132-223	FiAPC probe 3000 A, Ø 2.3 mm, flexible, length 3 m
20132-224	FiAPC probe 2200 SC, ø 2.3 mm, flexible, length 2.2 m
20132-225	FiAPC probe 2200 C, ø 2.3 mm, flexible, length 2.2 m
20132-226	FiAPC probe 3000 A, ø 1.5 mm, flexible, length 3 m

Erbe Elektromedizin GmbH
Waldhoernlestrasse 17
72072 Tuebingen, Germany

Date 2024-01-10

Natalie Zierhut, Business Manager Asia Pacific & Spain

Dr. Rajiv Garg
Professor
Department of Respiratory Medicine
King George's Medical University UP, Lucknow

Dr. R. A. S. Kushwaha
Professor
Department of Respiratory Medicine
King George's Medical University UP, Lucknow

Dr. Sanjay Kant
Professor & Head
Department of Respiratory Medicine
King George's Medical University UP, Lucknow
Founder & President, Pulmonary Rehabilitation Society

Erbe Elektromedizin GmbH, Waldhoernlestrasse 17, 72072 Tuebingen, Germany
Phone +49 7071 755-0, CEO and President: Christian O. Erbe
Fax +49 7071 755-179, Commercial Register Court Stuttgart
info@erbe-med.com, HRB 380187
erbe-med.com, VAT-ID (USt-IdNr.): DE 146893422
Baden-Württembergische Bank
IBAN: DE27 6005 0101 7477 5011 35
BIC: SOLADEST600
Kreissparkasse Tübingen
IBAN: DE54 6415 0020 0000 0001 83
BIC: SOLADES1TUB

Proprietary Certificate

To whom it may concern

Erbe flexible cryoprobes

This is to certify that the listed single-use flexible cryoprobes are proprietary products, manufactured by Erbe Elektromedizin GmbH, Waldhoernlestrasse 17, 72072 Tuebingen, Germany and these product are not manufactured elsewhere.

Article No.	Catalogue Description
20402-401	Flexible cryoprobe, single-use, ø 1.1 mm, with oversheath ø 2.6 mm, length 817 mm
20402-402	Flexible cryoprobe, single-use, ø 1.1 mm, with oversheath ø 2.6 mm, length 757 mm
20402-410	Flexible cryoprobe, single-use, ø 1.7 mm, length 1150 mm
20402-411	Flexible cryoprobe, single-use, ø 2.4 mm, length 1150 mm

Erbe Elektromedizin GmbH
Waldhoernlestrasse 17
72072 Tuebingen, Germany

Date 2022-08-08

Natalie Zierhut, Business Manager APAC & Spain

Dr. Rajiv Garg
Professor
Department of Respiratory Medicine
King George's Medical University UP, Lucknow

Dr. R. S. Kushwaha
Professor
Department of Respiratory Medicine
King George's Medical University UP, Lucknow

Dr. Surya Kant
Professor & Head
Department of Respiratory Medicine
King George's Medical University UP, Lucknow
Founder & President, Pulmonary Rehabilitation Society

Erbe Elektromedizin GmbH Waldhoernlestrasse 17 72072 Tuebingen Germany

Phone +49 7071 755-0
Fax +49 7071 755-179
info@erbe-med.com
erbe-med.com

CEO and President: Christian Erbe
Commercial Register Court Stuttgart
HRB 380137
VAT ID (USt-IdNr.): DE 146833422

Baden-Württembergische Bank
IBAN: DE27 6005 0101 7477 5011 35
BIC: SOLADEST600

Kreissparkasse Tübingen
IBAN: DE54 6415 0020 0000 0001 41
BIC: SOLADES1TUB

erbe
power your performance.

Proprietary Certificate

To whom it may concern

endoCUT® I and Q

This is to certify that the modes endoCUT® I and endoCUT Q for fractionated cutting on erbe VIO electrosurgical units are proprietary products, manufactured by Erbe Elektromedizin GmbH, Waldhoernlestrasse 17, 72072 Tuebingen, Germany and these products are not manufactured elsewhere.

Date 2019-01-21

Michael Reick, Director Business Management

Dr. R. S. Kushwaha
Professor
Department of Respiratory Medicine
King George's Medical University UP, Lucknow

Dr. Rajiv Garg
Professor
Department of Respiratory Medicine
King George's Medical University UP, Lucknow

Dr. Surya Kant
Professor & Head
Department of Respiratory Medicine
King George's Medical University UP, Lucknow
Founder & President, Pulmonary Rehabilitation Society

Dr. Santosh Kumar
Professor
Department of Respiratory Medicine
King George's Medical University UP, Lucknow

Erbe Elektromedizin GmbH Waldhoernlestraße 17 72072 Tuebingen Germany

power your performance

Proprietary Certificate

To whom it may concern

Nessy® Omega

This is to certify that the following products :

20193-082 Nessy Omega, split patient plate
20193-083 Nessy Omega, split patient plate

are specially designed

- with a split-pad effective contact surface 85 cm² + equipotential ring 23 cm²
- and can be applied irrespective of the direction of the operation site

These are proprietary products, marketed exclusively by Erbe Elektromedizin GmbH, Waldhoernlestrasse 17, 72072 Tuebingen, Germany.

April 4, 2018 Michael Reich, Director Business Management

Dr. R. S. Kushwaha
Professor
Department of Respiratory Medicine
King George's Medical University UP, Lucknow

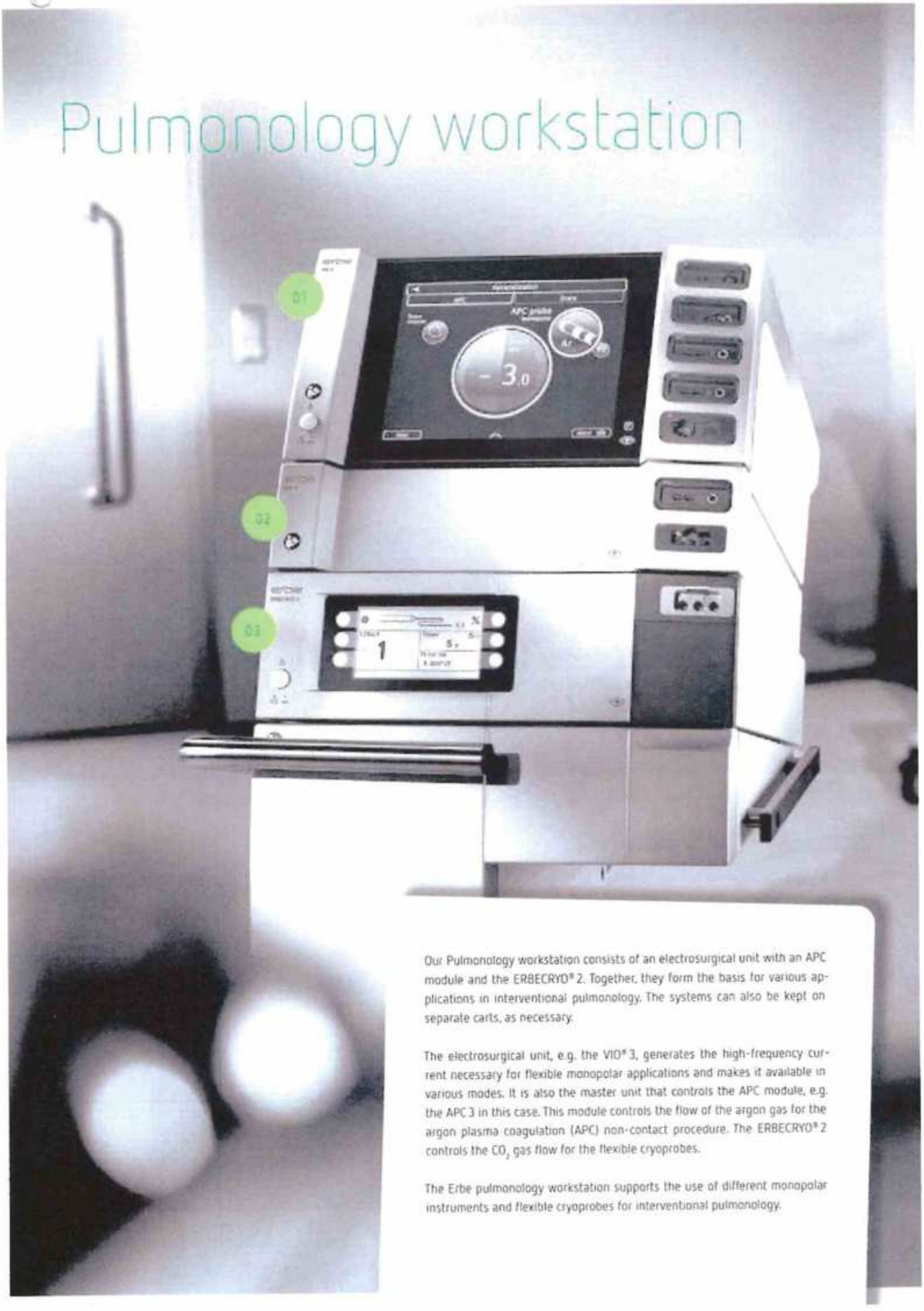
Dr. Rajiv Garg
Professor
Department of Respiratory Medicine
King George's Medical University UP, Lucknow

Dr. Surya Kant
Professor & Head
Department of Respiratory Medicine
King George's Medical University UP, Lucknow
Secretary & President, Pulmonary Rehabilitation Society

Dr. Santosh Kumar
Professor
Department of Respiratory Medicine
King George's Medical University UP, Lucknow

Erbe Elektromedizin GmbH Waldhoernlestrasse 17 72072 Tuebingen Germany

Pulmonology workstation

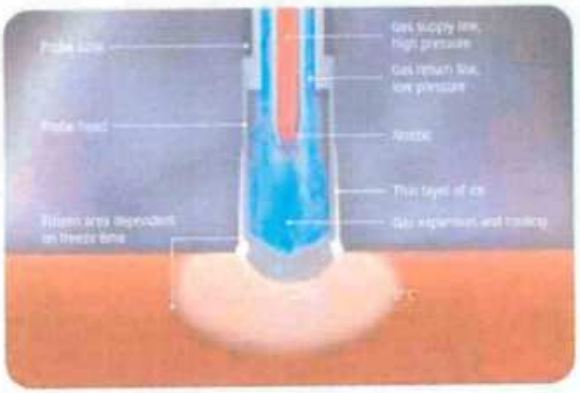


Our Pulmonology workstation consists of an electrosurgical unit with an APC module and the ERBECRYO® 2. Together, they form the basis for various applications in interventional pulmonology. The systems can also be kept on separate carts, as necessary.

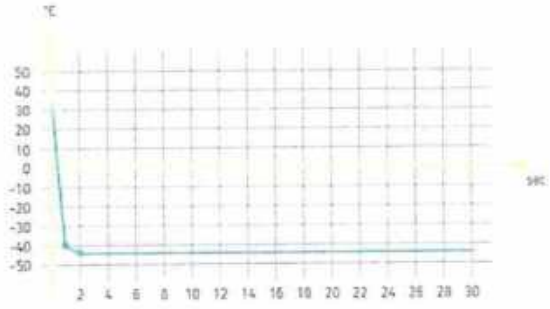
The electrosurgical unit, e.g. the VIO® 3, generates the high-frequency current necessary for flexible monopolar applications and makes it available in various modes. It is also the master unit that controls the APC module, e.g. the APC 3 in this case. This module controls the flow of the argon gas for the argon plasma coagulation (APC) non-contact procedure. The ERBECRYO® 2 controls the CO_2 gas flow for the flexible cryoprobes.

The Erbe pulmonology workstation supports the use of different monopolar instruments and flexible cryoprobes for interventional pulmonology.

Cryosurgery



Gas flow in cross-section of probe tip



Schematic representation of the cooling curve with a 1.7 mm cryoprobe

OPERATING PRINCIPLE OF CRYOTECHNIQUES

The freezing effect of the ERBECRYO® 2 is based on the Joule-Thomson effect: The relaxation (decompression) of certain gases at room temperature, e.g. carbon dioxide, gathers energy from the surrounding area and cools it down. The physical freezing temperature of CO_2 is -78.5°C.[1] However, this is a theoretical value that can be reduced through system characteristics.[1]

FUNCTIONALITY OF THE PROBE

The carbon dioxide flows with high pressure from the gas cylinder to the cryoprobe via the cryosurgical unit. Here, it is conducted via a narrow tube to the hollow tip of the probe. Here the gas enters the probe tip via a nozzle. The gas decompresses during influx due to the large pressure difference between the high-pressure tube and the interior of the probe tip. Here, the Joule-Thomson-Effect very rapidly cools down the tip of the probe. Based on different influencing factors, e.g. cylinder pressure or probe size, temperatures between -35°C and -50°C are possible at the tip of the flexible cryoprobes.[1]
The decompressed gas flows through the probe back to the unit and from there into the surrounding area.

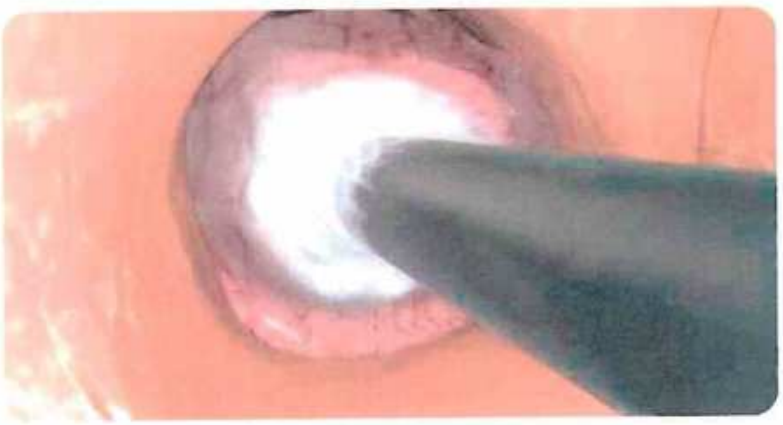
01 **VIO® 3**: Electrosurgical unit supports monopolar applications, such as tumor recanalization and hemostasis.

02 **APC 3**: APC module supports non-contact applications, such as tumor recanalization and hemostasis.

03 **ERBECRYO® 2**: cryosurgical unit supports tumor recanalization, biopsy sampling, foreign body extraction, and devitalization.

Tissue effects of flexible cryoprobes

Upon activation, the ice-cold probe tip enables cryoadhesion and cryodevitalization.



Cryoadhesion during tumor recanalization

CRYOADHESION

Cryoadhesion is used in interventional pulmonology, for example, to recanalize tumors[2], collect tissue biopsies[3], and extract foreign bodies, blood clots, and mucous plugs.[4-5,6,7,10]

A requirement of the adhesion effect is fluid between the tip of the cryoprobe and the to be extracted target (e.g. foreign body, tissue, blood clot or mucous plug). Once this fluid freezes by the cooling effect of the probe tip, the tip is joined to the object via the formation of ice crystals.

The size of the frozen area has a direct effect on the size of the collected tissue samples. It depends on the following factors:

1. **Freeze time:** The longer the freezing process lasts, the more extensive the frozen area becomes on the target tissue or foreign body to be extracted. The frozen area expands rapidly for up to 5 seconds, after which it expands more slowly. From approx. 10 seconds onward, the frozen area only expands very slowly because a thermal equilibrium develops as the heat dissipates and the frozen area isolates the probe tip.[1]

2. **Contact area:** The diameter of the probe is a major influencing factor on the freezing result. The larger the surface area of the active cryoprobe head, the greater the freezing effect per unit of time.[1]

3. **Moisture:** Moisture is required to connect the cryoprobe with the target. The cryoeffect may be reduced if there is too little moisture.[4]

4. **Tissue and foreign body properties:** The properties of the tissue or foreign body have an influence on the cryoeffect. Materials that are organic, soft, and contain water, such as tissue and food, tend to adhere better than hard, smooth, and inorganic materials, such as plastic or metal.[1]

5. **Cylinder pressure and ambient temperature:** The ambient temperature has a direct influence on the cylinder pressure because the temperature of the liquid carbon dioxide correlates with its evaporation pressure. If it is too high, the ERBECRYO® 2 can compensate for this up to 75 bar. The pressure in the gas cylinder has an influence on the cryoeffect. If it is too low, the ERBECRYO® 2 is unable to compensate for this and will lose freeze performance. The ERBECRYO® 2 will notify the user to this effect.



Cryodevitalization

CRYODEVITALIZATION

Cryoprobes are used in interventional pulmonology with the aim to freeze and devitalize tissue. Cold leads to crystallization of intracellular and extracellular fluid. The cell walls are destroyed through the formation of crystals and recrystallization during the thawing process, thus enabling tissue devitalization.

The following factors influence the efficacy of tissue cryodevitalization:

1. **Low freezing temperature:** A potential devitalization of various tissues starts at -10°C. A temperature below -35°C is sufficient for the effective devitalization of most tumor types.[8]

2. **Cooling rate:** The faster the cooling, the more effective the intracellular formation of crystals and thus devitalization. At -10°C to -50°C/min, the intracellular formation of ice crystals is enhanced and thus provides for cell devitalization.[9] The cooling rate of the flexible cryoprobes is over -1,500°C/min[2] and thus more than adequate.

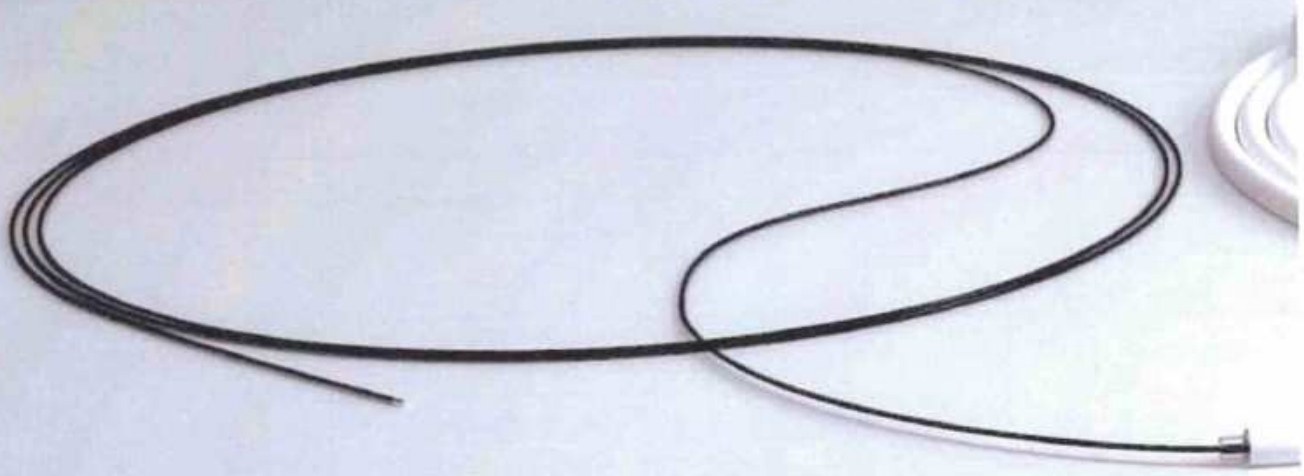
3. **Repetition of freezing and thawing cycles:** Multiple freezing and thawing cycles at the same spot support effective devitalization. Studies have found that a complete devitalization of tumor tissue is enhanced using two cycles or more.[8]

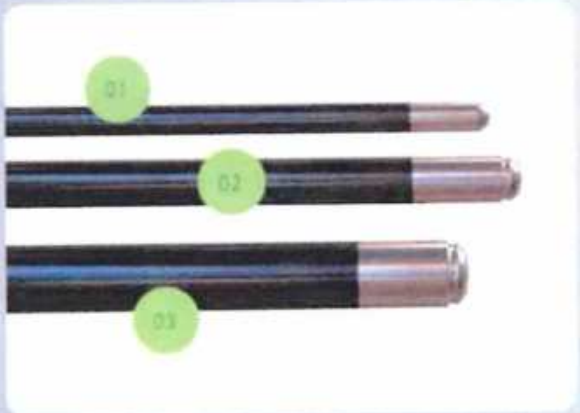
4. **Freeze time:** „The longer, the better" is not necessarily true for devitalization. Studies have found that as little as 20 seconds are sufficient to destroy cells through intracellular formation of ice crystals. In pulmonology, between 20 seconds and 3 minutes are used.[9,10,11]

5. **Thawing rate:** If biological tissue thaws slowly, extracellular recrystallization occurs as well as a change of the extra- and intracellular physiological concentration of saline solution, which contribute to osmotic cell lysis. Therefore, the slowest possible thawing phase, e.g. through pass ve thawing, is recommended.[8]

Flexible cryoprobes

Flexible cryoprobes can be used for various clinical applications, for example, to devitalize tissue and to extract foreign bodies, mucous plugs, blood clots, necrotic tissue, tissue tumors (recanalization), and tissue biopsies.[12]





All three probes are suitable for use with bronchoscopes of corresponding sizes and the 1.1 mm and 1.7 mm probes are compatible with navigation catheters by different manufacturers.

Single-use cryoprobes are available with diameters of 1.1 mm, 1.7 mm and 2.4 mm.

All probe types are suitable for use in the central and peripheral lung region.

