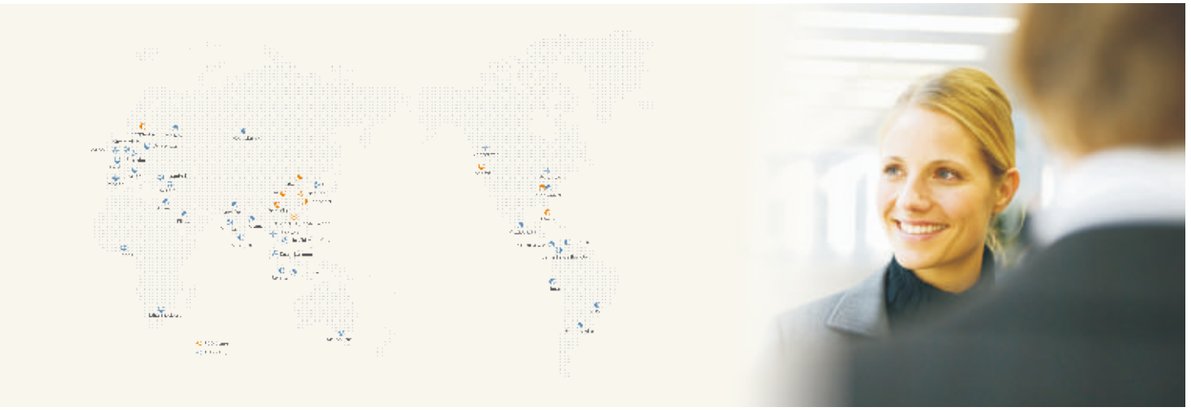

Globally experienced, locally accessible

Mindray is one of the leading global providers of medical devices and solutions. Firmly committed to our mission of "sharing medical technologies with the world", we are dedicated to innovation in the fields of Patient Monitoring & Life Support, In-Vitro Diagnostics, and Medical Imaging. The 1 Solution capitalises on Mindray's broad product portfolio and offers hospitals a holistic and systemic solution to improve the overall efficiency and quality of care particularly in three key clinical areas: emergency care, peri-operative care, and critical care.

Headquartered in Shenzhen, China Mindray possesses a sound distribution and service network with subsidiaries in 18 countries in North and Latin America, Europe, Africa and Asia-Pacific. While improving the quality of care, we help in reducing its cost, making it more accessible to a larger part of humanity.

Since its foundation in 1991, Mindray's development has been driven by innovation. Mindray has built up a global R&D network with research centers in Seattle, New Jersey, Miami, Stockholm, Shenzhen, Beijing, Nanjing, Chengdu, Xi'an and Shanghai.

Today, Mindray's products and services can be found in healthcare facilities in over 190 countries and regions. Inspired by the needs of our customers, we adopt advanced technologies and transform them into accessible innovation, bringing healthcare within reach.

Mindray Building, Keji 12th Road South,
High-tech Industrial Park, Nanshan, Shenzhen 518057, P.R. China
Tel: +86 755 8188 8998 Fax: +86 755 26582680
E-mail: PMLS-MarCom@mindray.com www.mindray.com

P/N: ENG-new WATO EX-65-420285X8P-20160112

CE 0123

mindray

WATO EX-65 NEW

Anaesthesia Workstation

Technical Specifications

Physical Specification	
Dimensions And Weight	
Height:	1370 mm
Width:	770 mm
Depth:	660 mm
Weight:	<145 kg (without vaporisers and cylinders)
Top Shelf	
Weight limit:	30 kg
Width:	305 mm
length:	545 mm
Work Surface	
Height:	850 mm
Area:	1635 cm^2
DIN Rail	
Side of machine:	370 mm
Drawer (3Xdrawers, Internal Dimension)	
Height:	130 mm
Width:	415 mm
Depth:	320 mm
Bag Arm	
Height:	980 mm
Length:	320 mm
Connection:	ISO 22mm OD, 15mm ID
Casters	
Diameter:	125 mm
Brakes:	Centre brake system with Lock / Unlock icons
Ventilator Specifications	
Modes Of Ventilation	
Manual/Spontaneous Ventilation	
Volume Control Ventilation **(VCV)** with tidal volume compensation	
Pressure Control Ventilation **(PCV)**	
Pressure Control Ventilation with volume guarantee **(PCV-VG)**	
Synchronized Intermittent Mandatory Ventilation **(SIMV-Volume And SIMV-Pressure)**	
Pressure Support Ventilation **(PSV)** with apnea backup	
Synchronised Intermittent Mandatory Ventilation Volume Guarantee **(SIMV-VG)**	
Continuous Positive Airway Pressure **(CPAP/PS)**	
Ventilation Parameters Ranges	
Tidal volume range:	20 ~ 1500 ml (VCV And SIMV-VC)
Incremental setting:	20 ~ 100 ml (increments of 5 ml)
	100 ~ 300 ml (increments of 10 ml)
	300 ~ 1500 ml (increments of 25 ml)