01 1.1 mm 02 1.7 mm 03 2.4 mm

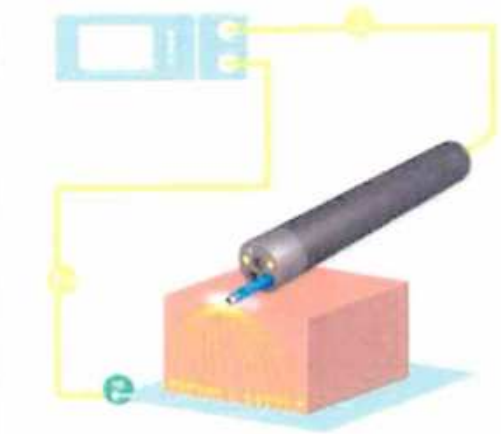


The indications for electrosurgery in interventional pulmonology include, for example, palliative treatment of malignant tumors of the airways or treatment of benign airway obstructions.[23]

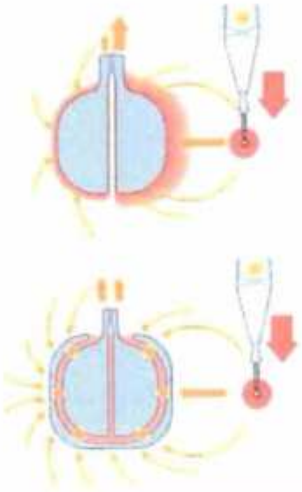
The application of endobronchial electrocautery was first described by Gilfoy in 1932.[24] *With the development of the flexible monopolar technique, electrosurgery has been more widely discussed in the field of interventional pulmonology since the 1980s. Its rising popularity can also be attributed to its wide availability and relatively low costs.*[25]

This section describes the contact procedures, in which direct contact is necessary between the application element and the target tissue. The electrosurgical non-contact procedure of argon plasma coagulation (APC) is described in detail in the next section.

Electrosurgery



Circuit for monopolar electrosurgery



↑ *High current density on the side closest to the operating field in the case of an incorrectly positioned conventional return electrode*

↓ *Distribution of current without a localized increase in temperature with Erbe NESSY® Q, which can be positioned in any direction*

Electrosurgical technique

MONOPOLAR TECHNIQUE

In monopolar electrosurgery, current (I_{HF}) flows in a closed loop, from the unit to the instrument, then through the patient's body to the return electrode (RE), and finally from the return electrode back to the unit. The tissue effect occurs at the contact point between the monopolar instrument and the target tissue. This very small contact area results in a very high current density, which in turn generates the desired thermal tissue effect. Thus, for example, an incision or a coagulation can be performed, depending on the generator setting. The return electrode (NE), has a large surface area and is placed against the patient's skin at an appropriate location in order to discharge the current. The increase in temperature on the large surface of the return electrode is not significant due to the low current density.

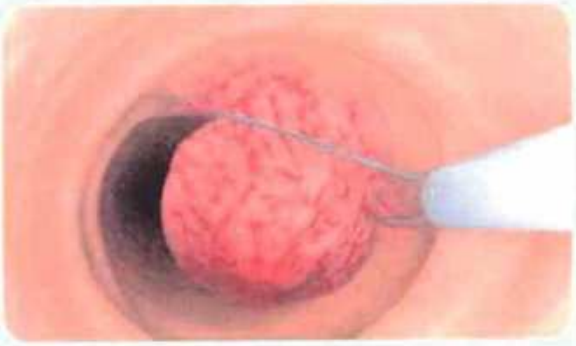
Monopolar electrosurgery can be applied in the case of malignant or benign diseases.[21]

Tissue effects in electrosurgery

The two electrosurgical tissue effects of the monopolar technique include cutting and coagulation. The terms are internationally standardized and uniformly used with available electrosurgical units. Cutting is symbolized by yellow activation elements (e.g. footswitch) and coagulation is symbolized by blue activation elements.



Coagulation



Cutting

COAGULATION

Coagulation current can be used to control bleeding, devitalize tissue, and recanalize tumors.

Heat is produced when electrical energy is converted in the tissue. Cell damage is irreversible at temperatures above 50°C to 60°C. The denaturation of proteins and heating of connective tissue cause a shrinkage effect, which is further reinforced by drying of the tissue and evaporation of tissue fluid.[33]

Different tissue effects are achieved, depending on the generator setting.

CUTTING

Temperatures of 100°C and higher are used in the cutting modes. Intracellular and extracellular fluids vaporize so quickly that the cell membranes and cell formation rupture and the tissue can be sectioned or cut.[34] At voltages of 200 V and up, sparks ignite between electrode and tissue, enabling the tissue to be cut with no considerable resistance. Cutting currents with different characteristics can be used, depending on the generator setting. See also section on electrosurgical modes.



According to international standards, yellow signifies cutting and blue signifies coagulation.

The heating of the tissue by the electrical current flow leads to different tissue effects depending on the temperature reached

THERMAL EFFECTS ON BIOLOGICAL TISSUE

None

Hyperthermia

Initial tissue damage, edema formation, depending on the duration of application, the tissue can recover or die (devitalization)

Devitalization

of the cells, shrinkage of the connective tissue through denaturation with simultaneous hemostasis

Coagulation / Desiccation

Vaporization of the tissue fluid, depending on the speed of vaporization.

→ Tissue shrinkage and tumor reduction through desiccation (drying out)

or

→ Cutting due to mechanical tearing of the tissue

Carbonization

The tissue burns and turns black

Vaporization

Tissue vaporizes due to extreme heat

Source: J. Helfmann, Thermal effects. In: H.-Peter Berlien, Gerard J. Müller (Ed.): Applied Laser Medicine. Published by Springer Verlag, Berlin Heidelberg, 2003.

Electrosurgical cutting and coagulation modes

Electrosurgical units provide various modes for flexible monopolar instruments in interventional pulmonology. We describe below the modes of our VIO® 3 electrosurgical unit that are relevant for interventional pulmonology.

endoCUT® cutting mode

The endoCUT® cutting mode fractionates the cutting process into cutting and coagulation intervals. Here, the tissue is coagulated at and after each cut. The cutting and coagulation cycles can be adjusted individually to minimize bleeding during bronchoscopic incision.

Possible endoCUT® mode settings include the following:

Effect: The effect levels control coagulation between cutting cycles. Greater coagulation is generated with higher effects (e.g. Effect 3) than with lower effects (e.g. Effect 1).

Cutting duration: The cutting duration defines the length of the cut for each cutting cycle. A cutting duration 3 generates a longer cut than a cutting duration 1.

Cutting interval: The cutting interval controls the frequency of cuts per unit of time. The higher the interval setting, the more frequently the incisions per unit of time.

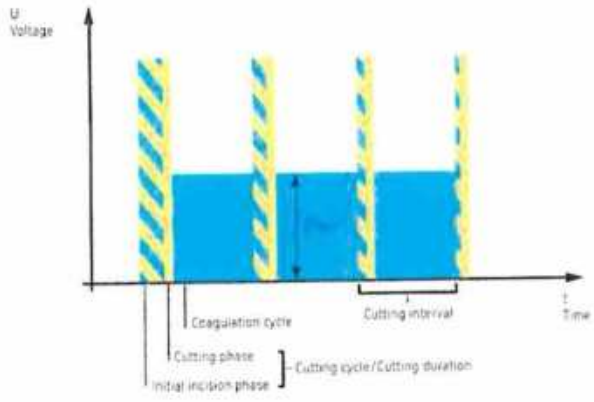
endoCUT® Q



endoCUT® Q is suitable for use with flexible snares as well as flexible needle knives. The mode has a high voltage to generate the greatest hemostasis possible while cutting.[47] This makes it suitable for applications requiring maximum control of bleeding.

endoCUT® I

The endoCUT® I operating principle is comparable to that of the endoCUT® Q, however, the endoCUT® I has a somewhat lower voltage and thus a somewhat lower hemostatic effect.[48] This enables an incision with less lateral tissue damage.



endoCUT® Q cutting sequence with effect, cutting duration, and cutting interval

Coagulation modes

Coagulation modes are used with monopolar forceps or coagulation probes. Like the cutting modes, they require direct contact between the application element and the target tissue. It is described that this results in higher cleaning efforts and a potential loss of efficacy in the case of bleeding.[1] Non-contact methods, such as APC, have the advantage that no adhesion occurs and the instrument does not stick to the target tissue.

softCOAG®



softCOAG® is suitable for coagulation of minor bleedings with a maximum application time of 1 to 2 seconds. The mode is also used to treat airway obstructions. softCOAG® enables a slow, deep coagulation and devitalization without carbonization of the tissue and without spark formation. Adhesion of the instrument is reduced. The activatable autostop function enables an automatic stop, once successful coagulation and desiccation have been achieved.[2]

forcedCOAG®



forcedCOAG® is suitable, for example, for the reduction of exophytic tumors. This coagulation mode provides fast and effective standard coagulation with medium thermal penetration depth. However, an increase in adhesion effects can result from the formation of sparks.

Difference between softCOAG® and forcedCOAG®

softCOAG® and forcedCOAG® differ in their tissue effects. The softCOAG® mode generates a slower coagulation with greater depth effect and limited desiccation properties. forcedCOAG® is the opposite: rapid coagulation with good desiccation properties, are accompanied by less depth effect.

The non-contact procedure of argon plasma coagulation is an alternative to forcedCOAG® with its low penetration depth. Adhesion effects can be avoided here.



Properties of the ERBE COAG modes

Flexible electrosurgical instruments



Polypectomy snare, © medanik



Single-use forceps



Needle knives

SNARES

Electrosurgical resection with snares is suitable for exophytic, pedunculated lesions.[3] The cutting and coagulating effect of the endoCUT® Q-mode is advantageous for this application. The resected tissue can be histologically evaluated.

NEEDLE KNIVES

Needle knives are suitable, for example, for incise benign, fibrotic, web-like stenoses.[3,4,6] Among these instruments, the fractionated cutting process of the endoCUT® can be used.

MONOPOLAR FORCEPS

Monopolar forceps can be used, for example, to control bleeding through coagulation with softCOAG® or forcedCOAG®. Another possible application is the so-called „hot biopsy", where tissue is extracted using the coagulation current in order to prevent bleeding.[3]

COAGULATION PROBES

Flexible coagulation probes are suitable for contact coagulation with the softCOAG® and forcedCOAG® modes. The penetration depth and coagulation speed can be adapted based on the selected mode.



Electrosurgical applications in pulmonology

Flexible monopolar instruments allow tumor recanalization and bleeding management within electrosurgery.

TUMOR RECANALIZATION

Indications for electrosurgery include the treatment of endobronchial malign or benign tumors or post-intubation stenosis.[27] Electrosurgery is often used as an umbrella term for the use of various monopolar instruments.

Unlike with cryodevitalization, photodynamic therapy or brachytherapy, an immediate effect is achievable with electrosurgery in order to reopen the airway.[31] Electrosurgery is contraindicated in cases of extrinsic compression of the airway.[24]

Snares

The use of a monopolar snare is especially suitable in cases of pedunculated tumors. After the snare has been placed around the tumor, the tumor can be severed from the base using coagulation current.[32,33] The snare should not be closed too quickly during removal in order to prevent a purely mechanical resection with no coagulation.[33] Bleedings can be controlled with the snare and a coagulation mode.[25] This enables the majority of the tissue to be removed without damage, making it suitable for subsequent pathological examination.[31]

Needle knives

Cutting modes such as the endoCUT®, which offers additional coagulation, are suitable for monopolar needle knives. Their use is described for web-like stenoses that circumferentially obstruct the airways. Needle knives can be used to perform incisions on these stenoses followed by dilation with a balloon.[34,35] Care should be taken when using needle knives because they can cut through bronchial walls and cartilage.[33] Here, endoCUT® mode enables a stepwise technique with activation using only one button and with coagulation current between each step. Amat et al. used the following endoCUT® I settings: Effect 1, Cutting duration 3, Cutting interval 3.

Coagulation probe or monopolar forceps

Airway obstructions, for example, can be ablated with coagulation probes or monopolar forceps.[35]

Following tissue contact, a soft coagulation current is applied with the coagulation probe or monopolar forceps. Tremblay et al. describe the advantages of the autostop function, which indicates that the coagulation was successful. Without autostop, the whitish discoloration of the tumor indicates successful devitalization. The lesion is treated from the base up and from proximal to distal. Then, the ablated tissue is removed, for example with a forceps or the rigid bronchoscope.

The coagulation instrument should be cleaned regularly during the application in order to maintain conductivity.[25] When working with a coagulation probe, increased caution is recommended so as not to damage the airway wall and cartilage. Detailed knowledge of the anatomy of vascular structures surrounding the airway is also crucial to avoid complications.[25]

Clinical results

The use of flexible coagulation instruments has been described in various publications as effective in patients with airway obstructions.[25]:

- ☑ Suledja et al. describe successful recanalization using coagulation probes in 70 % of cases[37]
- ☑ Tremblay et al. summarize other results involving the use of the electrosurgical instruments described above for malignant airway obstructions. They found successful treatment of malignant airway obstructions in 53 % to 100 % of cases.[25,26]
- ☑ Other authors report success rates of between 70 % and 80 %.[24]

BLEEDING MANAGEMENT

Electrosurgery enables bleeding to be quickly controlled in the case of hemorrhages in the lung.[35,39,36]
Bleeding can be controlled by placing the coagulation instrument on the target tissue and activating the softCOAG™ or forcedCOAG™ mode for a few seconds.

SAFETY

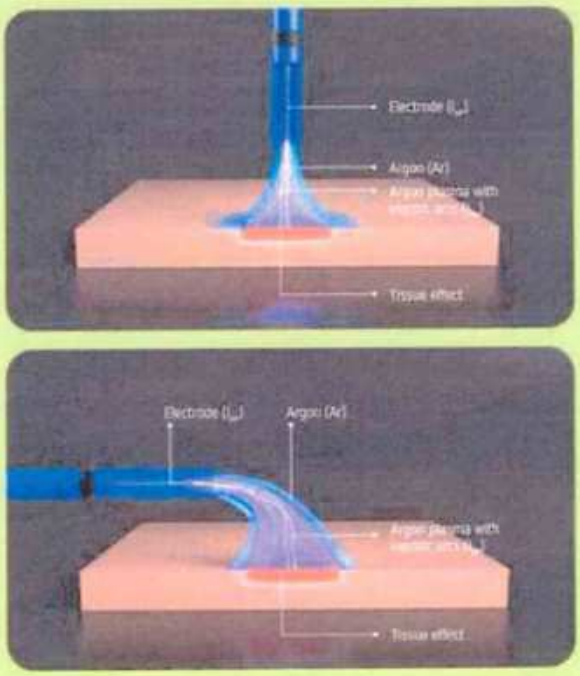
Complications directly related to electrosurgery are rare.[35,26] They include tracheal fire at excessive oxygen concentrations above 40 % and airway perforations when electrosurgery is combined with radiation. Other complications include bleeding, pneumonia, myocardial infarction, stroke and hypoxia.[35,32,26] Tremblay et al. point out that the small number of studies makes it difficult to estimate the exact incidence rate of major complications. It is estimated that these complications occur in less than 5 % of cases when good patient selection practices and attention to detail during the procedures are maintained.[35] Folch et al. estimate the risk of significant bleeding at 2–5 %.[26]

Comparison with laser therapy

The indications for the use of electrosurgery in the lung are identical to those for laser therapy and include palliative treatment of malignant as well as benign airway obstructions.[26,31,32,33] Here, the authors underscore less expensive electrosurgery. Tremblay et al. supplement this with further advantages, such as absence of laser specific safety precautions, lower risk of airway perforation and a steeper learning curve.[35]
Although no randomized studies are available, multiple authors report comparable results with electrosurgery.[37,38]
Bolliger et al. describe electrosurgical contact modes as comparable to Nd-YAG lasers and emphasize that the principle is straightforward and easy to comprehend and use.[38]

Argon plasma coagulation

Argon plasma coagulation (APC) is applied in the lung to coagulate benign and malignant tissue changes, ablate tissue, and control bleeding. Argon plasma coagulation is an expanded application of monopolar electrosurgery. Ionized argon gas (plasma) is used to conduct electric current to the target tissue. APC thus provides a contact-free tissue coagulation and bleeding control. [29,26,27,28,23,25,26,30,32]



Frontal and lateral application of argon plasma coagulation



Circuit for the monopolar APC technique

ARGON PLASMA COAGULATION TECHNIQUE

As in monopolar electrosurgery, current (I_{HF}) flows in a closed loop for APC application: from the unit to the instrument, then through the patient's body to the return electrode (NE), and finally from the return electrode back to the unit. In argon plasma coagulation, electric current is conducted with no contact. The APC unit conducts the argon gas (Ar) via the flexible probe to the tip of the probe, where it exits and flows into the target area. The current (I_{HF}) is transmitted via a metal wire that runs through the probe and transmits the current from the generator to the tip of the probe. The argon gas is ionized at a voltage of approx. 4000 V. A conductive plasma is formed that can transmit the electric current from the tip of the wire in the probe to the target tissue. This transmission takes place in the form of electric arcs with a range of up to 10 mm, depending on the setting.[29] These are transmitted to the site nearest the APC probe tip based on the principle of least resistance, regardless of whether the tissue is in front or to the side of the electrode and regardless of the flow direction of the argon gas. This enables lateral applications with APC.[29,42]

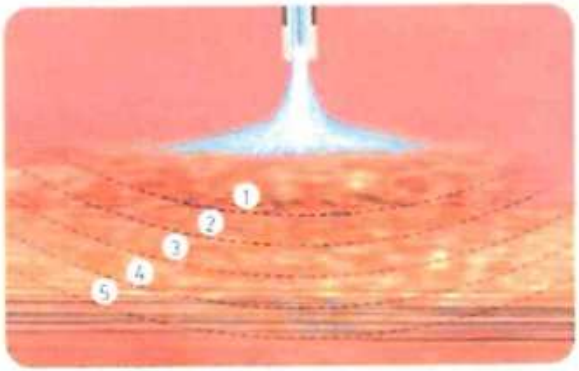
Tissue effects of APC

As in the case of contact coagulation, argon plasma coagulation heats the target tissue with a monopolar flow of current. However, as a non-contact procedure, APC has a lower penetration depth than for example coagulation with softCOAG®, because the effect is self-limiting to a certain degree due to tissue drying (desiccation).[32]

THERMAL EFFECT ZONES

Depending on different influencing factors, the following thermal effect zones arise and propagate radially into the depth:

1. Vaporization: Tissue vaporizes due to extreme heat
2. Carbonization: The tissue burns and turns black
3. Coagulation/Desiccation: The pronounced desiccation effect of APC causes tissue shrinkage that contributes to immediate tumor reduction
4. Devitalization: At higher temperatures, cell devitalization sets in with simultaneous hemostasis through denaturation of proteins
5. Hyperthermia: Depending on the duration of application, the tissue can recover or die (devitalization)



FACTORS INFLUENCING THE TISSUE EFFECT

The following main factors have an influence on APC coagulation. They are listed in order of relevance:[33]

1. Application duration (especially for static application):

The self-limiting effect of APC is due to the drying (desiccation) of the tissue and resulting reduction in conductivity.
However, deeper penetration depths are possible with a longer application duration. The following applies: The longer APC is applied, the deeper the effect on the target tissue.
For this reason, we recommend starting with short activation times and increasing the duration step by step up until the desired tissue effect is achieved under visualization.

2. Power limitation/effect level:

The power limitation should be set on the HF generator depending on localization and size (diameter, depth, convexness) and the lesion to be treated. Low power limitation settings (e.g. 20 watts/effect 2) are suitable for superficial, small lesions. Medium power limitation settings (e.g. 30–40 watts/effect 3–4) are ideal for devitalizing or reducing tumors or to control bleeding. High power limitation settings (e.g. 50 watts/effect 5) are especially suitable for palliative tumor treatment, e.g. for ablation of larger exophytic tumors and for stenosis recanalization.

3. Probe distance to target tissue

The tissue effect decreases with increasing probe distance and ignition breaks down. It is important to ensure that the direction of coagulation is determined by the direction of the argon flow and the shortest distance between the nozzle and the tissue.[19]

4. Static and dynamic application

In the case of longer, static APC application, the depth effect increases greatly. If the application duration is too long, the tissue may be carbonized and perforated. We therefore recommend short activation times of 1 to 2 seconds with static application in superficial lesions. In dynamic application, the APC probe should be moved under visual control in slow, controlled movements (brushstrokes) over the target tissue.

5. APC mode

Different tissue effects are possible, depending on the APC mode setting (see below). They are characterized by different depth effects and varying coagulation and desiccation rates.

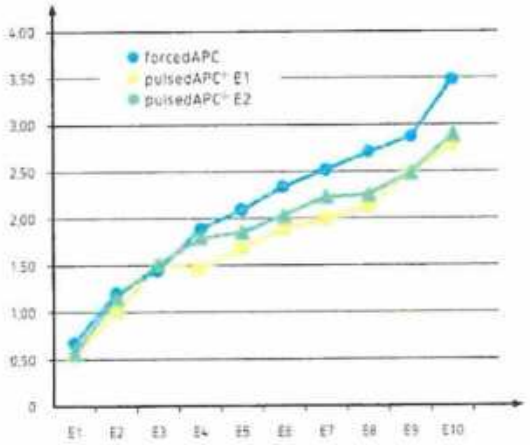
APC modes

Different APC modes are possible, depending on modulation of the electric current. They differ based on their characteristics and can be adjusted depending on methods and desired tissue effect.[1]

Differences in APC modes

The following generally applies: The energy transmission per unit of time with pulsedAPC® Effect 1 and 2 is comparable to that of forcedAPC with the same effect setting. This results in the same coagulation depth per unit of time with static application at one site and with the same effect setting.

However, different modulation and pulses with pulsedAPC® result in varying tissue effects that can be used in different ways with dynamic application. Thus, pulsedAPC® with Effect 1 supports a stepwise technique, while pulsedAPC® with Effect 2 and forcedAPC enable a continuous technique.



Coagulation depth [x-axis in mm] vs. effect setting [y-axis] at an application time of 5 seconds

forcedAPC



This mode for argon plasma coagulation continuously transmits electrical energy to the target tissue. There, it produces effective coagulation with desiccation of the tissue. The depth effect is decreased by the rapid desiccation of the tissue.

pulsedAPC®



This APC mode transmits the electrical energy with a pulsing on/off activation of the argon beam.
pulsedAPC® provides a slow (Effect 1) and fast (Effect 2) mode.

- pulsedAPC®, Effect 1: High energy transmission per pulse with longer pulse pauses
- pulsedAPC®, Effect 2: Higher pulse frequency with lower energy transmission per pulse

The average energy transmission per unit of time is identical for both modes.

APC probes

FiAPC® PROBES

APC probes consist of a thin tube that is introduced via the working channel of a flexible bronchoscope. The tube contains a metal wire that conducts electric current to the tip of the probe, which is equipped with a resistant tungsten electrode. Upon activation, argon gas is released from the tip of the probe and forms the plasma under high voltage that generates the tissue effect.[16] FiAPC® probes for interventional pulmonology by Erbe have a probe diameter of 1.5 mm or 2.3 mm and can be used in the central lung region under visualization. The probes are flexible and have axial, lateral (side fire) and radial (circumferential) beam forms (see below).

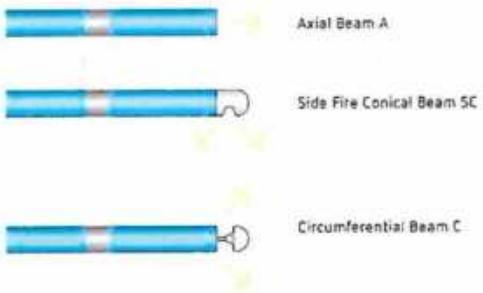
Axial probes are universally applicable and available in 1.5 mm and 2.3 mm. They enable applications in different situations, especially axial applications.

The side-fire variant is available in 2.3 mm and enables a precise application because the argon beam is only directed via a lateral opening.

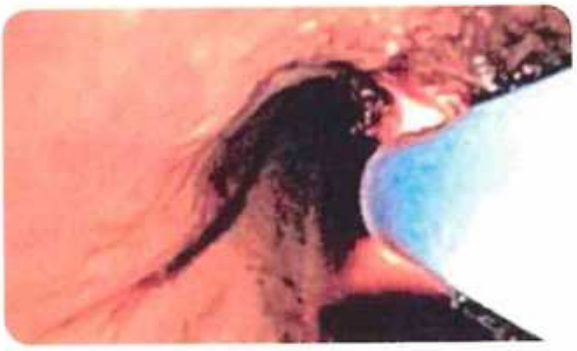
The circumferential beam form is especially suitable for lateral applications. The ceramic head preserves the tissue in front of the probe during application.

The pulsedAPC® or forcedAPC modes described above can be selected for the various applications, such as hemostasis, devitalization or recanalization.

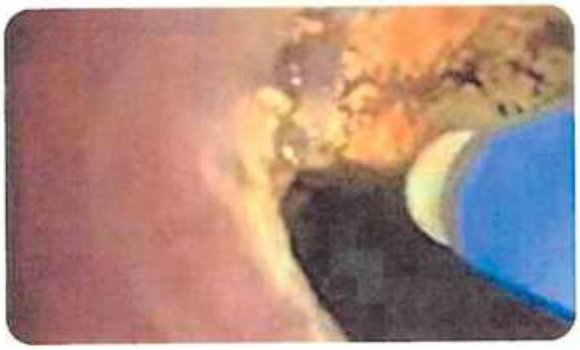




APC applications



Hemostasis



Recanalization

BLEEDING MANAGEMENT

Since 1991, APC in flexible endoscopy has been increasingly used to control bleeding in the gastrointestinal tract.[1] In addition to applications in the field of gastroenterology, APC in flexible bronchoscopy is used to control bleeding in the tracheobronchial tract.[2,9,16,27,28,33,35,39,52] Some authors consider bleeding control as the best indication for flexible APC in the lung[35], others consider it even as the method of choice.[16]

Technique

APC as a non-contact method can be used to control bleeding by using the plasma to coagulate the desired region. In order to control bleeding and in the case of other APC applications, it is important to note that the direction of coagulation is determined by the direction of the argon flow and the shortest distance between the nozzle and the tissue.[35]

Clinical results

The treatment of hemoptysis and control of bleeding with tumors are described as safe and effective.[9,13,40] Reichle et al. describe successful bleeding control in 118 out of 119 patients with the flexible as well as the rigid technique.[35] Morice et al. treated hemoptysis in a group of 56 patients with 100 % successful bleeding control. One of the success factors for patient selection: Bleeding in the central lung region accessible with the bronchoscope.[40]

RECANALIZATION

Endobronchial malignant and benign tumors can be recanalized using flexible APC applications.

Other described applications include:

- Recanalization of occluded stents
- Treatment of fistula conditioning before fibrin adhesion
- Removal of granulation tissue
- Treatment of scarring stenoses

Technique

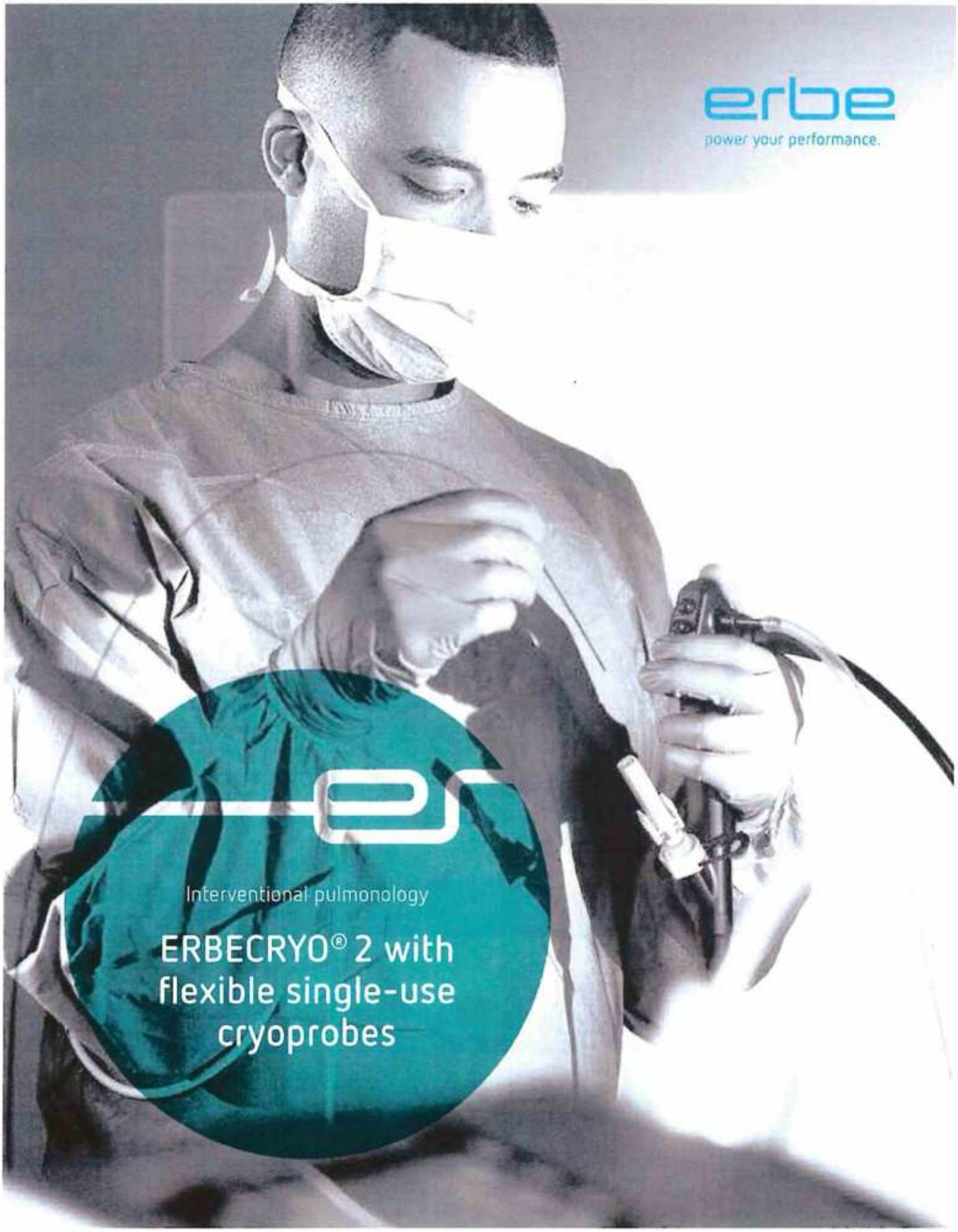
In addition to the properties of APC for tissue desiccation, recanalizations with APC are described in combination with mechanical extraction are described in the literature.[9,40] Here, an APC penetration depth of up to 3 mm is used in order to initially ablate the tumors. The pronounced desiccation effect also causes tissue shrinkage that contributes to immediate tumor reduction. This reduction was up to 50 % in bronchial tumors. The application time was 5 seconds.[16]

Reichle et al. describe the most applications with rigid intubation with jet ventilation and flexible bronchoscopy. Following successful ablation, the devitalized tissue is extracted using the rigid bronchoscope or a forceps.[40] Once the devitalized tissue layer is extracted, the step is repeated. APC is also suitable to control bleeding during the application. Applications with flexible intubation are also described.[35,40]

Depending on the situation, it can be necessary to repeat the bronchoscopy 1-3 days later in order to extract necrotic tissue and fibrin plaques. Follow-up bronchoscopies at 3 months are described as well.[35,40]

Clinical results

The reviewed data revealed successful and complete recanalizations using the technique described above in 67 % of cases with an additional 29 %, in whom a minor reopening of the airways was possible.[35] Other data reveal improved symptoms following recanalization in 98 % (59/60) of cases.[40]


erbe
power your performance.
Interventional pulmonology
ERBECRYO® 2 with flexible single-use cryoprobes

ERBECRYO® 2

the next evolutionary step in interventional pulmonology



Our flexible cryosurgical technology has been adopted in medical practice for more than two decades and continues to evolve as a leading modality in therapeutic and diagnostic applications in pulmonology.

Routine clinical applications include cryoextraction and cryo-devitalization.



Cryoextraction enables the removal of foreign bodies, mucus plugs, blood clots, necrotic tissue, tissue tumors (recanalization) and tissue biopsies.

Cryodevitalization enables destruction of tissue by the application of extreme cold.

The new ERBECRYO® 2 and accessories were developed based on latest requirements in pulmonology and supported by decades of our practical experience in cryosurgery and cryotherapy.

The ERBECRYO® 2 provides several new features introduced to improve clinical convenience for the user and to support state-of-the-art clinical results.[1]

94 %
of the users rate the overall impression and the freezing power as good to very good.[1]

Pulmonology workstation:
VIO® 3 – Electrosurgery
APC 3 – Plasmasurgery
ERBECRYO® 2 – Cryosurgery



Design integration – the pulmonology workstation

The ERBECRYO® 2 can be combined on one cart with our electrosurgical and APC devices. This multi-modular system supports a high level of handling convenience, is space-saving and facilitates multiple applications in interventional pulmonology.

80 %
of clinicians consider, that the plug and operate interface and the error management lead to increased clinical efficiency.[1]

The gas – Carbondioxide only

The ERBECRYO® 2 is designed and optimized to be used with CO_2 gas only. This configuration helps to standardize clinical results worldwide with a non-narcotic, user-friendly gas.[2]

Flow control – improved reproducibility with every probe

The optimal amount of gas which runs through a probe is important for the system's performance. The flow control of the ERBECRYO® 2 provides just as much gas as the probe needs to reach it's maximum freezing power – for every probe size. Furthermore, it saves gas and provides reproducible freezing results which supports standardization.[2]

Technology –
focus on reproducibility

The ERBECRYO® 2 is the next generation of Erbe cryo units and was designed with a focus on improved reproducibility for state-of-the-art flexible cryo applications. Several new features support ease-of-use and enhance the technical and clinical performance.

Plug and operate – system communication

Once connected, the system automatically detects the size of the cryoprobe. The flow control then sets the right parameters for an optimal freezing result based on probe size. Additionally, the gas bottle and footswitch connections are actively monitored.[1,2]

Error management – system feedback

The plug and operate detects malfunctioning connections of all components which lowers the time of searching for errors.
The flow control can detect malfunctions of the unit and the probes which helps to identify the source of failures.[2]

Timer – clinical standardization

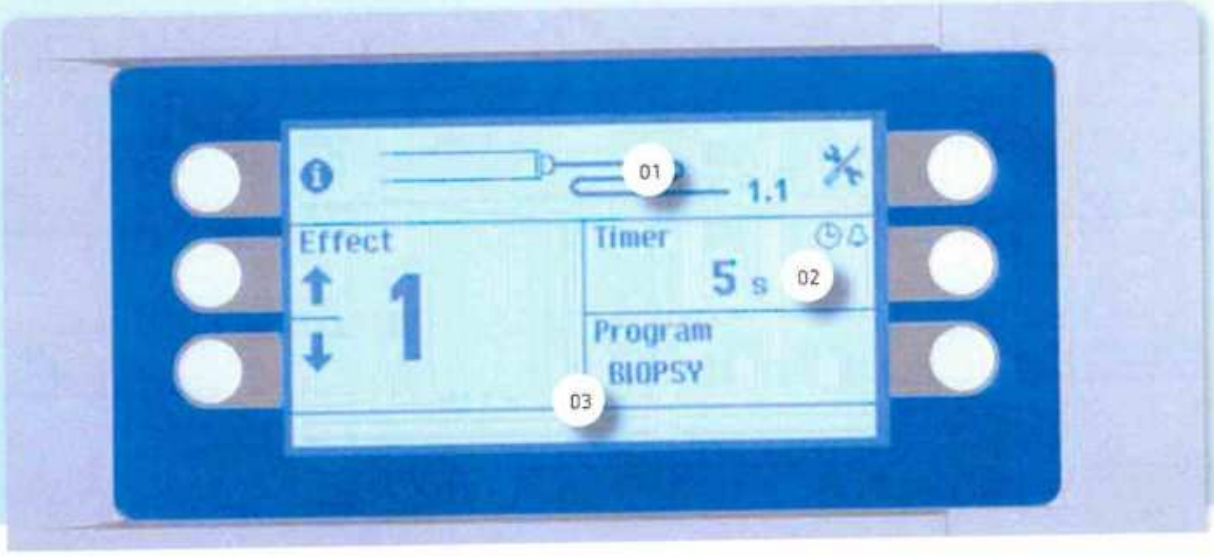
The timer provides visual and acoustic feedback of the freezing time. This supports standardization and reproducibility as the freezing time is a highly relevant factor of cryo target tissue effect.[1,2]

Design – improved convenience

The new socket design allows the connection of the cryoprobes with just one push. The digital display gives the user an overview of all important working parameters.[2]

All important information and setting options are shown on the new digital display:

01 Probe information, e.g. size
02 Visual and acoustic timer
03 Effect and program settings



KING GEORGE'S MEDICAL UNIVERSITY UP, LUCKNOW
DEPARTMENT OF RESPIRATORY MEDICINE
Email:- respiratorymedicinekgmu@gmail.com Mob. No.- +91 800 484 9266

Ref. No.- 1423 */resp./2026* *Date:-* 17 /08 /2026

सेवा में,

फैकल्टी इंचार्ज
कॉमन इक्यूपमेन्ट सेल
किंग जार्ज चिकित्सा विश्वविद्यालय,
लखनऊ।

विषय :– वित्तीय वर्ष 2026–27 में 26–मशीने और सज्जा/उपकरण और सैंयत्र मद में प्राविधानित धनराशि के सापेक्ष उपकरणों को क्रय किये जाने हेतु तकनीकी विशिष्टियां उपलब्ध कराये जाने के सन्दर्भ में।

महोदय,

कृपया अपने पत्र संख्या CE/2026/653 दिनांक 24.07.2026 का सन्दर्भ ग्रहण करें, जिसके द्वारा वित्तीय वर्ष 2026–27 में इस चिकित्सा विश्वविद्यालय में अनुदान संख्या 31, 26–मशीने और सज्जा/उपकरण और सैंयत्र में प्राविधानित राशि के सापेक्ष में अनुमोदित/स्वीकृत उपकरणों के जेम पोर्टल के माध्यम से क्रय हेतु आप द्वारा इन उपकरणों की तकनीकी विशिष्टतायें उपलब्ध कराये जाने हेतु कहा गया है।

अतः उक्त पत्र के माध्यम से स्वीकृत उपकरणों को आधुनिक तकनीकी से रोगियों के उपचार के साथ–साथ शोध कार्य हेतु विभाग की विभागीय समिति के निर्णयानुसार, विभागीय समिति के द्वारा निर्धारित विशिष्टियों के अनुसार तकनीकी विशिष्टतायें आपके अग्रिम कार्यवाही हेतु प्रेषित हैं।

इसके अतरिक्त विभाग के समिति के सदस्यों द्वारा यह भी निर्णय लिया गया कि विभाग के आई0सी0यू0 हेतु एक आई0सी0यू0 मॉनिटरिंग सिस्टम भी स्थापित कराया जाये। अतः यदि संभव हो तो इसी वित्तीय वर्ष में क्रय किये जा रहे उपकरणों के साथ ही विभाग के आई0सी0यू0 हेतु एक आई0सी0यू0 मॉनिटरिंग सिस्टम भी क्रय कराने का कष्ट करें।

धन्यवाद

<u>वाह्य संस्थान से सदस्य :–</u>

1. डा0 अशोक नाथ, विभागाध्यक्ष, एम्स पल्मोनरी मेडिसिन विभाग, पी0जी0आई0, लखनऊ।
2. डा0 एन0के0 वर्मा, विभागाध्यक्ष, रेस्पाइरेट्री मेडिसिन विभाग, एस0एस0एच0, लखनऊ।

भ व दी य

(डा0 सूर्य कान्त)
विभागाध्यक्ष

विभागाध्यक्ष
रेस्पाइरेटरी मेडिसिन विभाग
किंग जॉर्ज चिकित्सा विश्वविद्यालय
लखनऊ

{1/1}

TECHNICAL SPECIFICATION OF CRYO SYSTEM WORK STATION
(1.1) PROBE COMPATABLE WITH EXTRA CYLINDER

1. The unit shall comprise a Cryo System with flexible Cryo Probes for performing biopsies, recanalization and devitalization.
2. The system shall be supplied with an integrated High End RF Electro Surgical Unit for electro-surgical Cut & Coag modes for optimum HF surgical effect, along with a dedicated high-end Argon Plasma Coagulation unit for haemostasis of bleeding tissues and devitalization of pathological tissue using non-contact coagulation technology.
3. The offered equipment shall have the brand name/model number embossed or etched on the equipment and shall be supported by original literature from the Original Equipment Manufacturer (OEM). The OEM Principal Company shall have mandatory regional and head-office support for after-sales service through a dedicated team of trained service engineers/service representatives.
4. Installation and training shall be performed by OEM-trained service engineers/service representatives within 30 days of supply. An installation report shall be submitted on OEM letterhead. Preventive service visits by an OEM-trained service engineer/service representative shall be provided quarterly per year after completion of the warranty period, i.e. 20 visits for the first 05 years, followed by quarterly visits (04 visits/year) until completion of the CMC period.
5. The offered equipment shall strictly comply with an uptime guarantee of 95%. In case of technical snag/failure/breakdown, the response time for inspection by a trained OEM service engineer shall be within 24 hours and repair shall be completed within 05 days. In case of a major breakdown where repair of the unit requires more than a week, a service machine shall mandatorily be provided until the breakdown is rectified, failing which penal action shall be applicable.
6. All offered equipment accessories and consumables shall be from the same Original Equipment Manufacturer (OEM). Demonstration of the offered model at the hospital premises shall be mandatory and shall be provided at OEM cost.
7. The offered Cryo System shall have US-FDA 510 K and European Certificate marking in accordance with the medical devices directive (93/42/EEC), EN60601-1 type: CF & Class I Equipment, Electromagnetic Compatibility Certificate, and ISO Certificate.
8. The Cryo System shall be programmable, have a monochrome display and footswitch activation, and the minimum freezing temperature shall be achieved within 5 seconds. The system shall be mounted on an imported original mobile cart with wire basket and CO2 Cylinder (01 Units), compatible with CO2 gas as coolant and supplied with a gas exhaust connection pipe.
9. The Cryo System shall be flow-controlled for operating gas pressure between 45-65 bar and shall have a facility to count the reprocessing cycle of the instrument.
10. The system shall have Effect Settings up to 5, depending on the type of instruments used, with programmable memory of up to 10 settings and activation through a Foot Switch.
11. The system shall operate at a Frequency of 50/60Hz with a line current of 0.4-0.8 Amp.
12. The Cryo System shall be supplied with various reusable flexible probes and trans bronchial single-use probes. Reusable probes shall have a declared shelf life and shall be recommended for Low Temperature sterilization systems, i.e. Plasma Sterilizer or ETO or Auto cleavable, and shall be compatible with the existing endoscopy system.
13. The Mobile Cryo Work Station shall be capable of synchronization with other compatible Energy Units of the same make and OEM so that it can be used as an Advanced Workstation.