Pressure (Pinsp) range:	5 ~ 70 cmH_2O (increments of 1 cmH_2O) (PCV)
Pressure (Plimit) range:	10 ~100 cmH_2O (increments of 1 cmH_2O)
Pressure (ΔPsupp) range:	3 ~ 60 cmH_2O (increments of 1 cmH_2O)
Rate range:	4 ~ 100 bpm (increments of 1 bpm)
I:E range:	4:1 ~ 1:8 (increments of 0.5)
Inspiratory pause (Tip:Ti) :	Off, 5 - 60% (increments of 5%)
Inspiratory time (Tinsp) range:	0.2 ~ 5s (increments of 0.1s)
Trigger window range:	5 ~ 90% (increments of 5%)
Flow trigger:	0.5 ~ 15 L/min (increments of 0.5 L/min)
Pressure trigger:	-20 ~ -1 cmH_2O (increments of -1 cmH_2O)
Expiration termination level:	5 ~ 60% (increments of 5%)
Min. frequency for apnea-ventilation (Min Rate in PSV):	2 - 30 bpm (increments of 1bpm)
Positive End Expiratory Pressure (PEEP)	
Type:	Integrated, electronic controlled
Range:	Off, 3 to 30 cmH_2O (increments of 1 cmH_2O)
Ventilator Performance	
Driving pressure:	280 kPa to 600 kPa
Peak gas flow:	120 L/min
Monitoring Parameters	
Minute volume range:	0 ~ 100 L/min
Tidal volume range:	0 ~ 2500 ml/min
Inspired oxygen (FiO_2):	16% ~ 100%
Peak airway pressure:	-20 ~ 120 cmH_2O
Mean pressure :	-20 ~ 120 cmH_2O
Plateau pressure:	-20 ~ 120 cmH_2O
I:E	4:1 ~ 1:10
Rate:	0 ~ 120 bpm
Positive-End-Expiratory-Pressure (PEEP):	0 ~ 70 cmH_2O
Resistance (R):	0 ~ 600 $cmH_2O/(L/s)$
Compliance (C):	0 ~ 300 ml/cmH_2O
Trend Graphnn	
Continuous trend information with time discrete events for the latest 24 hours	
TVe, MV, Ppeak, Pplat, PEEP, Pmean, Rate, FiO_2, $EtCO_2$ and BIS	
Resolution:	5s, 30s, 1min, 2min, 4min adjustable
Refresh every time after the machine is restarted	
Trend Table	
Continuous trend information together with time discrete events for the latest 24 hours for TVe, Ppeak, MV, Pplat, PEEP, Pmean, Rate FiO_2, $EtCO_2$, BIS	
Resolution:	30s, 1min, 5min, 30min adjustable
Refresh every time after the machine is restarted	
Alarm Log Book	
100 events storage, first in first out	
Ventilator Accuracy	
Control/Monitor Accuracy	
Volume delivery:	< 75 ml, ± 15 ml
	≥ 75 ml, ± 20 ml or ± 10%
Pinsp:	± 3 cmH_2O or ± 8%
Plimit:	± 3.0 cmH_2O or ± 8%
PEEP delivery:	3 cmH_2O ~ 30 cmH_2O: ± 2.0 cmH_2O or ± 10% of the displayed value, whichever is greater
Volume monitoring:	< 75 ml, ± 15 ml
	≥ 75 ml: ± 20 ml or ± 10%
Pressure monitoring:	± 2 cmH_2O
Alarm	
Tidal volume :	Low: 0 ~ 1595 ml
	High: 5 ~ 1600 ml
Minute volume :	Low: 0 ~ 10 L
	High: 0.2 ~ 30 L
Inspired oxygen (FiO_2):	Low: 18 ~ 98%
	High: 20 ~ 100%
Apnea alarm:	VTe < 10ml measured in 20s
	Paw < (PEEP + 3) cmH_2O in 20s
Airway pressure low:	0 ~ 98 cmH_2O
Airway pressure high:	2~ 100 cmH_2O
Sustained airway pressure alarm:	>15s
Subatmospheric pressure alarm:	Paw < -10 cmH_2O
Alarm silence countdown timer:	120 to 0 seconds
Ventilator Components	
Flow Sensor	
Type:	Variable orifice flow sensor
Dimensions:	22 mm OD and 15 mm ID
Location:	Inspiratory and expiratory port
Oxygen Sensor	
Type:	Galvanic fuel cell or
	paramagnetic O_2 sensor (optional)
Ventilator Screen	
Display type:	Colour active matrix TFT touch screen
Display size:	12.1 in diagonal
Pixel format:	1024 x 768
Brightness:	Adjustable
Screen display:	Configurable
Display parameters:	All setting and alarm parameters (including Breath rate, I/E ratio, Tidal volume, Minute volume, PEEP, Pmean, Ppeak,
	Pplat, and O_2 concentration, $EtCO_2$, N_2O, Anaesthesia gas concentration, BIS)
Display waveforms:	P-T, F-T, V-T, $EtCO_2$, BIS waveforms
Spirometry loops:	P-V, F-V and F-P
Timer:	On screen timer
Communication Ports	
One RS-232C connector and one DB9 connector	
Ethernet (RJ-45)	
USB	
VGA	
Gas Monitor	
Anaesthesia Gas (AG) Module	
Measurement mode:	Infrared absorbtion
Monitor gases:	CO_2, N_2O, Halothane, Enflurane, Isoflurane, Sevoflurane, Desflurane, MAC, Paramagnetic O_2 (optional)
Warm-up time:	45s (ISO accuracy mode)
	10min (full accuracy mode)
Sample rate:	Adu/Ped: 150, 180, 200 ml/min
	Neo: 100, 110, 120 ml/min
Accuracy:	± 10 ml/min or ± 10%
Range:	CO_2: 0% ~ 10%
	AA: 0% ~ 30%
	O_2/N_2O: 0% ~ 100%

Carbon Dioxide (CO_2) Modules	
Method:	Infrared absorbtion
Module type:	Mindray side-stream, Capnostat mainstream and Oridion micro-stream, optional
Work mode:	Standby or measurement
Displayed numerics:	$EtCO_2$, $FiCO_2$
Waveforms:	Capnography
Sweep:	6.25 mm/s, 12.5 mm/s
Side-Stream Carbon Dioxide (CO_2) Module	
Measurement range:	0 ~ 99 mmHg
Accuracy:	± 2 mmHg (0 ~ 40 mmHg)
	± 5% (41 ~ 76 mmHg)
	± 10% (77 ~ 99 mmHg)
Resolution:	1 mmHg
Gas compensations:	N_2O, O_2 and Anaesthestic Gas ompensation (only for Desflurane)
Sampling rate:	70 or 100 ml/min
Sampling rate accuracy:	± 15% or 15 ml/min whichever is larger
Warming-up time:	< 1min
Response time:	When measured with a neonatal watertrap and
	a 2.5 m-long neonatal sampling line:
	< 3s @ 100 ml/min
	< 3.5s @ 70 ml/min
	When measured with an adult watertrap and a
	2.5 m-long adult sampling line:
	< 5s @ 100 ml/min
	< 6.5s @ 70 ml/min
Displayed numerics:	$EtCO_2$, $FiCO_2$
Sweep:	6.25 mm/s, 12.5 mm/s
Capnostat Mainstream CO_2 Module	
Measurement range:	0 ~ 150 mmHg
Accuracy:	± 2 mmHg (0 ~ 40 mmHg)
	± 5% of reading (41 ~ 70 mmHg)
	± 8% of reading (71 ~ 100 mmHg)
	± 10% of reading (101 ~ 150 mmHg)
Resolution:	1 mmHg
Response time:	< 60 ms
Gas compensation:	O_2 compensation, AG compensation, balance gas (room air or N_2O) compensation
Alarm limit:	$EtCO_2$ High: 2 ~ 150 mmHg
	$EtCO_2$ Low: 0 ~ 148 mmHg
	$FiCO_2$ High: 0 ~ 150 mmHg
Displayed numerics:	$EtCO_2$, $FiCO_2$
Sweep:	6.25 mm/s, 12.5 mm/s
Micro-stream CO_2 Module	
Measurement range:	0 ~ 99 mmHg
Accuracy:	0 ~ 38 mmHg: ± 2 mmHg
	39 ~ 99 mmHg: ± 5% of reading (+ 0.08% for every 1 mmHg above 38 mmHg)
Resolution:	Waveform: 0.1 mmHg
	Value: 1 mmHg
Sampling rate:	50 ml/min
Sampling accuracy:	-7.5 ml/min ~ + 15 ml/min
Initialisation time:	30s
Response time:	2.9s
Rising time:	< 190 ms
Delay time:	2.7s
Alarm range:	$EtCO_2$ High: 2 ~ 99 mmHg
	$EtCO_2$ Low: 0 ~ 97 mmHg
	$FiCO_2$ High: 0 ~ 99 mmHg
Displayed numerics:	$EtCO_2$, $FiCO_2$
Sweep:	6.25 mm/s, 12.5 mm/s
BIS Module	
Measured parameters:	EEG
BIS:	0 ~ 100
Sweep speed:	6.25 mm/s,12.5 mm/s, 25 mm/s or 50 mm/s
Input impedance:	> 50 Mohm
Noise (RTI):	< 0.3 uV (0.25 ~ 50 Hz)
Input signal range:	± 1 mv
EEG Brandwidth:	0.25 ~ 100 Hz
Patient leakage:	< 10 uA
Alarm limit:	BIS high: 2 ~ 100
	BIS low: 0 ~ 98
Calculated parameters:	SQI, EMG, SR, SEF, TP
Impedance range:	0 ~ 999 Kohm
Agent Consumption Calculation	
Calculation range:	0 to 3000 ml
Accuracy:	± 2 mL, or ± 25% of reading, whichever is larger
Electrical Specifications	
Current Leakage	
100 ~ 240V:	< 500 µA
Power And Battery Backup	
Power input:	220-240 Vac, 50/60 Hz, 6A
	100-120 Vac, 50/60 Hz, 7A
	100-240 Vac, 50/60 Hz, 7A
Auxiliary electrical outlets:	Up to 4 outlets (3A for each, total 5A)
Battery backup:	90 minutes for 1 piece battery (powered by new fully-charged batteries with 25 ambient temperature)
	240 minutes for 2 piece battery (powered by new fully-charged batteries with 25 ambient temperature)
Battery type:	Build-in Li-ion battery, 11.1 VDC, 4500 mAh
Safety feature:	In case of electricity and battery failure, manual, ventilation, gas delivery and agent delivery are possible
	Manual ventilation possible even under total power supply failure condition
Pneumatic Specifications	
ACGO (Auxiliary Common Gas Outlet, Integrated)	
Connector:	ISO 22 mm OD and 15 mm ID
Gas Supply	
Gas type:	O_2, N_2O and Air
Pipeline input range:	0.28 ~ 0.6 MPa
Pipeline connections:	NIST, DISS
	All fittings available for O_2, N_2O and Air