Dr. Darshan Kumar Bajaj
Professor
Department of Respiratory Medicine
King George's Medical University UP, Lucknow

Dr. Ankit Kumar
Associate Professor
Department of Respiratory Medicine
King George's Medical University UP, Lucknow

Dr. Jyoti Bajpai
Associate Professor
Department of Respiratory Medicine
King George's Medical University UP, Lucknow

Dr. Sanjiv Gupta
Professor
Department of Respiratory Medicine
King George's Medical University UP, Lucknow

Dr. Alok N
Professor &
Deptt. of Pulmone
Sanjay Gandhi P
Institute of Medi
Lucknow

14. The Argon Plasma Coagulation system shall be suitable for haemostasis of bleeding tissues and devitalization of pathological tissues, including control of bleeding, using non-contact coagulation technology.
15. Management of bleeding and devitalization of tissue abnormalities shall be achievable through optimal coordination with the RF/ESU generator of the same make.
16. The Argon Plasma Coagulation system shall have automatic parameter setting for various types of instruments and automatic depth-controlled plasma regulation.
17. The system shall have three different APC modes suitable for different indications.
18. Precise APC adjustment shall be possible using the effect settings.
19. Pulsed APC adjustment shall be possible using the parameter power settings.
20. Forced APC adjustment shall be possible using the parameter power settings.
21. The system shall provide an adjustable argon flow rate from 0.lL/min to 8L/min in steps of 0.1L/min, with automatic regulation of the selected flow rate.
22. The system shall have the facility to use Argon Plasma Coagulation and Monopolar Coagulation simultaneously.
23. The system shall have automatic monitoring of flow rate and Argon supply, along with an auto purge facility, and shall have provision for connection to a central gas supply.
24. The system shall provide a visual display of argon gas bottle content and an acoustic alarm when the bottle content reaches a minimum level.
25. The unit shall have a facility for activation through the foot pedal of the Electro Surgical Unit.
26. The system shall have Argon-supported cutting and coagulation capability for use in double balloon endoscopy procedures.
27. The Argon Plasma Coagulation system shall be supplied with the following accessories/consumables: APC 3-button electrosurgical pencil; connecting cable; probes and applicators for both Laparoscopy and open Surgery (02Units); and Argon-assisted cutting instruments (applicators) for open Surgery and laparoscopic Surgery.
28. The supplied Electro Surgical Unit shall be microprocessor-controlled and shall have USFDA and European Certificate marking in accordance with the medical devices' directive (93/42/EEC), Class I Equipment, Electromagnetic Compatibility certificate, and ISO Certificate.
29. The Electro Surgical Unit shall be microcontroller-based and shall automatically adjust power to obtain the desired surgical effect on tissue. All settings shall be controlled by the machine according to the tissue response. Power shall be displayed on the screen with a graph facility showing delivered power.
30. The Electro Surgical Unit shall have cutting and more than 8 Coagulation Modes, namely Auto Cut, High Cut, Dry Cut, Bipolar Cut, Bipolar resection Cut (Saline). Coagulation modes shall include Soft Coagulation, Swift Coagulation, Forced Coagulation, Spray Coagulation, Bipolar soft coagulation, Bipolar forced coagulation, Bipolar resection Coagulation (Saline), Twin Coagulation, Bi-clamp-Bipolar thermo fusion, precise coagulation, and Monopolar Cut & Coagulation Mode. It shall also have two bipolar modes with Auto Bipolar start & stop and Vessel fusion technology, all integrated into one system.
31. The Electro Surgical Unit shall have automatic Power and Voltage regulation to prevent tissue damage and charring. Output voltage shall be regulated at various levels, with LCD Backlight adjustment for good visibility in the operating room. The system shall have patient plate monitoring, audio-visual alarm, and automatic deactivation of output if contact between the patient and patient plate is inadequate, to eliminate the risk of patient burns.
32. The system shall have three different APC modes suitable for different indications.
33. Precise APC adjustment shall be possible using the effect settings.
34. Pulsed APC adjustment shall be possible using the parameter power settings.
35. Forced APC adjustment shall be possible using the parameter power settings.

Dr. Alok Nat
Professor & He
Deptt. of Pulmonary M
Sanjay Gandhi Postgr
Institute of Medical Sc
Lucknow-226014

Dr. Ajay Kumar
Dr. Rajiv Garg
Dr. Jyoti Baijpai
Dr. Ankit Kumar

36. The system shall provide an adjustable argon flow rate from 0.1 L/min to 8 L/min in steps of 0.1 L/min, with automatic regulation of the selected flow rate.
37. The system shall have the facility to use Argon Plasma Coagulation and Monopolar Coagulation simultaneously.
38. The system shall have automatic monitoring of flow rate and Argon supply, connection to central gas supply, and an auto purge facility.
39. The system shall provide a visual display of argon gas bottle content and an Acoustical alarm when the bottle content reaches a minimum level.
40. The unit shall have a facility for activation through the foot pedal of the Electro Surgical Unit.
41. The system shall have Argon-supported cutting and coagulation capability for use in double balloon endoscopy procedures.
42. The system shall have Argon-supported cutting and coagulation capability.
43. The offered Cryo System shall also be supplied with the following:
    a. Flexible probes dia 1.1 mm, Length 1150 mm, with over sheath length 817 mm and over sheath diameter 2.6 mm for trans bronchial procedures – 04 Box.
    b. Flexible probes dia 1.7 mm, Length 1150 mm, for Trans bronchial procedures – 04 Box.
    c. Neutral electrodes/patient plate for Argon Plasma procedures – 02 Box. (50 pieces).
    d. Flexible probes 2.5 mm – 4 box.
    e. Monopolar Cable reusable – 4 pieces.
    f. Argon cylinder – 2 no.
    g. CO2 Cylinder – 2 no.
    h. APC probe all type – 15 pieces each.

GENERAL TERMS AND CONDITIONS:

1. Five years comprehensive unconditional warranty after installation.
2. CMC for five years after completion of 05 years warranty for the equipment, spare parts/accessories used.
3. The supplier shall provide a certificate confirming that the quoted model is the latest and not obsolete, and that spares will be easily available for the next seven years.
4. Warranty and CMC shall be applicable to all spares and accessories except consumables.
5. The demonstration shall be an integral part of the tender process; failing which, the bid may be cancelled.

Dr. Ankit Kumar
Associate Professor
Department of Respiratory Medicine
King George's Medical University UP, Lucknow

Dr. Jyoti Bajpai
Associate Professor
Department of Respiratory Medicine
King George's Medical University UP, Lucknow

DR. AJAY KUMAR
MD, EDRM, FCCP (USA)
PROFESSOR AND HEAD
DEPT. OF RESPIRATORY MEDICINE

Integrated energy and vision systems

King George's Medical University UP, Lucknow

Common Equipment Cell

Email: ce@kgmcindia.edu

Reference No. Date:

PROPRIETARY/ SPECIFIC BRAND GOODS CERTIFICATE

1	Item/ Type/ Model No. required along with specification	**Integrated Energy and Vision Systems**
2	If the item a spare part attachment or accessory for an existing equipment **Yes / No (If yes, provide details)**	No
3	Name of the manufacturers/supplier of the item proposed by the indenter	**M/S Erbe Elektromedizin GmbH**, Waldhorenlestrasse 17, D-72072, Tubingen, Germany **(OEM)** **M/S Pee Vee Enterprises** Lucknow – **Authorized Supplier**
4	Are they sole manufacturers/ sold distributors of the Item **Yes / No**	Yes, Proprietary In Nature- Sole Manufacturers
5	If there any other item with similar/equivalent specification available in the market to meet the job requirement envisaged. Yes / No (If Yes, explain why those alternatives cannot be procured and provide a comparative analysis of the functional advantages/cost-effectiveness of the recommended item)	No
6	Efforts made to locate alternative sources of supply or use of substitutes	As per best of our knowledge offered configuration of various integrated Energy & Vision technologies by single OEM are not available on GeM Portal
7	Why open tender can't be resorted to, for locating alternative source.	Proprietary In Nature as both Energy Source and Vision Source are positioned together in form of EV Station to perform various Open & Lap Surgeries.
8	Are the proprietary items certified to have reasonable rates? **Yes / No (Attach supporting documents, if applicable)**	Yes – The proposed estimated value is in compliance of Purchase Orders issued by various accounts such as KSSSCI Lucknow, KGMU Lucknow
9	Any other justification for procuring the item from a single source	Complete Energy & Vision Platform consists of Radiofrequency Electrocautery Source + Vessel Fusion Source + Kinetic Energy Source + Hydrojet Source + UHD 4K Laparoscopic Tower with Recording Facility of Same OEM is not applicable by other OEM

I hereby certify that the above item is required to be procured on a proprietary/single-source basis, as the specified brand is the only known source that meets our functional requirements. Given the unique advantages of this brand, an open tender process would not serve any meaningful purpose in this case and can justifiably be waived.

(Strike out whoever is not applicable)

Head of Department

King George's Medical University UP, Lucknow

Common Equipment Cell

Email: ce@kgmcindia.edu

Reference No. Date:

Proprietary Article Certificate in the following form is to be provided by the Ministry/Department before procuring the goods from a single source under the provision of sub Rule 166 (i) and 1 66 (iii) as applicable.

(I) **The indented goods are manufactured by** M/s Erbe Elektromedizin GmbH, Waldhorenlestrasse 17, D-72072, Tubingen, Germany

Authorized Distributor: M/S Pee Vee Enterprises, 2137/M(8), Canal Road, Indralok Colony, Krishna Nagar, Lucknow

(II) **No other make or model is acceptable for the following reasons:**

High End E V Station is safest and advanced Energy and Vision Platform, plays vital role for performing Open & Lap Surgeries with golden hours of Surgeon, shorter hospitalization time. Complete Platform consists of: Advanced Energy Platform- Waterjet + Argon Plasma with RF energy Source + Vision Platform; 4K UHD Resolution, 4 CHIP, 4 CMOS White Light with ICG.

(III) **Concurrence of finance wing to the proposal vide: .....**

(IV) **Approval of the competent authority vide: .....**

22/9/16

(Signature with date and designation of the indenting officer)

power your performance.

Proprietary Certificate

To whom it may concern

VIO®3, APC 3, ERBEJET® 2, ERBECRYO® 2, IES 3, ESM 2 & Viron X

This is to certify that the combination of above-mentioned products is a proprietary solution, manufactured by the Erbe Group with Headquarter at Waldhoernlestrasse 17, 72072 Tuebingen, Germany. We are the only manufacturer of these products, and they are not manufactured by any other company elsewhere in the world.

The following modes are proprietary for Erbe VIO®3:

preciseSECT	highCUT bipolar	thermoSEAL®
Optimized exposure as a result of dynamically adapting modulation. Medium coagulation	Smooth incisions, minimum to moderate hemostasis. For bipolar resection in a saline solution	Special COAG mode for sealing highly-vascularized tissue bundles and blood vessels with a diameter of up to 7 mm using appropriate Erbe instruments[1]

erbe

Erbe Elektromedizin GmbH
Waldhoernlestrasse 17
72072 Tuebingen Germany

Date 2024-09-12

Natalie Zierhut, Business Manager Asia Pacific & Sp

Erbe Elektromedizin GmbH P. O. Box 14 20 72004 Tuebingen Germany

July 13, 2026

To whom it may concern

Dear Sir or Madam,

This is to certify that the below listed article codes are proprietary products for which Erbe Vision GmbH, Eisenbahnstraße 102, 78573 Wurmlingen, Germany, is the legal manufacturer. Erbe Vision GmbH is part of the Erbe Group. The products listed below are marketed under the responsibility of Erbe Vision GmbH.

The article codes below are compatible with the Erbe Vision laparoscopic camera systems designed for use with rigid rod-lens endoscopes.

S.No	Cat No	Product Description
1	20862-000	Endoscope for hysteroscope, Ø 4 mm, 0°, HD, working length 300 mm;
2	20862-001	Endoscope for hysteroscope, Ø 4 mm, 12°, HD, working length 300 mm;
3	20862-002	Endoscope for hysteroscope, Ø 4 mm, 30°, HD, working length 300 mm;
4	20862-003	Endoscope for hysteroscope, Ø 4 mm, 70°, HD, working length 300 mm;
5	20862-004	Endoscope for hysteroscope, Ø 2.9 mm, 0°, HD, working length 300 mm;
6	20862-005	Endoscope for hysteroscope, Ø 2.9 mm, 12°, HD, working length 300 mm;
7	20862-006	Endoscope for hysteroscope, Ø 2.9 mm, 30°, HD, working length 300 mm;
8	20864-000	Endoscope for cystoscope, Ø 4 mm, 0°, HD, working length 300 mm;
9	20864-001	Endoscope for cystoscope, Ø 4 mm, 12°, HD, working length 300 mm;
10	20864-002	Endoscope for cystoscope, Ø 4 mm, 30°, HD, working length 300 mm;
11	20864-003	Endoscope for cystoscope, Ø 4 mm, 70°, HD, working length 300 mm;

The following features are characteristics for Erbe Endoscopes.

- Scratch resistance is achieved by the sapphire glass–covered tip of the rigid endoscope.
- Mechanical stability is achieved by the triple tube design of the rigid endoscope.
- Durable sealing is achieved by laser welding of the optical system.
- The scopes are compatible with leading manufacturers' camera heads, including Erbe.

Yours faithfully,

Erbe Elektromedizin GmbH
Waldhörnlestraße 17
72072 Tübingen

Joel Sigle
Business Manager India
Erbe Elektromedizin GmbH

power your performance.

Proprietary Certificate

To whom it may concern

Erbe VIO® 3, APC 3, IES 3 & Instruments

This is to certify that the VIO® 3, APC 3 and IES 3 are proprietary products, manufactured by Erbe Elektromedizin GmbH, Waldhoernlestrasse 17, 72072 Tuebingen, Germany. We are the only manufacturer of this products and this is not manufactured by any other company elsewhere in the world.

The following technologies are proprietary for Erbe VIO®3 and APC 3:

Power electronics: Regulated power supply adapter improves power output especially with high and varying impedance loads, e.g. during bipolar resection.

Multiprocessor technology: 15 processors facilitates superior system performance

Latest digital signal processors: 25 million measurements per second improves reproducibility of the tissue effect.

Connection options: When using APC 3, you can extend your options and insert up to 6 instruments of your choice.

Our modes are regulated to a constant voltage level continually adapting output power to changing parameters to achieve reproducible tissue effects.

Following modes are available with Erbe VIO®3 and APC 3:

CUT modes

- autoCUT
- highCUT
- dryCUT®
- autoCUT bipolar
- highCUT bipolar
- thermoSECT
- endoCUT® Q
- endoCUT® I
- endoCUT® U

COAG modes

- preciseSECT
- swiftCOAG®
- softCOAG®
- forcedCOAG®
- sprayCOAG®
- twinCOAG®
- softCOAG® bipolar
- forcedCOAG® bipolar
- thermoSEAL®
- biCLAMP
- forcedAPC
- pulsedAPC®
- preciseAPC®
- moveAPD®
- senseAPD®

The high-end electrosurgical device Erbe VIO® 3, with argon plasma coagulation system APC 3 and the smoke evacuation system IES 3 - in combination with the below listed instruments, form a proprietary system.

Instruments for VIO® 3 &APC 3

- BiClamp®
- Bipolar Forceps
- BiClamp® knife 220
- Electrosurgical Pencil
- FiAPC® probes
- FIAPC® plus probes
- APCapplicator
- TriSect rapide®

Instruments and Accessories for IES 3

- Smoke evacuation pencil
- Clip-On handle for smoke evacuation
- Main filter cartridge IES 3
- Prefilter for smoke evacuation
- Self-sealing water trap
- LAP tubing set for IES 3
- Smoke evacuation tubing for open surgical application

Date 2026-06-15

Maik Luz, Global Sales Support

Proprietary Certificate

To whom it may concern

Erbe Bipolar PREMIUM Forceps

This is to certify that the listed Bipolar PREMIUM Forceps are proprietary products, manufactured by Erbe Elektromedizin GmbH, Waldhoernlestrasse 17, 72072 Tuebingen, Germany and these product are not manufactured elsewhere.

Article No.	Catalogue Description
20195-501	Bipolar forceps PREMIUM, straight, tip 0.2 mm, pointed, length 120 mm
20195-502	Bipolar forceps PREMIUM, straight, tip 0.4 mm, very fine, length 120 mm
20195-503	Bipolar forceps PREMIUM, straight, tip 0.7 mm, fine, length 120 mm
20195-504	Bipolar forceps PREMIUM, straight, tip 0.7 mm, fine, angled, length 120 mm
20195-505	Bipolar forceps PREMIUM, straight, tip 0.2 mm, pointed, length 185 mm
20195-506	Bipolar forceps PREMIUM, straight, tip 0.4 mm, very fine, length 185 mm
20195-507	Bipolar forceps PREMIUM, straight, tip 0.7 mm, fine, length 185 mm
20195-508	Bipolar forceps PREMIUM, straight, tip 1 mm, blunt, length 185 mm
20195-509	Bipolar forceps PREMIUM, straight, tip 1 mm, blunt, angled, length 185 mm
20195-510	Bipolar forceps PREMIUM, straight, tip 0.2 mm, pointed, length 200 mm
20195-511	Bipolar forceps PREMIUM, straight, tip 0.4 mm, very fine, length 200 mm
20195-512	Bipolar forceps PREMIUM, straight, tip 1 mm, blunt, length 200 mm
20195-513	Bipolar forceps PREMIUM, straight, tip 1 mm, blunt, angled, length 200 mm
20195-514	Bipolar forceps PREMIUM, straight, tip 2 mm, blunt, angled, length 200 mm
20195-515	Bipolar forceps PREMIUM, straight, tip 2 mm, blunt, length 230 mm
20195-516	Bipolar forceps PREMIUM, straight, tip 1 mm, blunt, angled, length 260 mm
20195-517	Bipolar forceps PREMIUM, straight, tip 2 mm, angled, length 260 mm
20195-518	Bipolar forceps PREMIUM, straight, tip 2 mm, blunt, length 280 mm e.g. for urology
20195-531	Bipolar forceps PREMIUM, bayonet, tip 0.2 mm, pointed, length 155 mm
20195-532	Bipolar forceps PREMIUM, bayonet, tip 0.4 mm, very fine, length 155 mm
20195-533	Bipolar forceps PREMIUM, bayonet, tip 0.7 mm, fine, length 155 mm
20195-534	Bipolar forceps PREMIUM, bayonet, tip 0.2 mm, pointed, length 170 mm
20195-535	Bipolar forceps PREMIUM, bayonet, tip 1 mm, blunt, length 170 mm
20195-536	Bipolar forceps PREMIUM, bayonet, tip 0.4 mm, very fine, length 200 mm
20195-537	Bipolar forceps PREMIUM, bayonet, tip 0.7 mm, fine, length 200 mm
20195-538	Bipolar forceps PREMIUM, bayonet, tip 1 mm, blunt, length 200 mm
20195-539	Bipolar forceps PREMIUM, bayonet, tip 1.2 mm, blunt, length 200 mm
20195-540	Bipolar forceps PREMIUM, bayonet, tip 2 mm, blunt, length 200 mm
20195-541	Bipolar forceps PREMIUM, bayonet, tip 1.2 mm, blunt, length 200 mm angled downwards
20195-542	Bipolar forceps PREMIUM, bayonet, tip 1.2 mm, blunt, length 200 mm angled upwards

20195-543	Bipolar forceps PREMIUM, bayonet, tip 0.2 mm, pointed, length 230 mm
20195-544	Bipolar forceps PREMIUM, bayonet, tip 0.4 mm, very fine, length 230 mm
20195-545	Bipolar forceps PREMIUM, bayonet, tip 0.7 mm, fine, length 230 mm
20195-546	Bipolar forceps PREMIUM, bayonet, tip 1 mm, blunt, length 230 mm
20195-547	Bipolar forceps PREMIUM, bayonet, tip 1.2 mm, blunt, length 230 mm
20195-548	Bipolar forceps PREMIUM, bayonet, tip 0.7 mm, fine, length 230 mm angled upwards
20195-549	Bipolar forceps PREMIUM, bayonet, tip 1.2 mm, blunt, length 230 mm angled upwards
20195-550	Bipolar forceps PREMIUM, bayonet, tip 0.7 mm, fine, length 230 mm angled downwards
20195-551	Bipolar forceps PREMIUM, bayonet, tip 0.2 mm, pointed, length 250 mm
20195-552	Bipolar forceps PREMIUM, bayonet, tip 0.4 mm, very fine, length 250 mm
20195-553	Bipolar forceps PREMIUM, bayonet, tip 0.7 mm, fine, length 250 mm
20195-554	Bipolar forceps PREMIUM, bayonet, tip 1 mm, blunt, length 250 mm
20195-555	Bipolar forceps PREMIUM, bayonet, tip 1.2 mm, blunt, length 250 mm
20195-556	Bipolar forceps PREMIUM, bayonet, tip 0.7 mm, fine, length 250 mm angled upwards
20195-557	Bipolar forceps PREMIUM, bayonet, tip 0.7 mm, fine, length 170 mm
20195-558	Bipolar forceps PREMIUM, bayonet, tip 2 mm, blunt, length 250 mm
20195-559	Bipolar forceps PREMIUM, bayonet, tip 2mm, blunt, length 170 mm
20195-560	Bipolar forceps PREMIUM, bayonet, tip 0.2 mm, pointed, length 200 mm
20195-561	Bipolar forceps PREMIUM, bayonet, tip 2 mm, blunt, length 230 mm

erbe

Erbe Elektromedizin GmbH
Waldhoernlestrasse 17
72072 Tuebingen, Germany

Date 2021-02-18

Natalie Zierhut, Business Manager Asia Pacific

Erbe Elektromedizin GmbH Waldhoernlestrasse 17 72072 Tuebingen Germany

Phone +49 7071 755-0
Fax +49 7071 755-179
info@erbe-med.com
erbe-med.com

CEO and President: Christian O. Erbe
Commercial Register Court Stuttgart
HRB 380197
VAT ID (USt-IdNr.): DE 146893422

Baden-Württembergische Bank
IBAN: DE27 6005 0101 7477 5011 35
BIC: SOLADEST600

Kreissparkasse Tübingen
IBAN: DE54 6415 0020 0000 0001 41
BIC: SOLADES1TUB

erbe
power your performance

Proprietary Certificate

To whom it may concern

Nessy® Omega

This is to certify that the following products :

20193-082 Nessy Omega, split patient plate
20193-083 Nessy Omega, split patient plate

are specially designed

- with a split-pad effective contact surface 85 cm² a concentral ring 33 cm²
- and can be applied irrespective of the direction of the operating tip

These are proprietary products, marketed exclusively by Erbe Elektromedizin GmbH, Waldhoernlestrasse 17, 72072 Tuebingen, Germany.

April 4, 2018 Michael Reick, Director Business Management

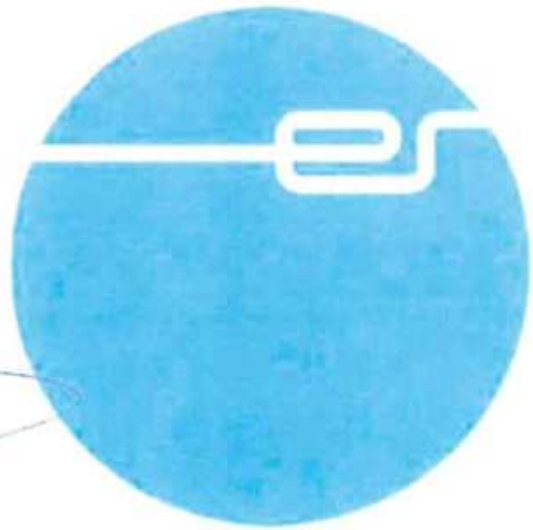
power your performance.

Proprietary Certificate

To whom it may concern

endoCUT® I and Q

This is to certify that the modes endoCUT® I and endoCUT Q for fractionated cutting on erbe VIO electrosurgical units are proprietary products, manufactured by Erbe Elektromedizin GmbH, Waldhoernlestrasse 17, 72072 Tuebingen, Germany and these products are not manufactured elsewhere.



Date 2019-01-21

Michael Reick, Director Business Management

Erbe Elektromedizin GmbH Waldhoernlestraße 17 72072 Tuebingen Germany

erbe
power your performance.

Proprietary Certificate

To whom it may concern

Bipolar Instruments

This is to certify that the following products :

- 20195-132 Bipolar LAP forceps, Maryland, deep ribbed, shaft ø 5 mm, length 340 mm
- 20195-133 Bipolar LAP forceps, fenestrated, deep ribbed, shaft ø 5 mm, length 340 mm
- 20195-081 Bipolar fixation forceps, shaft ø 5 mm, insulated, length 230 mm
- 20195-226 Bipolar LAP scissors, Metzenbaum, shaft ø 5 mm, length 340 mm

are specially designed to achieve the desired surgical outcomes as stated in the Intended Use (see Notes on Use of each product) in different surgical procedures".

These are proprietary products, marketed exclusively by Erbe Elektromedizin GmbH, Waldhoernlestrasse 17, 72072 Tuebingen, Germany.

2017/05/15

Axel Retzlaff, Director Regulatory Affairs

Erbe Elektromedizin GmbH Waldhoernlestraße 17 72072 Tuebingen Germany

power your performance.

Proprietary Certificate

To whom it may concern

TriSect rapide®

- with VIO® 3 and thermoSECT mode

This is to certify that the below listed variations of TriSect rapide®, with our electrosurgical generator VIO® 3 and the thermoSECT mode, are proprietary products, manufactured by Erbe Elektromedizin GmbH, Waldhoernlestrasse 17, 72072 Tuebingen, Germany. We are the only manufacturer of these products, and they are not manufactured by any other company elsewhere in the world.

- 21195-400 - TriSect rapide 140, single-use, bent 17 mm, shaft length 140 mm
- 21195-401 - TriSect rapide 200, single-use, bent 17 mm, shaft length 200 mm
- 21195-402 - TriSect rapide 350, single-use, bent 17 mm, shaft length 350 mm
- 21195-403 - TriSect rapide 450, single-use, bent 17 mm, shaft length 450 mm

The following technologies are proprietary to Erbes TriSect rapide® dissect and sealing instrument:

- unique **tripolar technology** enables a quick electrical cut without a blade
- **true single step**: grasp, seal and dissect vessels and tissue bundles in a single workflow
- **thermoSECT** mode for simultaneous dissection and sealing
- **softCOAG bipolar** mode for immediate hemostasis, with powerful initial coagulation
- **cooler impact:** reduced thermal spread with lateral spread lower than 1mm

erbe

Erbe Elektromedizin GmbH
Waldhoernlestrasse 17
72072 Tuebingen, Germany

Date 2024-09-30

Natalie Ziemut, Business Manager Asia Pacific & Spain

Erbe Elektromedizin GmbH Waldhoernlestraße 17 72072 Tuebingen Germany

power your performance.

Proprietary Certificate

To whom it may concern

This is to certify that the listed instruments are proprietary products, manufactured by Erbe Elektromedizin GmbH, Waldhoernlestrasse 17, 72072 Tuebingen, Germany and these products are not manufactured elsewhere.

Article No.	Catalogue Description
20150-015	HybridAPC, ø 2.3 mm, length 1.9 m
20150-030	Applicator, straight, ø 6 mm, length 65 mm; with suction, e.g. for liver surgery
20150-031	Applicator, flexible tip, ø 6 mm, length 65 mm; with suction, e.g. for liver surgery
20150-036	Applicator, straight, with monopolar electrosurgical function, ø 6 mm, length 80 mm; with suction, e.g. for liver surgery
20150-038	Applicator, straight, ø 6 mm, length 306 mm; with suction, e.g. for TME
20150-039	Applicator, straight, ø 6 mm, length 180 mm; with suction, e.g. for TME
20150-060	HybridKnife, T-type, full-stream, ø 2.3 mm, length 1.9 m; with connecting plug international (3-Pin)
20150-061	HybridKnife, I-type, full-stream, ø 2.3 mm, length 1.9 m; with connecting plug international (3-Pin)
20150-062	HybridKnife, O-type, full-stream, ø 2.3 mm, length 1.9 m; with connecting plug international (3-Pin)
20150-100	ERBEJET 2 two-pedal foot switch with ReMode, AP & IP X8 equipment
20150-101	ERBEJET 2 one-pedal foot switch with ReMode, AP & IP X8 equipment
20150-301	Pump cartridge plus for ERBEJET 2

Date 2023-09-11

i.A. Manuel Neuburger

Manuel Neuburger, Product Specialist International Sales Support

Proprietary Certificate

Proprietary Certificate

To whom it may concern

Erbe FiAPC Probes

This is to certify that the listed FIAPC Probes are proprietary products, manufactured by Erbe Elektromedizin GmbH, Waldhoernlestrasse 17, 72072 Tuebingen, Germany and these product are not manufactured elsewhere.

Article No.	Catalogue Description
20132-220	FiAPC probe 1500 A, ø 1.5 mm, flexible, length 1.5 m
20132-221	FiAPC probe 2200 A, ø 2.3 mm, flexible, length 2.2 m
20132-222	FiAPC probe 2200 A, ø 3.2 mm, flexible, length 2.2 m
20132-223	FiAPC probe 3000 A, Ø 2.3 mm, flexible, length 3 m
20132-224	FiAPC probe 2200 SC, ø 2.3 mm, flexible, length 2.2 m
20132-225	FiAPC probe 2200 C, ø 2.3 mm, flexible, length 2.2 m
20132-226	FiAPC probe 3000 A, ø 1.5 mm, flexible, length 3 m

erbe

Erbe Elektromedizin GmbH
Waldhoernlestrasse 17
72072 Tuebingen, Germany

Date 2024-01-10

Natalie Ziehut, Business Manager Asia Pacific & Spain

Erbe Elektromedizin GmbH · Waldhoernlestrasse 17 · 72072 Tuebingen · Germany

Phone +49 7071 755-0
Fax +49 7071 755-179
info@erbe-med.com
erbe-med.com

CEO and President: Christian O. Erbe
Commercial Register Court Stuttgart
HRB 380137
VAT ID (USt-IdNr.): DE 146693422

Baden-Württembergische Bank
IBAN: DE27 6005 0101 7477 5011 35
BIC: SOLADEST600

Kreissparkasse Tübingen
IBAN: DE54 6415 0020 0000 0014 41
BIC: SOLADES1TUB

Proprietary Certificate

To whom it may concern

Erbe flexible cryoprobes

This is to certify that the listed single-use flexible cryoprobes are proprietary products, manufactured by Erbe Elektromedizin GmbH, Waldhoernlestrasse 17, 72072 Tuebingen, Germany and these product are not manufactured elsewhere.

Article No.	Catalogue Description
20402-401	Flexible cryoprobe, single-use, ø 1.1 mm, with oversheath ø 2.6 mm, length 817 mm
20402-402	Flexible cryoprobe, single-use, ø 1.1 mm, with oversheath ø 2.6 mm, length 757 mm
20402-410	Flexible cryoprobe, single-use, ø 1.7 mm, length 1150 mm
20402-411	Flexible cryoprobe, single-use, ø 2.4 mm, length 1150 mm

Erbe Elektromedizin GmbH
Waldhoernlestrasse 17
72072 Tuebingen, Germany

Date 2022-08-08

Natalie Zierhut, Business Manager APAC & Spain

erbe

LETTER OF AUTHORITY

To,

The Incharge,
Common Equipment Cell,
King George's Medical University UP,
Lucknow, Uttar Pradesh- 226003

Subject: Letter of Authority for the participation in tenders.

Whereas, **Erbe Medical India Pvt Ltd, Unit no. 393-396, 3rd Floor, Office Block, Vegas Mall, Pocket 1, Sector 14, Dwarka, New Delhi-110078, India** wholly owned subsidiary of **M/S ERBE Elektromedizine GmbH Germany** who are established and reputable manufacturers of **Electro surgical Unit, Argon Plasma Coagulator, Water jet, Surgical Work Station and their accessories,** etc. having production facilities **at Waldhorenlestrasse 17. D-72072 Tubingen** do hereby authorize as Indian Agent **M/S Pee Vee Enterprises – 2137/M (8), Canal Road, Indralok Colony, Krishna Nagar, Lucknow – 226023** to submit a bid, and sign the contract with you against the bid floated for **High End Energy Vision Platform (EV Station), Advanced Surgical Workstation, other Erbe Energy Source and Erbe Accessories** including the above goods manufactured by us.

We hereby extend our full guarantee and warrantee for the above specified goods against the bidding documents for full five years as well as confirm to provide AMC/CMC for next five years after the expiry of guarantee and warrantee period.

No company or firm individual other than **M/S Pee Vee Enterprises, No: 2137/M (8), Canal Road, Indralok Colony, Krishna Nagar Lucknow** are authorized to tenders and conclude the contract for all the goods manufactured by us.

We further guarantee that in the event we change our dealer / Indian agent, we will continue to provide all the services as assured in the tender document and are also as required by the concerned Principal /Director of respective medical college/ Institute as the case may be, through our new dealer / Indian Agent or directly as may be required.

Yours Truly,
For ERBE Medical India Pvt Ltd

Yash Sharma

Erbe Medical India Pvt. Ltd.
New Delhi

Authorized Signatory

Erbe Medical India Private Limited

Corporate & Registered office:
Unit No. 393-396, 3rd Floor
Office Block, Vegas Mall
Sector -14, NSIT, Dwarka
New Delhi – 110078
GSTIN – 07AABCE7430L1ZK

Deutsche Bank AG
Current Acc. No. 5006846000
SWIFT code DEUT0916CNN
CIN U33119DL2007PTC429896

Warehouse:
Lower Ground Floor
Plot No. 447, Pocket B
Sector – 19, Dwarka
New Delhi – 110075
Phone: +91 11 41009808

Branch offices:
Kolkata
Bengaluru
Chennai
Pune

Contact Information:
Web: www.erbe-india.com
E-Mail: erbe@erbe-india.com
Phone: +91 8920936829 (10AM-6PM)
Erbe Care WhatsApp:
+91 8448874998

Technical Specification for Integrated Energy and Vision Systems

Complete EV Surgical Station should comprise of following Energy & Vision Source

A) **RF Energy Platform** -Electro surgery unit with Thermo-fusion (Vessel Sealing)
B) **Argon Plasma Coagulation -** For management of bleeding and devitalization of tissue abnormalities
C) **Water Jet Tissue Dissection System with Suction Module -** For management of separating the different tissue types with their varying elasticity and firmness with the help of adjusted water pressure based on the kinetic energy principle.
D) **Smoke Evacuation Unit** – For taking care of surgical smoke
E) **UHD 4K Camera Head**
F) **UHD 4K Camera Control Unit (CCU)**
G) **4K UHD Telescopes**
H) **4K UHD Medical Grade Monitor 32" (Twin)**
I) **LED Light Source with NIR Imaging & fiber optic Cable**
J) **Illuminator for open surgery ICG procedure**
K) **CO2 Gas Insufflator**
L) **Suction - irrigation pump**
M) **Lap Instruments**

1. RF Energy Platform -Electro surgery unit with Thermo-fusion (Vessel Sealing)

- Radio Frequency Energy Platform High End Electro Surgical Generator unit with Vessel Sealing facility should be microprocessor controlled, US-FDA / European Certificate marked in accordance with the medical devices directive (93/42/EEC) & should comply with the requirement of the medical device directive of class I Equipment and electromagnetic compatibility.
- The Electro surgical generator should be 400-watt touch screen display with 15 digital signal processors.
- Unit should facilitate functions of monopolar, bipolar & vessel sealer with in-built regulated power supply adapter for bipolar resection.
- Special bipolar mode for coagulation of vascular tissue (Vessel Sealing) up to 7 mmwith Reusable / Single use Hand instrument for open as well laparoscopic surgeries & should have US- FDA approval for 7mm Vessel.
- Unit should have a Step guide suggesting appropriate setting configurations for every instrument and application.
- The system should make 25 million measurements / sec for better tissue effect and should measure tissue impedance through power peak system.
- System should have wifi compatibility for future OR integration.
- Unit should be plug & play with 5 or more universal multi-functional sockets to accommodate any instrument.
- System should have remote function to allow user to access 6 sub programs directly from the sterile field.
- Unit should have high cut mode for monopolar modalities.
- Each socket should support the Auto Start function for bipolar instruments.
- Unit should have the facility for socket exchange.

- Unit should have Soft Coagulation mode with quick start function for any open or laparoscopic application.
- Unit should have Precise Sect mode for optimized dissection in open or laparoscopic cases.
- The generator should work on a supply voltage of 100 - 120 VAC & 220 - 240 VAC.
- Power consumption at Max HF power should be 550 watts with max pulse power Consumption of 1600 watts.
- Should have a special Coagulation mode called "Thermoseal" with auto start function for highly vascular zed tissue bundles and vessels up to 7mm diameter and min. burst 360mmHg burst pressure.
- Unit should have an Auto Cut bipolar mode to facilitate bipolar cutting instruments.
- Supply frequency should be in the range of 50 -60 Hz.
- Unit should have the facility to store 1800 programmers' or applications.
- Unit should have the facility to show the active instruments on the screen display.
- The generator should have an inbuilt feature of accessory assignment.
- The unit should have high cut bipolar to facilitate bipolar resectoscopes.
- The generator should be supplied with Argon plasma coagulation unit having forced APC, pulsed APC and precise APC Modes.
- The generator should be supplied with Hydrojet to facilitate use of unique hybrid technology instruments for all Surgical Modalities.
- Unit must be compatible & Supplied with Intelligent smoke evacuation module and suction module from Same OEM.
- Unit should support neutral electrode.

*** Following essential accessories to be supplied as a part of Radio Frequency Energy Platform High End Electro Surgical Generator unit with Vessel Sealing facility from Same Single OEM and Affidavit related to the 100% compliance of offered accessories as per nomenclature mentioned below - single or reusable along with mentioned qty and offered of same O.E.M. should be provided, else bid will be rejected**

a) Water resistant or 100% Washable (IPX8) Footswitch Monopolar & Bipolar both with facility for swapping between programs with mandatory minimum shelf life of 500 Procedure - 1Nos.
b) Reusable Monopolar cable for Endoscopic instruments with mandatory minimum shelf life of 50 -100 Procedures - 2 Nos
c) Reusable Bipolar Cable for reusable bipolar forceps with mandatory minimum shelf life of 50 -100 Procedures - 5 No
d) Reusable Bipolar forcep straight & Bayonet non sticky 02 each with mandatory minimum shelf life of 50-100 Procedures
e) Reusable Thermo-fusion / Vessel Sealing hand instrument for Lap surgeries (for vasculatures up to 7mm) LAP forceps, Maryland, semi-deep ribbed, shaft @ 5 mm, non-adhesive coating, length 340 mm; with connecting cable 4 m and MF plug, complete instrument with mandatory minimum shelf life of 50 - 100Procedures - 2 Nos
f) Reusable Thermo-fusion / Vessel Sealing hand instrument for Open surgeries (for vasculatures up to 7mm) bent 18°, smooth, length 200 mm; with connecting cable 4 m and MF plug, with thermal insulation, for open surgical procedures, e.g., intestinal surgery with mandatory minimum shelf life of 50 - 100 Procedures - 4 Nos.
g) Single Use Tissue Navigation Instrument for Cutting & Sealing both Lap & Open Surgery 10 Pcs each



h) Reusable Bipolar Lap Scissor for Laparoscopic surgery with cable, shaft $ 5 mm, length 350 mm; complete instrument with mandatory minimum shelf life of 50 - 100 Procedures - 02 Nos
i) Single Use hand pencil with Monopolar Electrodes - disposable 100 Pcs to perform 100 procedures
j) Single Use Patient plate with equipotential ring - disposable 100 Pcs to perform 100 procedures
k) Workstation trolley with attached Suction unit from same OEM - 1Nos.

2. Argon Plasma Coagulation

For management of bleeding and devitalization of tissue abnormalities achieved by optimal coordination with RF generator

- Argon Plasma unit should be microprocessor controlled, US-FDA / European Certificate marked in accordance with the medical devices directive (93/42/EEC) & should comply with the requirement of the medical device directive of class I equipment and electromagnetic compatibility.
- The Argon Plasma Coagulation system should have automatic parameters setting for various types of instruments and automatic depth controlled plasma regulation.
- Should have t h r e e different APC modes suitable for different indicationsPrecise APC - adjustment made using the effect settings Pulsed APC - adjustment made using the parameter power settings Forced APC - adjustment made using the parameter power settings.
- Should have Adjustable argon flow rate from 0.1L/min to 8L/ min in steps of 0.1 L /min with automatic regulation of selected flow rate.
- Should have the facility to use Argon plasma coagulation and monopolar coagulation simultaneously.
- Should have automatic monitoring of flow rate and Argon supply and auto purge facility. It should have the facility to connect with central gas supply.
- Should give visual display of argon gas bottle content and should give Acoustic alarm when bottle content reaches a minimum.
- Should have facility for activation of unit by foot pedal of the Electro Surgical unit.
- Should have facility to use in double balloon endoscopy procedures.
- Should have facility for Argon supported cutting and coagulation.

*** Following essential accessories to be supplied as a part of Argon Plasma from Same OEM only.**

a) Argon assisted cutting instrument for open surgery and laparoscopic surgery – 01 Nos each.
b) Imported Argon Cylinder with Pressure reducer - 02 Nos
c) Imported Pressure reducer for argon cylinder - 01 Nos

3. Water Jet Tissue Dissection System

For management of separating the different tissue types with their varying elasticity and firmness with the help of adjusted water pressure based on the kinetic energy principle.

- Water jet Unit should be, US-FDA / European Certificate marked in accordance with the medical devices directive (93/42/EEC) & should comply with the requirement of the medical device directive of class I equipment and electromagnetic compatibility.

- Should have pressure range:1-80 bars & Volume flow:1-65ml/min. It should indicate delivered fluid vol.
- Should adapt any sterile saline solution bag (disposable) as separation medium.
- Should be integrated with Electro surgical workstation with other accessories and facility to connect Monopolar coagulation with the applicator.
- Should have facility to individually configure programs for different surgeries.
- Water jet activation should be via footswitch and Remote facility for switching between two different user settings.
- Should have facility for various applicators to be used in Laparoscopy, flexible endoscopy and open surgeries.

*** Following essential accessories to be supplied as a part of Waterjet energy source from Same OEM only.**

a) Water Jet accessories / applicator for Laparoscopy and open surgery - 02 Nos Each
b) Water Jet pump cart edge - 02 Box (Box of 10 Pcs)

4. Automatic Smoke Evacuation Unit

- The smoke plume evacuation system should be microprocessor controlled, US-FDA / European Certificate marked in accordance with the medical devices directive (93/42/EEC) & Electro Surgical Unit should comply with the requirement of the medical device directive of class I equipment and electromagnetic compatibility.
- The smoke plume evacuation system should be compatible with already installed VIO Surgical Workstation & Electrosurgical Units and should be fitted into same station trolley for smooth functioning and ergonomics.
- The smoke plume evacuation system should be able to extract and filter smoke and aerosol- laden air during surgical procedures & should be also able to filter COVID -19 like viruses and other microorganism present in surgical smoke generated during the procedure.
- The system should have a functional 5.7 inches touch screen display for better visibility& ease of control & display should be able to show settings, operating modes, filter run-time and information messages for the user.
- The System should have Bi-Turbo technology for effective filtration, should have ULPA-15 filter (5 stage filter protection) and active carbon filters & should also have ability to remove 99.9995% of all 0.1µm particles.
- The system filter should have maximum output of 730 l/min & have the ability to give a notification when volume flow of more than 300l/min is reached.
- The system should have ability to be used along with any electrosurgical unit, Laser and ultrasound devices & system should have automatic activation feature, no need of any additional footswitch for activation during monopolar electrosurgical applications.
- The system should display error if filter is not inserted to prevent damage & system should be able to be used in vertical as well as horizontal way as per user needs.
- The system should have the ability to be fixed on the ceiling units (OT pendants) & should have the ability to be used with 2 instruments at the same time during any Surgical Procedures.

- The system should be able to be used in open as well as lap surgical procedures with All required Accessories from same OEM only & system noise development at 100% evacuation should be ≤ 59 dB as must have sound insulation cladding, integrated ducts and airborne sound absorbers for noise insulations.
- The user should be able to set critical features like - suction efficiency, standby suction efficiency as well as standby suction time in both lap and open surgery modes & should have footswitch activation facility for laser and ultrasonic uses during procedure.
- The system should be provided with self-sealing water trap to protect the main filter cartridge from liquids & weight of system should be < 10kgs.
- Service life of the unit filter should be for

- **OPEN SURGERIES**
- 40 hrs at 30% evacuation
- 32 hrs at 60% evacuation
- 25 hrs at 100% evacuation

- The smoke evacuator unit should have an interface to connect it to the Electro Surgery system and should also be used as a "stand alone" unit.
- The unit should have provision to be activated via the interface to the Electrosurgery unit, and the time and type of activation can be selected and stored for every output socket and for every cutting or coagulation mode of each program of the Electro surgery unit.
- The unit should additionally be activated manually using the START / STOP button or the footswitch. Deactivation should be controlled via the interface or by programming an after-run time.
- For safety reasons, an automatic function check of the unit and of the activation components connected to the unit should be performed after the mains switch has been switched on.
- A System display should indicate the filter level.
- The smoke evacuator unit should be supplied with essential accessory Filter Cartridge.
- The smoke evacuator unit should be supplied with essential accessories of same O.E.M
- One pedal foot switch AP & IP 100% waterproof endorsed by IPX8 certification of same O.E.M.

5. UHD 4K Laparoscopy Set with ICG Platform

UHD Camera Head & Camera Control Unit (CCU)

Ultra High-Definition (HD) Laparoscopic camera system should have following features:

- Pure Digital UHD technology with UHD video of 3840 x 2160p native resolution.
- Should have progressive scan technology.
- Consistent use of 16:9 formats for input and output for HDTV function.
- Single CMOS having hi-fidelity image transmission with digital conversion at camera head itself.
- System should be able to optimize all the settings and should have surgery presets for use in different surgeries as per telescope size.
- Should be compatible for remote controlled operation of various features.
- Image Sensor: 3 CMOS, 1 ICG
- AGC Microprocessor controlled.

- Video Outputs HDTV-DVI-D/3GSDI/HDSDI
- Dedicated Full UHD (3840*2160p) medical grade USB recording system for still images and video recording.
- Camera should have function to identify blood vessels using edge & spectral enhancement algorithms.
- Camera settings (e.g., white balance, zoom, gain, sharpness etc.) should be possible directly from the camera head buttons.
- The system should have **digital zoom** and **optional optical zoom** to enhance the quality of image size & cross specialty standardization of the camera system, regardless of the telescope used.
- Should have EU Declaration of conformity

UHD IR Telescope 10mm (0 & 30 degree)

- 4K Optics for better contrast & color reproduction.
- Large field of view and depth of focus.
- Completely distortion free
- Laser welded, Sapphire tip and three tube design. Autoclavable type
- Telescope should have outstanding sharpness at periphery as well as at center of the image.

UHD IR Telescope 5 / 5.5mm (0 & 30 degree)

- HD/ Optics for better contrast & color reproduction.
- Large field of view and depth of focus.
- Laser welded, Sapphire tip and three tube design.
- Completely distortion free
- Autoclavable type and should be supplied with autoclavable tray.

6. ICG

- Should supply with Fluorescence Imaging technology for open procedure and Laproscopic procedure
- Video Processor and Illuminator
- The VPI shall be able to provide the VIS (visible) and NIR (near-infrared) illumination to the surgical endoscope via a flexible light guide simultaneously.
- The VIS light source shall be consisted of light emitting diode array.
- The NIR light source shall be consisted of NIR laser diode array.
- The VPI shall be able to generate simultaneous real-time UHD video color and ICG fluorescence images as an overlay in the same image.
- NIR light source shall be triggered by the button on the camera.
- It shall have an indicator in the monitor when NIR light source is on.
- Video output signals: 2 UHD-SDI, 1 DVI
- It shall be able to convert the video format between UHD-SDI and 3G-SDI.
- The device shall have features for easy use at the front panel for quick operation and setting purpose:
- Illumination button
- White balance button
- Menu setting
- An indication icon shall be shown on the monitor to indicate whether the white balance is completed.

- The device shall be able to generate and display 4 different modes of images on the monitor simultaneously.
- White Light mode - displays the image in white light.
- Black and White Fluorescence mode - displays the NIR Fluorescence image in greyscale and displays others in black.
- NIR and VIS overlay mode - displays the NIR fluorescence which is superimposed in pseudo-color (green) on a white light image
- Color-segmented Fluorescence mode - displays the NIR fluorescence intensities in a color spectrum that is superimposed on a white light image
- Indication icons shall be shown on the monitor to differentiate the 4 modes of display.

7. UHD Monitor – 32"

- It should be supplied with double arm UHD monitor stand with double UHD 4K monitors.
- The Monitor should have a 32" display and full glass front panel.
- The monitor should have a native resolution on 4K ultra high definition (3840 x 2160 pixels).
- The monitor should be of medical grade with ultra-flat compact housing for display and power supply in extremely robust light metal construction.
- The monitor should be maintenance-free with special cooling, completely without mechanical moving parts.
- The monitor should comply with IEC 60601-1: 2012, IEC 60601-1-2:2020.
- The monitor should have a protective panel having aluminum silicate glass with anti- reflective coating and anti-fingerprint coating.
- The monitor should have a color depth of 1.07 billion colors & contrast ratio of 1700:
- The monitor should have Brightness of max. 650 cd/m? & a Viewing angle of 178°/178°
- The monitor should have optical bonding.
- The monitor should have following input Interfaces, 4x SDI-IN (2x max. 12G-capable, 2x max. 3G-capable), 1x 12G-SDI loop through, 2x HDMI 2.0 IN, 1x HDMI 2.0 loop-through.
- The monitor should have integrated OSD settings LED Light Source
- The white light LED source should have a color temperature of 6000K.
- The lamp lifetime of the light source should be greater than 50,000 hours.
- The light source should have automatic or manual dimming method.
- The light source should have a BNC video input connector.
- The light source should have overheating and fibre optic connection safety feature. Light Guide Cable The system should come with an autoclavable fibre optic cable of 4.8 mm diameter, must be Autoclavable: High Resistance protection tube, reduced diameter with high fibre density, Small bending radius for comfortable use, min. 230 cm Length.

8. LED Light Source with NIR Imaging & Fiber Optic Cable

- The Light Source combines white light and near-infrared illumination in a single light source, helping users improve visualization and streamline fluorescence-guided workflows.
- Automatic adjustment of the light spectra (WL/NIR) when used with the Camera Control Unit & Camera

Head System

- Should provide High image fidelity supporting confident surgical decisions (CRI ≥ 90)
- Should provide Laser-free technology, Should reduce the risk of thermal injury, Should improves handling confidence, and supports a safe intraoperative environment
- Should provide same level of anatomical clarity (bulb lifespan approx. 30,000 hrs.)
- It should provide Color rendering index (CRI) 90, Color temperature (white light) Ca. 5400 K
- Should provide number of light outputs 1
- Should provide Illumination technology LED
- The LED life expectancy should have 30,000 h (WL); 30,000 h (NIR)
- The Number of LED´s 2 (1xWL, 1xNIR)
- Power frequency should be 50 / 60 Hz
- Should provide system voltage 100-240 V
- Should have Potential equalization connection
- Should provide maximum power consumption 150 VA
- The dimensions should be (H x W x D) 122.3 x 300 x 394.5 mm
- Weight 6.7 kg
- Should be Classification according to MDR 2017/745) Class I
- Certificate: IEC 60601-1, IEC 60601-1-2, IEC 60601-2-18, CB certificate, Applied part type CF, IP protection class IP20
- Should have facility of Manual cleaning Wipe disinfection possible (mat. resistance)
- Should provide Fiberoptic cable for use with the cold light source offered Length min. 2.5m
- Autoclavable fiber optic cable with a diameter of 4.8 mm
- Adjustable light source
- Monitoring the LED function (e.g. service life if necessary)
- BNC video input connector
- Overheating and fiber optic connection protection
- Automatic exposure control mode that adjusts the aperture depending on the available light
- What status indicators are there on the processor or the light source?
- Automatic switch-off of the light source when the cold light cable is disconnected or mechanical shutter
- LED cold light source with high-performance LEDs for white light applications with high light intensity.
- No use of laser light, thus eliminating the need for any laser safety measures
- Should have EU Declaration of conformity

9. VIRON XO Illuminator

- It should be applied along with working length 150mm.

10. UHD Medical Video Recorder

- Should be a modular and preconfigured system for intraoperative documentation of still images and videos.
- Should record still images and videos in 4K UHD (3860 x 2160)
- Video recording format should be MPEG 4 AVC/H.265
- Still image recording format should be BMP/TIFF/JPEG
- Compatible media should be Internal HDD/Blu-ray disks/DVD/USB stick
- Internal HDD capacity should be at least 4 TB
- Should have basic functions for editing of still images & videos

- Should have integrated file viewer for still images & videos
- Should have structured & clear user guidance to fill patient's data (ID, procedure name, sex, Surgeon's name, etc.), and have access for functions like play, recording start-stop, pause, capture. Supported color system should be PAL, NTSC
- Should have an in-built display monitor or separate HD monitor should be provided which allows to record or capture in real time
- Should have video input signals- 12GSDI, Quad SDI, HDMI
- Should be able to record the fluorescence images
- The system should have supplied with all the accessories and inter component interface devices / switches for integration of system, ready for to interface with the hospital central IT network through LAN.
- Power Supply- 230VAC, 50-60Hz

11. CO2 Insufflator – Indigenous (MII)

- Should have line voltage range of 170-260 volts.
- Should have frequency of 50Hz.
- Should have maximum power consumption up to 75VA.
- Should have CO2 medical grade (USP) insufflations medium.
- The LCD Display should show pressure, gas consumption settings and actual pressure.
- It should have pressure setting range between 1 to 25 mmHg.
- It should have a maximum of 30/40 L/min outlet for CO2 gas flow.
- It should have 3L/min fixed Veress CO2 flow.
- It should have 36-degree Celsius outlet of the trocar end for warmer (only for CO2)
- The unit should have operating environment range of 10 degree Celsius to 40 degree Celsius
- It should have dimensions of 160x330xx330mm
- It should have weight of at least 6 kg.

12. Suction - Irrigation Pump

- The suction irrigation pump should be a single unit.
- It should have a provision to customize/upgrade the user programs through software license keys.
- It should have Touch screen display for easy operation.
- It should have functions for distension, fluid aspiration and irrigation of body cavities.
- It should have monitoring of fluid deficit in laparoscopy.
- It should come with a pressure sensitive and wireless foot switch for easier operation.
- Should have EU Declaration of conformity

13. Should be supplied along with various Lap Instrument (Basic):

S.NO	Description	Qty
1	Insufflation needle Verres, shaft length, 120 mm / 150mm	1
2	Trocar Cannula with pyramidal tip Obturator for use with 10mm instruments, dismantable, Multifunctional valve, Made of Stainless Steel.	2
3	Trocar Cannula with pyramidal tip Obturator for use with 5mm instruments, dismantable Multifunctional valve, Made of Stainless Steel.	2
4	Reducer with silicone latch long, Ø 10.0 – 5mm	1
5	Maryland dissecting forceps, 5 mm, dismentable in three parts, length 330 – 360 mm, monopolar pin for coagulation, without ratchet handle, AUTOCLAVABLE	1
6	Standard Grasping forceps, Atraumatic, 5 mm, dismentable in three parts, length 330 – 360 mm, monopolar pin for coagulation, with ratchet handle (Can be used with or without rachet Both), AUTOCLAVABLE	1
7	Fenestrated Grasping forceps, Atraumatic, 5 mm, dismentable in three parts, length 330 – 360 mm, monopolar pin for coagulation, with ratchet handle (Can be used with or without rachet Both), AUTOCLAVABLE	1
8	Universal Grasping forceps, Atraumatic, 5 mm, dismentable in three parts, length 330 – 360 mm, monopolar pin for coagulation, with ratchet handle (Can be used with or without rachet Both), AUTOCLAVABLE	1
9	Metzenbaum curved Scissors, 5 mm, dismentable in three parts, length 330 – 360 mm, monopolar pin for coagulation, without ratchet handle, AUTOCLAVABLE	1
10	Crocie Olmi Grasping forceps, Atraumatic, 5 mm, dismentable in three parts, length 330 – 360 mm, monopolar pin for coagulation, with ratchet handle (Can be used with or without rachet Both), AUTOCLAVABLE	1
11	Claw forceps, 2 X3 teeth, 10 mm, dismentable in three parts, length 330 – 360 mm, monopolar pin for coagulation, with ratchet handle (Can be used with or without rachet Both), AUTOCLAVABLE	1
12	Monopolar, L-hook tip, HF-port Length 330 – 360 mm working length, AUTOCLAVABLE	1
13	Monopolar, spatula tip, HF-port 330 – 360 mm working length AUTOCLAVABLE.	1
14	Aspiration Needle with Monopolar HF connection 5mm	1
15	HF-cable to all Instruments, monopolar use, generator side 4 mm,	1
16	Suction irrigation Cannula dia. 5 mm non Thumb Controle, AUTOCLAVABLE	1
17	Clip Applicator non rotatable use with 400 clip	1
18	Claw forceps, 2 X3 teeth, 10 mm, length 330 – 360 mm, for with ratchet handle, AUTOCLAVABLE	1

Essential Criteria:

1. Demonstration Optional, Online or Physical or at hospital premises at OEM cost.
2. CMC offered for the quoted equipment should not be more than 5% of the quoted model with not more than 5% escalation per year after completion of CMC period.
3. CMC offered for the quoted equipment must be on OEM letterhead for further years. CMC offered on distributors / vendor letterhead will not be considered.
4. Installation process should be performed by OEM trained service engineer/ service representative on OEM's letter head/ service report, with a mandatory provision of providing preventive service visits of OEM trained service engineer/ service Representative quarterly per year till completion of warranty period (i.e. 20 visits for first five years) and further quarterly visit (04 visits/ year) till the completion of CMC period
5. The installation process must be completed by the OEM/ Service provider within 30 days of supply.
6. The accessories/ consumables utilized during the period of installation process should be taken care FOC by OEM/ Service provider.
7. The equipment complies with the requirement of the Medical Device Directive of class I equipment and Electromagnetic compatibility; all supporting documents must be provided.
8. Equipment should have brand name / model number embossed/ etched on the equipment.
9. In case of technical snag/ failure/ breakdown, the response time for Inspection should be within 24 Hour and repair within 5 days, otherwise provide a service machine until the period of recovery of breakdown of the unit. Failing which will attract penal action as per the decision of the University (Uptime guarantee of 95%).

Dr. Brijesh Mishra
Incharge, Equipment Cell

Dr. Abhishek Saini
Member, Equipment Cell

Dr. Abhinav Sonkar
Head, General Surgery

Dr. Abhijit Chandra
Head, Surgical Gastroenterology

Dr. M.S. Ansari
External Member, SGPGI,LKo

Dr. Durgesh Kumar Pandey
External Member, KSSSCI,LKo

Dr. Sunil Gaba
External Member, PGI Chandigarh

Surgical Workstations

King George's Medical University UP, Lucknow

Common Equipment Cell

Email: ce@kgmcindia.edu

Reference No. Date:

PROPRIETARY/ SPECIFIC BRAND GOODS CERTIFICATE

1	Item/ Type/ Model No. required along with specification	**Surgical Workstation**
2	If the item a spare part attachment or accessory for an existing equipment **Yes / No (If yes, provide details)**	No
3	Name of the manufacturers/supplier of the item proposed by the indenter	**M/S Erbe Elektromedizin GmbH**, Waldhorenlestrasse 17, D-72072, Tubingen, Germany **(OEM)** **M/S Pee Vee Enterprises** Lucknow – **Authorized Supplier**
4	Are they sole manufacturers/ sold distributors of the Item **Yes / No**	Yes, Proprietary In Nature- Sole Manufacturers
5	If there any other item with similar/equivalent specification available in the market to meet the job requirement envisaged. Yes / No (If Yes, explain why those alternatives cannot be procured and provide a comparative analysis of the functional advantages/cost-effectiveness of the recommended item)	No
6	Efforts made to locate alternative sources of supply or use of substitutes	As per best of our knowledge offered configuration of various integrated technologies by single OEM are not available on GeM Portal
7	Why open tender can't be resorted to, for locating alternative source.	Proprietary In Nature as the integrated Surgical Workstation consists of various integrated technologies in single tower which work simultaneously as per surgical procedure. It consists of integrated energy sources such as Electrocautery Source + Vessel Fusion Source + Kinetic Energy with Argon Plazma Source + Hydrojet Source with suction
8	Are the proprietary items certified to have reasonable rates? **Yes / No (Attach supporting documents, if applicable)**	Yes – The proposed estimated value is in compliance of Purchase Orders issued by various accounts such as KSSSCI Lucknow, AIIMS Gorakhpur
9	Any other justification for procuring the item from a single source	Complete Energy Platform consists of Radiofrequency Electrocautery Source + Vessel Fusion Source + Kinetic Energy with Argon Plazma Source + Hydrojet Source with suction for perform various open and lap surgeries of Same OEM is not applicable by other OEM

I hereby certify that the above item is required to be procured on a proprietary/single-source basis, as the specified brand is the only known source that meets our functional requirements. Given the unique advantages of this brand, an open tender process would not serve any meaningful purpose in this case and can justifiably be waived.

(Strike out whoever is not applicable)

Head of Department

King George's Medical University UP, Lucknow

Common Equipment Cell

Email: ce@kgmcindia.edu

Reference No. Date:

Proprietary Article Certificate in the following form is to be provided by the Ministry/Department before procuring the goods from a single source under the provision of sub Rule 166 (i) and 1 66 (iii) as applicable.

(I) **The indented goods are manufactured by** M/s Erbe Elektromedizin GmbH, Waldhorenlestrasse 17, D-72072, Tubingen, Germany

Authorized Distributor: M/S Pee Vee Enterprises, 2137/M(8), Canal Road, Indralok Colony, Krishna Nagar, Lucknow

(II) **No other make or model is acceptable for the following reasons:**

Complete Energy Platform consists of Radiofrequency Electrocautery Source + Vessel Fusion Source + Kinetic Energy with Argon Plazma Source + Hydrojet Source with suction for performing various open and lap surgeries with golden hours of Surgeon, shorter hospitalization time which work simultaneously as per surgical procedure.

(III) **Concurrence of finance wing to the proposal vide: .....**

(IV) **Approval of the competent authority vide: .....**

22/9/26

(Signature with date and designation of the indenting officer)

Technical Specification for Surgical Workstation

An integrated RF, with Argon and Kinetic energy surgical platform which can dissect, coagulate and seal the tissues during open and laparoscopic surgeries. System should comprise of below Type of Module Energies.

1. RF Energy Platform -Electro surgery unit with Thermo fusion (Vessel Sealing)

- Radio Frequency Energy Platform High End Electro Surgical Generator unit with Vessel Sealing facility should be microprocessor controlled, US-FDA & European Certificate marked in accordance with the medical devices directive (93/42/EEC) & should comply with the requirement of the medical device directive of class I equipment and electromagnetic compatibility.
- The Electro surgical generator should be**400-watt touch screen / touch pad display** with 15 digital signal processors.
- Unit should facilitate functions of monopolar, bipolar & vessel sealer with in-built regulated power supply adapter for bipolar resection.
- Special bipolar mode for coagulation of vascular tissue (Vessel Sealing) up to 7 mm with **Reusable / Single useHand instrument** for open as well laparoscopic surgeries & should have US- FDA approval for 7mm Vessel.
- Unit should have a Stepguide suggesting appropriate setting configurations for every instrument and application.
- The system should make **25 million measurements / sec** for better tissue effect and should measure tissue impedance through power peak system.
- System should have wifi compatibility for future OR integration.
- Unit should be plug & play with **4 or more** universal multi-functional sockets to accommodate any instrument.
- System should have remode function to allow user to access **2- 6 sub programs** directly from the sterile field.
- Unit should have high cut mode for monopolar modalities
- Each socket should support the Autostart function for bipolar instruments.
- Unit should have the facility for socket exchange.

- Unit should have Soft Coagulation mode with quick start function for any open or laparoscopic application
- Unit should have Precise Sect mode for optimized dissection in open or laparoscopic cases
- The generator should work on a supply voltage of 100 – 120 VAC & 220 – 240 VAC
- Power consumption at Max HF power should be 550 watts with max pulse power consumption of 1600 watts.
- Should have a special Coagulation mode called "Thermoseal" with auto start function for highly vascularised tissue bundles and vessels upto 7mm diameter and min. burst 360mmHg burst pressure.
- Unit should have an AutoCut bipolar mode to facilitate bipolar cutting instruments.
- Supply frequency should be in the range of 50 -60 Hz.
- Unit should have the **optional facility**to store 1800 programmes or applications.
- Unit should have the facility to show the active instruments on the screen display.
- The generator should have an inbuilt feature of accessory assignment.
- The unit should have high cut bipolar to facilitate bipolar resectoscopes.
- The generator should be supplied with Argon plasma coagulation unit having forced APC, pulsed APC and precise APC modes.
- The generator should be supplied with Hydrojet to facilitate use of unique hybrid technology instruments for all Surgical Modalities.
- Unit must be compatible& Supplied with Intelligent smoke evacuation module and suction module. from Same OEM
- Unit should support neutral electrode.
- **Following essential accessories to be supplied as a part of Radio Frequency Energy Platform High End Electro Surgical Generator unit with Vessel Sealing facilityfrom Same Single OEM and Affidavit related to the 100% compliance of offered accessories as per nomenclature mentioned below – single or reusable along with mentioned qtyand offered of same O.E.M should be provided, else bid will be rejected**

  a) **Water resistant or 100% Washable (IPX8) Footswitch**Monopolar & Bipolar both with facility for swapping between programs with mandatary minimum shelf life

of 500 Procedures – **1Nos.**

b) Reusable Monopolar cable for Endoscopic instruments with mandatary minimum shelf life of 100 Procedures – **2 Nos to perform minimum 100 procedures** by each cable

c) Reusable Bipolar Cable for reusable bipolar forcep with mandatary minimum shelf life of 100 Procedures – **2 Nos, to perform 100 procedures** by each cable

d) Reusable Bipolar forcep straight & Bayonet non sticky 01 each with mandatary minimum shelf life of 100 Procedures – **1 Nos, to perform minimum 50 procedures by both forceps**

e) **Reusable Thermo fusion / Vessel Sealing** hand instrument for **Lap surgeries** (for vasculatures up to 7mm) LAP forceps, Maryland, semi-deep ribbed, shaft ø 5 mm, non-adhesive coating, length 340 mm; with connecting cable 4 m and MF plug, complete instrument with mandatary minimum shelf life of **performimg 50 - 100 Procedures – 2 Nos, to perform 100 procedures**

f) **Reusable Thermo fusion / Vessel Sealing** hand instrument for **Open surgeries** (for vasculatures up to 7mm) bent 18°, smooth, length 200 mm; with connecting cable 4 m and MF plug, with thermal insulation, for open surgical procedures, e.g. **intestinal surgery** with mandatary minimum **shelf life of performimg 50 - 100 Procedures – 2 Nos, to perform 100 procedures**

g) **Single Use Thermo fusion / Vessel Sealing & Cutting Instrument for Open Surgery – Tripolar Tissue Navigation Instrument L- 200 mm bent 17 mm** hand instrument for **Open surgeries**; with connecting cable 4 m and MF plug, – **10 Nos**

h) **Single Use Thermo fusion / Vessel Sealing & Cutting Instrument for Lap Surgery – Tripolar Tissue Navigation Instrument L- 350 mm bent 17 mm** hand instrument for **performing Lap surgeries**; with connecting cable 4 m and MF plug, – **10 Nos**

i) **Reusable Bipolar Lap Scissor** for Laparoscopic surgery with cable, shaft ø 5 mm, length 350 mm; complete instrument with mandatary minimum minimum **shelf life of performimg 50 - 100 Procedures – 1 Nos, to perform minimum 50 procedures**

j) **Single Use Monopolar hand pencil** with Monopolar Electrodes – **100 Nos, to perform minimum 100 procedures**

k) **Single Use Patient plate** with equipotential ring **-100 Pcs to perform minimum 100 procedures**

l) Workstation trolley with attached Suction unit from same OEM – 1Nos.

2. **Argon Plasma Coagulation**

For management of bleeding and devitalization of tissue abnormalities achieved by optimal coordination with RF generator

- Argon Plasma unit should be microprocessor controlled, US-FDA / European Certificate marked in accordance with the medical devices directive (93/42/EEC) & should comply with the requirement of the medical device directive of class I equipment and electromagnetic compatibility.
- The Argon Plasma Coagulation system should have automatic parameters setting for various types of instruments and automatic depth controlled plasma regulation.
- Should have three different APC modes suitable for different indications

  Precise APC – adjustment made using the effect settings

  Pulsed APC – adjustment made using the parameter power settings

  Forced APC – adjustment made using the parameter power settings
- Should have Adjustable argon flow rate from 0.1L/min to 8L/ min in steps of 0.1 L /min with automatic regulation of selected flow rate.
- Should have the facility to use Argon plasma coagulation and monopolar coagulation simultaneously
- Should have automatic monitoring of flow rate and Argon supply and auto purge facility. It should have the facility to connect with central gas supply.
- Should give visual display of argon gas bottle content and should give Acoustic alarm when bottle content reaches a minimum.
- Should have facility for activation of unit by foot pedal of the Electro Surgical unit.
- Should have facility to use in double balloon endoscopy procedures.
- Should have facility for Argon supported cutting and coagulation.
-
- **Following essential accessories to be supplied as a part of Argon Plasma** from Same OEM only.

a) Argon assisted cutting instrument for open surgery and laparoscopic surgery - 01 Nos each
b) Argon Cylinder -02 Nos
c) Imported Pressure reducer for argon cylinder – 01Nos

3. Water Jet Tissue Dissection System with ESM – Suction Module for Water Jet

For management of separating the different tissue types with their varying elasticity and firmness with the help of adjusted water pressure based on the kinetic energy principle.

- Waterjet Unit should be, US-FDA & European Certificate marked in accordance with the medical devices directive (93/42/EEC) & should comply with the requirement of the medical device directive of class I equipment and electromagnetic compatibility.
- Should have pressure range:1–80 bars & Volume flow:1–65ml/min. It should indicate delivered fluid vol.
- Should adapt any sterile saline solution bag (disposable) as separation medium.
- Should be integrated with Electro surgical workstation with other accessories and facility to connect Monopolar coagulation with the applicator
- Should have facility to individually configure programs for different surgeries.
- Water jet activation should be via footswitch and Remote facility for switching between two different user settings.
- Should have facility for various applicators to be used in Laparoscopy, flexible endoscopy and open surgeries.
- **Following essential accessories to be supplied as a part of Waterjet energy source** from Same OEM only.
  a) Water Jet accessories / applicator for Laparoscopy and open surgery – **02 Box (**10 Nos Each)
  b) Water Jet pump cart edge – 02 Box (10 Pcs)

4. Automatic Smoke Evacuation Unit

- The smoke plume evacuation system should be microprocessor controlled, US-FDA and / or European Certificate marked in accordance with the medical devices directive (93/42/EEC) & Electro Surgical Unit should comply with the requirement of the medical device directive of class I equipment and electromagnetic compatibility.
- The smoke plume evacuation system should be compatible with Electrosurgical Units for smooth functioning and ergonomics.
- The smoke plume evacuation system should be able to extract and filter smoke and aerosol- laden air during surgical procedures & should be also able to filter COVID - 19 like viruses and other microorganism present in surgical smoke generated during the procedure.
- The system should have a functional 5.7 inches touch screen display for better visibility& ease of control & display should be able to show settings, operating modes, filter run-time and information messages for the user.
- The System should have Bi-Turbo technology for effective filtration, should have ULPA-15 filter (5 stage filter protection) and active carbon filters & should also have ability to remove 99.9995% of all 0.1µm particles.
- The system filter should have maximum output of 730 l/min & have the ability to give a notification when volume flow of more than 300l/min is reached.
- The system should have ability to be used along with any electrosurgical unit, Laser and ultrasound devices & system should have automatic activation feature, no need of any additional footswitch for activation during monopolar electrosurgical applications.
- The system should display error if filter is not inserted to prevent damage & system should be able to used in vertical as well as horizontal way as per user needs.
- The system should have the ability to be fixed on the ceiling units (OT pendants) & should have the ability to be used with 2 instruments at the same time during any Surgical Procedures.
- The system should be able to used in open as well as lap surgical procedures& system noise development at 100% evacuation should be ≤ 59 dB as must have sound insulation cladding, integrated ducts and airborne sound absorbers for noise insulations.
- The user should be able to set critical features like - suction efficiency, standby suction efficiency as well as standby suction time in both lap and open surgery modes & should have footswitch activation facility for laser and ultrasonic uses during procedure.
- The system should be provided with self-sealing water trap to protect the main filter cartridge from liquids & weight of system should be < 10kgs.
- Service life of the unit filter should be for:
- **OPEN SURGERIES =** 40 hrs at 30% evacuation, 32 hrs at 60% evacuation, 25 hrs at 100% evacuation

- **LAPAROSCOPY SURGERIES** = 80 hrs at 30% evacuation, 60 hrs at 60% evacuation, 25 hrs at 100% evacuations
- The smoke evacuator unit should have an interface to connect it to the Electro Surgery system and should also be used as a "stand alone" unit.
- The unit should have provision to be activated via the interface to the Electro Surgery unit, and the time and type of activation can be selected and stored for every output socket and for every cutting or coagulation mode of each program of the Electro Surgery unit.
- The unit should additionally be activated manually using the START / STOP button or the footswitch. Deactivation should be controlled via the interface or by programming an after-run time.
- For safety reasons, an automatic function check of the unit and of the activation components connected to the unit should be performed after the mains switch has been switched on.
- A System display should indicate the filter level.
- Following essential accessories to be supplied as a part of Smoke Evacuation Unit from Same OEM only.
    a) One pedal foot switch AP & IP 100% water proof endorsed by IPX8 certification of same O.E.M with Automatic Activation Device - 01 Qty
    b) Main Filter for Smoke Evacuation Unit – 02 Qty
    c) Pre filter for smoke evacuator – 45 Pcs

Essential Criteria Mandatory for Technical Qualification Of Bid

Installation process should be performed by OEM trained service engineer/ service representative on OEM's letter head/ service report, with a mandatory provision of providing preventive service visits of OEM trained service engineer/ service representative quarterly per year till completion of warranty period (i.e. 20 visits for first five years) and further quarterly visit (04 visits/ year) till the completion of CMC period. The installation process must be completed by the OEM/ Service provider within 30 days of supply.

The accessories/ consumables utilized during the period of installation process should be taken care FOC by OEM/ Service provider.

Main Equipment as well as offered accessories / consumables should have brand name / model number embossed/ etched on the front side.

Should have strong Installation base with latest Installation report (Not Older than 24 Months) of Surgical Workstation in various government reputed organization such as KGMU / DRRMLIMS / SGPGIMS / AIIMS Delhi/ AIIMS RISHIKESH / R.R Army Delhi.

CMC should be offered by O.E.M letterhead, Installation, training process should be performed by O.E.M trained service engineers at their cost.

Dr. Brijesh Mishra
Incharge, Equipment Cell

Dr. Abhishek Saini
Member, Equipment Cell

Dr. Abhinav A. Sonkar
Head, General Surgery

Dr. Vijay Kumar
Head, Plastic Surgery

Dr. Sandeep Tiwari
Head, Trauma Surgery

Dr. Nisha Singh
Head, Gynae Oncology

Dr. Ankur Verma
External Member, KSSCI,Lko.

Dr. Sunil Gaba
External Member, PGI Chandigarh

Dr. Basant Kumar
External Member, SGPGI,Lko

Dr. Brijesh Mishra

Dr. Manish Kr. Singh

Dr. B.K. Ojha

power your performance.

Proprietary Certificate

To whom it may concern

Erbe VIO® 3, APC 3 and ERBEJET® 2

This is to certify that the electrosurgical device Erbe VIO® 3 with argon Plasma Coagulation system APC 3 and the hydrosurgery system ERBEJET® 2, built in one workstation are proprietary products, manufactured by Erbe Elektromedizin GmbH, Waldhoernlestrasse 17, 72072 Tuebingen, Germany and these products are not manufactured elsewhere.

Erbe Elektromedizin GmbH
Waldhoernlestrasse 17
72072 Tuebingen, Germany

Date 2021-10-06

Natalie Zierhut, Business Manager Asia Pacific

power your performance.

Proprietary Certificate

To whom it may concern

Erbe VIO® 3, APC 3, IES 3 & Instruments

This is to certify that the VIO® 3, APC 3 and IES 3 are proprietary products, manufactured by Erbe Elektromedizin GmbH, Waldhoernlestrasse 17, 72072 Tuebingen, Germany. We are the only manufacturer of this products and this is not manufactured by any other company elsewhere in the world.

The following technologies are proprietary for Erbe VIO®3 and APC 3:

Power electronics: Regulated power supply adapter improves power output especially with high and varying impedance loads, e.g. during bipolar resection.

Multiprocessor technology: 15 processors facilitates superior system performance

Latest digital signal processors: 25 million measurements per second improves reproducibility of the tissue effect.

Connection options: When using APC 3, you can extend your options and insert up to 6 instruments of your choice.

Our modes are regulated to a constant voltage level continually adapting output power to changing parameters to achieve reproducible tissue effects.

Following modes are available with Erbe VIO® 3 and APC 3:

CUT modes

- autoCUT
- highCUT
- dryCUT®
- autoCUT bipolar
- highCUT bipolar
- thermoSECT
- endoCUT® Q
- endoCUT® I
- endoCUT® U

COAG modes

- preciseSECT
- swiftCOAG®
- softCOAG®
- forcedCOAG®
- sprayCOAG®
- twinCOAG®
- softCOAG® bipolar
- forcedCOAG® bipolar
- thermoSEAL®
- biCLAMP
- forcedAPC
- pulsedAPC®
- preciseAPC®
- moveAPD®
- senseAPD®

The high-end electrosurgical device Erbe VIO® 3, with argon plasma coagulation system APC 3 and the smoke evacuation system IES 3 - in combination with the below listed instruments, form a proprietary system.

Instruments for VIO® 3 &APC 3

- BiClamp®
- Bipolar Forceps
- BiClamp® knife 220
- Electrosurgical Pencil
- FiAPC® probes
- FIAPC® plus probes
- APCapplicator
- TriSect rapide®

Instruments and Accessories for IES 3

- Smoke evacuation pencil
- Clip-On handle for smoke evacuation
- Main filter cartridge IES 3
- Prefilter for smoke evacuation
- Self-sealing water trap
- LAP tubing set for IES 3
- Smoke evacuation tubing for open surgical application

Date 2026-06-15

Maik Luz, Global Sales Support

Proprietary Certificate

To whom it may concern

Erbe Bipolar PREMIUM Forceps

This is to certify that the listed Bipolar PREMIUM Forceps are proprietary products, manufactured by Erbe Elektromedizin GmbH, Waldhoernlestrasse 17, 72072 Tuebingen, Germany and these product are not manufactured elsewhere.

Article No.	Catalogue Description
20195-501	Bipolar forceps PREMIUM, straight, tip 0.2 mm, pointed, length 120 mm
20195-502	Bipolar forceps PREMIUM, straight, tip 0.4 mm, very fine, length 120 mm
20195-503	Bipolar forceps PREMIUM, straight, tip 0.7 mm, fine, length 120 mm
20195-504	Bipolar forceps PREMIUM, straight, tip 0.7 mm, fine, angled, length 120 mm
20195-505	Bipolar forceps PREMIUM, straight, tip 0.2 mm, pointed, length 185 mm
20195-506	Bipolar forceps PREMIUM, straight, tip 0.4 mm, very fine, length 185 mm
20195-507	Bipolar forceps PREMIUM, straight, tip 0.7 mm, fine, length 185 mm
20195-508	Bipolar forceps PREMIUM, straight, tip 1 mm, blunt, length 185 mm
20195-509	Bipolar forceps PREMIUM, straight, tip 1 mm, blunt, angled, length 185 mm
20195-510	Bipolar forceps PREMIUM, straight, tip 0.2 mm, pointed, length 200 mm
20195-511	Bipolar forceps PREMIUM, straight, tip 0.4 mm, very fine, length 200 mm
20195-512	Bipolar forceps PREMIUM, straight, tip 1 mm, blunt, length 200 mm
20195-513	Bipolar forceps PREMIUM, straight, tip 1 mm, blunt, angled, length 200 mm
20195-514	Bipolar forceps PREMIUM, straight, tip 2 mm, blunt, angled, length 200 mm
20195-515	Bipolar forceps PREMIUM, straight, tip 2 mm, blunt, length 230 mm
20195-516	Bipolar forceps PREMIUM, straight, tip 1 mm, blunt, angled, length 260 mm
20195-517	Bipolar forceps PREMIUM, straight, tip 2 mm, angled, length 260 mm
20195-518	Bipolar forceps PREMIUM, straight, tip 2 mm, blunt, length 280 mm e.g. for urology
20195-531	Bipolar forceps PREMIUM, bayonet, tip 0.2 mm, pointed, length 155 mm
20195-532	Bipolar forceps PREMIUM, bayonet, tip 0.4 mm, very fine, length 155 mm
20195-533	Bipolar forceps PREMIUM, bayonet, tip 0.7 mm, fine, length 155 mm
20195-534	Bipolar forceps PREMIUM, bayonet, tip 0.2 mm, pointed, length 170 mm
20195-535	Bipolar forceps PREMIUM, bayonet, tip 1 mm, blunt, length 170 mm
20195-536	Bipolar forceps PREMIUM, bayonet, tip 0.4 mm, very fine, length 200 mm
20195-537	Bipolar forceps PREMIUM, bayonet, tip 0.7 mm, fine, length 200 mm
20195-538	Bipolar forceps PREMIUM, bayonet, tip 1 mm, blunt, length 200 mm
20195-539	Bipolar forceps PREMIUM, bayonet, tip 1.2 mm, blunt, length 200 mm
20195-540	Bipolar forceps PREMIUM, bayonet, tip 2 mm, blunt, length 200 mm
20195-541	Bipolar forceps PREMIUM, bayonet, tip 1.2 mm, blunt, length 200 mm angled downwards
20195-542	Bipolar forceps PREMIUM, bayonet, tip 1.2 mm, blunt, length 200 mm angled upwards

20195-543	Bipolar forceps PREMIUM, bayonet, tip 0.2 mm, pointed, length 230 mm
20195-544	Bipolar forceps PREMIUM, bayonet, tip 0.4 mm, very fine, length 230 mm
20195-545	Bipolar forceps PREMIUM, bayonet, tip 0.7 mm, fine, length 230 mm
20195-546	Bipolar forceps PREMIUM, bayonet, tip 1 mm, blunt, length 230 mm
20195-547	Bipolar forceps PREMIUM, bayonet, tip 1.2 mm, blunt, length 230 mm
20195-548	Bipolar forceps PREMIUM, bayonet, tip 0.7 mm, fine, length 230 mm angled upwards
20195-549	Bipolar forceps PREMIUM, bayonet, tip 1.2 mm, blunt, length 230 mm angled upwards
20195-550	Bipolar forceps PREMIUM, bayonet, tip 0.7 mm, fine, length 230 mm angled downwards
20195-551	Bipolar forceps PREMIUM, bayonet, tip 0.2 mm, pointed, length 250 mm
20195-552	Bipolar forceps PREMIUM, bayonet, tip 0.4 mm, very fine, length 250 mm
20195-553	Bipolar forceps PREMIUM, bayonet, tip 0.7 mm, fine, length 250 mm
20195-554	Bipolar forceps PREMIUM, bayonet, tip 1 mm, blunt, length 250 mm
20195-555	Bipolar forceps PREMIUM, bayonet, tip 1.2 mm, blunt, length 250 mm
20195-556	Bipolar forceps PREMIUM, bayonet, tip 0.7 mm, fine, length 250 mm angled upwards
20195-557	Bipolar forceps PREMIUM, bayonet, tip 0.7 mm, fine, length 170 mm
20195-558	Bipolar forceps PREMIUM, bayonet, tip 2 mm, blunt, length 250 mm
20195-559	Bipolar forceps PREMIUM, bayonet, tip 2mm, blunt, length 170 mm
20195-560	Bipolar forceps PREMIUM, bayonet, tip 0.2 mm, pointed, length 200 mm
20195-561	Bipolar forceps PREMIUM, bayonet, tip 2 mm, blunt, length 230 mm

erbe

Erbe Elektromedizin GmbH
Waldhoernlestrasse 17
72072 Tuebingen, Germany

Date 2021-02-18

Natalie Zierhut, Business Manager Asia Pacific

Erbe Elektromedizin GmbH Waldhoernlestrasse 17 72072 Tuebingen Germany

Phone +49 7071 755-0
Fax +49 7071 755-179
info@erbe-med.com
erbe-med.com

CEO and President: Christian O. Erbe
Commercial Register Court Stuttgart
HRB 380137
VAT ID (USt-IdNr.): DE 146893422

Baden-Württembergische Bank
IBAN: DE27 6005 0101 7477 5011 95
BIC: SOLADEST600

Kreissparkasse Tübingen
IBAN: DE54 6415 0020 0000 0001 41
BIC: SOLADES1TUB

erbe
power your performance

Proprietary Certificate

To whom it may concern

Nessy® Omega

This is to certify that the following products :

20193-082 Nessy Omega, split patient plate
20193-083 Nessy Omega, split patient plate

are specially designed

- with a split-pad effective contact surface 85 cm² [illegible] 33 cm²
- and can be applied irrespective of the direction of the operative site

These are proprietary products, marketed exclusively by [illegible]
Waldhoernlestrasse 17, 72072 Tuebingen, Germany.

April 4, 2018 Michael Reick, Director Business Management

Erbe Elektromedizin GmbH Waldhoernlestraße 17 72072 Tuebingen Germany

power your performance.

Proprietary Certificate

To whom it may concern

endoCUT® I and Q

This is to certify that the modes endoCUT® I and endoCUT Q for fractionated cutting on erbe VIO electrosurgical units are proprietary products, manufactured by Erbe Elektromedizin GmbH, Waldhoernlestrasse 17, 72072 Tuebingen, Germany and these products are not manufactured elsewhere.

Date 2019-01-21

Michael Reick, Director Business Management

power your performance.

Proprietary Certificate

To whom it may concern

Bipolar Instruments

This is to certify that the following products :

- 20195-132 Bipolar LAP forceps, Maryland, deep ribbed, sha
- 20195-133 Bipolar LAP forceps, fenestrated, deep ribbe
- 20195-081 Bipolar fixation forceps, shaft ø 5 mm, ins
- 20195-226 Bipolar LAP scissors, Metzenbaum, shaf

are specially designed to achieve the desired surgical out on Use of each product) in different surgical procedures"

These are proprietary products, marketed exclusively by E 17, 72072 Tuebingen, Germany.

2017/05/15

Axel Ret ff, Director Regulatory Affairs

Erbe Elektromedizin GmbH Waldhoernlestraße 17 72072 Tuebingen Germany

power your performance.

Proprietary Certificate

To whom it may concern

TriSect rapide®

- with VIO® 3 and thermoSECT mode

This is to certify that the below listed variations of TriSect rapide®, with our electrosurgical generator VIO® 3 and the thermoSECT mode, are proprietary products, manufactured by Erbe Elektromedizin GmbH, Waldhoernlestrasse 17, 72072 Tuebingen, Germany. We are the only manufacturer of these products, and they are not manufactured by any other company elsewhere in the world.

- 21195-400 - TriSect rapide 140, single-use, bent 17 mm, shaft length 140 mm
- 21195-401 - TriSect rapide 200, single-use, bent 17 mm, shaft length 200 mm
- 21195-402 - TriSect rapide 350, single-use, bent 17 mm, shaft length 350 mm
- 21195-403 - TriSect rapide 450, single-use, bent 17 mm, shaft length 450 mm

The following technologies are proprietary to Erbes TriSect rapide® dissect and sealing instrument:

- unique **tripolar technology** enables a quick electrical cut without a blade
- **true single step**: grasp, seal and dissect vessels and tissue bundles in a single workflow
- **thermoSECT** mode for simultaneous dissection and sealing
- **softCOAG bipolar** mode for immediate hemostasis, with powerful initial coagulation
- **cooler impact:** reduced thermal spread with lateral spread lower than 1mm

erbe

Erbe Elektromedizin GmbH
Waldhoernlestrasse 17
72072 Tuebingen, Germany

Date 2024-09-30

Natalie Zierhut, Business Manager Asia Pacific & Spain

erbe
power your performance.

Proprietary Certificate

To whom it may concern

This is to certify that the listed instruments are proprietary products, manufactured by Erbe Elektromedizin GmbH, Waldhoernlestrasse 17, 72072 Tuebingen, Germany and these products are not manufactured elsewhere.

Article No.	Catalogue Description
20150-015	HybridAPC, ø 2.3 mm, length 1.9 m
20150-030	Applicator, straight, ø 6 mm, length 65 mm; with suction, e.g. for liver surgery
20150-031	Applicator, flexible tip, ø 6 mm, length 65 mm; with suction, e.g. for liver surgery
20150-036	Applicator, straight, with monopolar electrosurgical function, ø 6 mm, length 80 mm; with suction, e.g. for liver surgery
20150-038	Applicator, straight, ø 6 mm, length 306 mm; with suction, e.g. for TME
20150-039	Applicator, straight, ø 6 mm, length 180 mm; with suction, e.g. for TME
20150-060	HybridKnife, T-type, full-stream, ø 2.3 mm, length 1.9 m; with connecting plug international (3-Pin)
20150-061	HybridKnife, I-type, full-stream, ø 2.3 mm, length 1.9 m; with connecting plug international (3-Pin)
20150-062	HybridKnife, O-type, full-stream, ø 2.3 mm, length 1.9 m; with connecting plug international (3-Pin)
20150-100	ERBEJET 2 two-pedal foot switch with ReMode, AP & IP X8 equipment
20150-101	ERBEJET 2 one-pedal foot switch with ReMode, AP & IP X8 equipment
20150-301	Pump cartridge plus for ERBEJET 2

i.A. Manuel Neuburger

Date 2023-09-11

Manuel Neuburger, Product Specialist International Sales Support

Proprietary Certificate

Proprietary Certificate

To whom it may concern

Erbe FiAPC Probes

This is to certify that the listed FiAPC Probes are proprietary products, manufactured by Erbe Elektromedizin GmbH, Waldhoernlestrasse 17, 72072 Tuebingen, Germany and these product are not manufactured elsewhere.

Article No.	Catalogue Description
20132-220	FiAPC probe 1500 A, ø 1.5 mm, flexible, length 1.5 m
20132-221	FiAPC probe 2200 A, ø 2.3 mm, flexible, length 2.2 m
20132-222	FiAPC probe 2200 A, ø 3.2 mm, flexible, length 2.2 m
20132-223	FiAPC probe 3000 A, Ø 2.3 mm, flexible, length 3 m
20132-224	FiAPC probe 2200 SC, ø 2.3 mm, flexible, length 2.2 m
20132-225	FiAPC probe 2200 C, ø 2.3 mm, flexible, length 2.2 m
20132-226	FiAPC probe 3000 A, ø 1.5 mm, flexible, length 3 m

Erbe Elektromedizin GmbH
Waldhoernlestrasse 17
72072 Tuebingen, Germany

Date 2024-01-10

Natalie Zierhut, Business Manager Asia Pacific & Spain

Erbe Elektromedizin GmbH Waldhoernlestrasse 17 72072 Tuebingen Germany

Phone +49 7071 755-0
Fax +49 7071 755-179
info@erbe-med.com
erbe-med.com

CEO and President: Christian O. Erbe
Commercial Register Court Stuttgart
HRB 380137
VAT ID (USt-IdNr.): DE 146893422

Baden-Württembergische Bank
IBAN: DE27 6005 0101 7477 5011 95
BIC: SOLADEST600

Kreissparkasse Tübingen
IBAN: DE54 6415 0020 0000 0001 41
BIC: SOLADES1TUB

Proprietary Certificate

To whom it may concern

Erbe flexible cryoprobes

This is to certify that the listed single-use flexible cryoprobes are proprietary products, manufactured by Erbe Elektromedizin GmbH, Waldhoernlestrasse 17, 72072 Tuebingen, Germany and these product are not manufactured elsewhere.

Article No.	Catalogue Description
20402-401	Flexible cryoprobe, single-use, ø 1.1 mm, with oversheath ø 2.6 mm, length 817 mm
20402-402	Flexible cryoprobe, single-use, ø 1.1 mm, with oversheath ø 2.6 mm, length 757 mm
20402-410	Flexible cryoprobe, single-use, ø 1.7 mm, length 1150 mm
20402-411	Flexible cryoprobe, single-use, ø 2.4 mm, length 1150 mm

erbe

Erbe Elektromedizin GmbH
Waldhoernlestrasse 17
72072 Tuebingen, Germany

Date 2022-08-08

Natalie Zierhut, Business Manager APAC & Spain

Erbe Elektromedizin GmbH Waldhoernlestrasse 17 72072 Tuebingen Germany

Phone +49 7071 755-0
Fax +49 7071 755-179
info@erbe-med.com
erbe-med.com

CEO and President: Christian O. Erbe
Commercial Register Court Stuttgart
HRB 380137
VAT ID (USt-IdNr.): DE 146893422

Baden-Württembergische Bank
IBAN: DE27 6005 0101 7477 5011 35
BIC: SOLADEST600

Kreissparkasse Tübingen
IBAN: DE54 6415 0020 0000 0001 41
BIC: SOLADES1TUB

erbe

LETTER OF AUTHORITY

To,

The Incharge,
Common Equipment Cell,
King George's Medical University UP,
Lucknow, Uttar Pradesh- 226003

Subject: Letter of Authority for the participation in tenders.

Whereas, **Erbe Medical India Pvt Ltd, Unit no. 393-396, 3rd Floor, Office Block, Vegas Mall, Pocket 1, Sector 14, Dwarka, New Delhi-110078, India** wholly owned subsidiary of **M/S ERBE Elektromedizine GmbH Germany** who are established and reputable manufacturers of **Electro surgical Unit, Argon Plasma Coagulator, Water jet, Surgical Work Station and their accessories,** etc. having production facilities **at Waldhorenlestrasse 17. D-72072 Tubingen** do hereby authorize as Indian Agent **M/S Pee Vee Enterprises – 2137/M (8), Canal Road, Indralok Colony, Krishna Nagar, Lucknow – 226023** to submit a bid, and sign the contract with you against the bid floated for **High End Energy Vision Platform (EV Station), Advanced Surgical Workstation, other Erbe Energy Source and Erbe Accessories** including the above goods manufactured by us.

We hereby extend our full guarantee and warrantee for the above specified goods against the bidding documents for full five years as well as confirm to provide AMC/CMC for next five years after the expiry of guarantee and warrantee period.

No company or firm individual other than **M/S Pee Vee Enterprises, No: 2137/M (8), Canal Road, Indralok Colony, Krishna Nagar Lucknow** are authorized to tenders and conclude the contract for all the goods manufactured by us.

We further guarantee that in the event we change our dealer / Indian agent, we will continue to provide all the services as assured in the tender document and are also as required by the concerned Principal /Director of respective medical college/ Institute as the case may be, through our new dealer / Indian Agent or directly as may be required.

Yours Truly,
For ERBE Medical India Pvt Ltd

Yash Sharma

Erbe Medical India Pvt. Ltd.
New Delhi

Authorized Signatory

Erbe Medical India Private Limited

Corporate & Registered office:
Unit No. 393-396, 3rd Floor
Office Block, Vegas Mall
Sector -14, NSIT, Dwarka
New Delhi – 110078
GSTIN – 07AABCE7430L1ZK

Deutsche Bank AG
Current Acc. No. 5006846000
SWIFT code DEUT0916CNN
CIN U33119DL2007PTC429896

Warehouse:
Lower Ground Floor
Plot No. 447, Pocket B
Sector – 19, Dwarka
New Delhi – 110075
Phone: +91 11 41009808

Branch offices:
Kolkata
Bengaluru
Chennai
Pune

Contact Information:
Web: www.erbe-india.com
E-Mail: erbe@erbe-india.com
Phone: +91 8920936829 (10AM-6PM)
Erbe Care WhatsApp:
+91 8448874998

Ligasure machines
(buyback)

K.G.'s Medical University U.P., Lucknow

Department of Surgery(Gen.)

PROPRIETARY/SPECIFIC BRAND GOODS CERTIFICATE

1.	Item Type/Model No. required along with specification	Ligasure Vessel Sealer-VLFT10GEN
2.	If the item a spare part attachment or accessory for an existing equipment Yea/No (If Yes, provide details)	Machine with spare parts and accessories
3.	Name of the manufacturers/sold distributors of the item proposed by the indenter	Medtronics India Pvt Ltd
4.	Are they sole manufacturers/sold distributors of the item Yes/No	Sole Manufacturer
5.	If there any other item with similar/equivalent specification available in the market to meet the job requirement envisaged. Yea/No (If Yes, explain why those alternatives cannot be procured and provide a comparative analysis of the functional advantages/cost-effectiveness of the recommended item)	Similar item not available, many other companies have/claim to have equivalent Technology but they do not have patient safety USFDA CERTIFICATE
6.	Efforts made to locate alternative sources of supply or use of substitutes.	Yes, done, Bid on Gem Portal done
7.	Why open tender can't be resorted to, for locating alternative source.	Open Tender done, but Ligasure is a PAC item
8.	Are the proprietary items certified to have reasonable rates ? Yes/No	PAC item, yes, as per AIIMS or KGMU Previous rates.
9.	Any other justification for procuring the item from a single source	Ligasure is Required for Advance MIS Surgical Procedures.

I hereby certify that the above item is required to be procured on a proprietary/single-source basis, as the specified brand is the only known source that meets our functional requirements. Given the unique advantages of this brand, an open tender process would not serve any meaningful purpose in this case and can justifiably be waived.

(Strike out whoever is not applicable)

Head of department of Surgery(Gen.)
K.G. Medical University U.P., Lucknow

Proprietary Article Certificate in the following form is to be provided by the Ministry/Department before procuring the goods from a single source under the provision of sub Rule 166 (i) and 166 (iii) as applicable.

(i) The indented goods are manufactured by M/s Medtronics India Pvt Ltd

(ii) No other make or model is acceptable for the following reasons:

The Ligasure Machine are supplied by M/s Medtronics India Pvt Ltdis manufacturer of Ligasure Machine. The accessories of this equipment are also manufactured by M/s Medtronics India Pvt Ltd. The accessories is proprietary item due to design & Fitting in the equipment.

(iii) Concurrence of finance wing to the proposal vide requested

(iv) Approval of the competent authority vide requested.

Head of department of Surgery (Gen.)
K.G. Medical University U.P., Lucknow

Ligasure (Advanced vessel sealer) – under buyback

1. The system must be micro-processor controlled which should identify the tissue type with a real time feedback system and adjust the power to get the desired surgical effect on the tissue.
2. The system should have current ammeter, to display the conductivity of the bipolar energy and should have audio indication.
3. System should be an integrated system with 350W output generator and a single 7" touch screen having four quadrants for Monopolar, Bi-Polar, Vessel Fusion and Under-water Bipolar Resection in Saline integrated in one generator. For Monopolar, Bi-Polar, Vessel Fusion and Under-water Bipolar Resection in Saline integrated in one generator.
4. The Power Efficiency Rating of the generator should be more than 98.
5. System should have 2 monopolar output, 1 Bipolar output and 1 Vessel Sealing output.
6. The system having 2 monopolar outputs, both working simultaneously at one time 2 cautery pencils should work together.
7. The Monopolar output must have Cut, Blend, "Hemostasis with division(HWD)", Soft Coag, Fulgurate and Spray mode.
8. The Bi-Polar must have Low, Standard and Macro mode with Auto Bi-Polar control with Bipolar current ammeter.
9. The system should be able to be used with ablation procedures and instruments.
10. The system should be able to use with defibrillator for emergency.
11. System should have separate monopolar, bipolar & Vessel Sealing foot pedal.
12. System should have 8Gb internal memory for storage of programs and error data.
13. The system should be able to store settings and minimum 10 different program settings.
14. The system should have one different Vessel Fusion output which should be able to seal artery, veins along with tissue bundle up to and including 7mm in diameter, and fused vessels should be able to withstand more than 3 times of normal systolic blood pressure.
15. The Vessel seal system should be of minimum of 300W at a rated load of 20 ohms.
16. The vessel sealing system should have simple audiovisual feedback display from the generator. This should include:
    A. System should have System Error Indicator
    B. System should have System status indicators such as Self test, ready for use, ready for sealing/seal cycle complete, sealing in process
    C. Seal cycle incomplete alert,
    D. System should have usage limit indicator.
    E. System should have instruments status indicator.
17. The vessel sealing system should support both open and laparoscopic hand instruments.
18. The vessel sealing hand instruments should have cutting independent of sealing.
19. There should be an option of enabling or disabling the footswitches.
20. The system should have demo mode facility and recall facility to recall the last setting used by user.
21. System should have bipolar resection with saline facility in-built in the integrated in main unit software without any interfacing cable.
22. Selectable range of bipolar cut initiation, should have six combinations of cutting and coagulation settings
23. System should be compatible of polyhesive contact quality monitoring system.
24. System should have audio-visual alarm facility, to indicate any breakage of direct contact between the patient and patient plate.
25. All open surgery including head and neck and thyroid can be precisely controlled with very less thermal spread by using sealing technique.
26. System should have three button pencil with adjustable power setting in sterile zone.
27. Integrated seal with choice of cut of 10 mm and 5 mm should be there.
28. Vessel sealing instrument should have nano-coated jaws and should be having curved tip for dissection purpose.
29. Vessel sealing instruments should not work under auto-cut.
30. Both Footswitch and hand control mode should be available.
31. System should be Compatible with Argon Coagulator and smoke evacuator.
32. The system should be upgradable and should have RS232, USB, Ethernet port for on field software downloads, upgrades and serviceability.
33. Mounting Cart manufacturer by the original principal manufacturer, to be provided with the equipment.

Terms & Conditions:

1. System should be USFDA & European CE approved.
2. The Vessel sealing instruments should also be USFDA & European CE Approved.
3. The Manufacturer/Agent should quote the latest model available in the market. (Undertaking to be given by the Manufacturer).
4. CMC – 5 years should be quoted separately.
5. All accessories and consumables should be of same manufacturer only.

Should be supplied with Accessories:

1. Bipolar Foot Switch - 01 Nos.
2. Monopolar Foot Switch - 01 Nos.
3. Universal Active Adapter - 01 Nos.
4. Vessel sealing Foot switch - 01 Nos.
5. Universal Cart - 01 Nos.
6. Disposable 2 Button Switch Pencil - 100 Nos
7. Disposable Patient Plate - 100 Nos
8. Disposable Pediatric Plate - 25 Nos
9. Disposable Lap Vessel Sealing Instrument - 05 Nos
10. Disposable Open Vessel Sealing Instrument - 03 Nos
11. Disposable Laparoscopic Smoke Evacuator - 120 Nos

Prof Abhinav A Sonkar
Head, Surgery (Gen)

Prof K K Singh
Member, Surgery (Gen)

Prof H S Pahwa
Member, Surgery (Gen)

Prof Surender Kumar
Member, Surgery (Gen)

Prof Parijat Suryavanshi
Member, Surgery (Gen)

Prof Faraz Ahmad
Member, Surgery (Gen)

Dr Akshay Anand
Member, Surgery (Gen)

Dr Rohit Srivastava
Addl Professor Surgery
RMLIMS (External)

Mr Anjani Mishra
Biomedical Supervisor

Medtronic
Covidien llc
15 Hampshire Street
Mansfield, Massachusetts 02048
United States of America

Tel: 1.508-261-8000
www.medtronic.com

Date: 13 July 2026

To Whom So Ever It May Concern

Proprietary Article Certificate

This is to certify that the below Product:

Product Code	Product Description
VLFT10GEN	Valleylab FT10 Energy Platform

"VLFT10GEN" is a proprietary product of Medtronic (Covidien llc), 15 Hampshire Street, Mansfield, MA 02048 USA.

1. The Product features built-in smart TissueFect™ tissue sensing technology in the Valleylab™ FT10 energy platform which examines device performance 434,000 times per second, monitoring tissue impedance and allowing effective and efficient energy delivery. This technology is only available on Valleylab™ generators and drives all electrosurgical and advanced bipolar functions.

2. The Product Features LigaSure™ tissue fusion, like LigaSure™ vessel sealing, uses the body's own collagen and elastin to create a permanent fusion zone. This technology can fuse vessels up to and including 7 mm, lymphatics, and tissue bundles, and has an average seal cycle of two to four seconds in most surgical situations.

3. The Product Features Adaptive REM™ which combines the feedback circuitry of hardware monitoring with an advanced software-controlled adaptation feature. The adaptive system still maintains the 5-135 ohms limits, but also creates a window of acceptable impedances based on contact conditions of the individual patient.

The above technology is patented technology by Covidien , The Patent Information is as below :

Product Brand	Product Type	Patent Information	Representative SKUs
Valleylab™ FT10	FT Series Energy Platform	U.S. Patents 7,972,328; 8,034,049; 8,685,016; D775,734	VLFT10GEN

The Product Design and specifications are the property of and controlled by Medtronic (Covidien llc), USA.

The Product is manufactured only by Covidien and no other Company/Manufacturer/Dealer are manufacturing the same product other than Covidien. The Product is imported in India by India

Medtronic
Covidien llc
15 Hampshire Street
Mansfield, Massachusetts 02048
United States of America

Tel: 1.508-261-8000
www.medtronic.com
Medtronic Pvt. Ltd.

Medtronic (Covidien LLC) is the manufacturer of the VALLEYLAB FT10 Energy Platform which is a patented technology, and they hold all the proprietary rights to sale of this equipment along with parts and service for these units.

On The Behalf of Covidien llc

Chris Williams
Digitally signed by Chris Williams
Date: 2026.07.13 09:43:30 -06'00'

Chris Williams
Prin. RA Operations Specialist