Cylinder input:	PISS (PIN Index Safety System)
Primary regulator nominal output: 207 kPa	
O_2 Controls	
Method:	N_2O shut off with loss of O_2 pressure
Supply failure alarm:	< 220.6 kPa
O_2 Flush:	25 ~ 75 L/min
O_2 - N_2O Link System (ORC)	
Type:	Mechanical
Range:	O_2 concentration not lower than 21%
Auxiliary O_2 Flowmeter	
Range:	0 ~ 15 L/min
Indicator:	Flow tube
Electronic Flow Meters	
O_2 range:	0 ~ 15 L/min
N_2O range:	0 ~ 10 L/min
Air range:	0 ~ 15 L/min
Accuracy:	between -10% and +10% of the indicated value (under 20˚C and 101.3 kPa, for flow between 10% and 100% of full scale)
Environmental Specifications	
Operating	
Temperature:	10 ~ 40
Relative humidity:	15 ~ 95% (noncondensing)
Barometric (Kpa):	70 ~ 106 kPa
Storage	
Temperature:	-20 ~ 60 for main unit,
	-20 ~ 50 for O_2 sensor
Relative humidity:	10 ~ 95% (noncondensing)
Barometric (KPa):	50 ~ 106 kPa optional
Electromagnetic Compatibility	
Immunity:	Complies with all requirements of IEC 60601-1-2
Emissions:	CISPR 11 group 1 class B
Breathing System Specification	
System Conponents	
Circular breath system with ACGO option	
Carbon dioxide absorbent canister	
Absorbent capacity:	1500 mL
Integrated expiratory limb water trap	
Water trap	
Capacity:	6 mL
System Pressure Gauge	
Range:	-20 ~ 100 cmH_2O
Accuracy:	± (2% of the full scale reading + 4% of the actual reading)
Ports And Connectors	
Exhalation:	22 mm OD / 15 mm ID conical
Inhalation:	22 mm OD /15 mm ID conical
Manual bag port:	22 mm OD /15 mm ID conical
Bag-to-Ventilator Switch	
Type:	Bi-stable
Control:	Switch between manual and mechanical ventilation

Integrated Adjustable Pressure Limiting (APL) Valve	
Range:	5 ~ 75 cmH_2O
Tactile knob indication at:	> 30 cmH_2O
Accuracy:	± 10 cmH_2O or + 15% of the measure value, whichever is greater
Materials	
All materials in contact with exhaled patient gases are autoclavable, except flow sensors, O_2 sensor, and mechanical pressure meter.	
All materials in contact with patient gas are latex free.	
Anaesthetic Gas Scavenging System (AGSS)	
Size:	430 x 132 x 114 mm (height x width x depth)
Type of disposal system:	Active: High-flow or Low-flow
	Passive
Applicable standard:	ISO 8835-3: 2007
Pump rate:	75 ~ 105 L/min or 25 ~ 50 L/min
Pressure relief device:	Pressure compensation opening to the air
State indication of the disposal system:	The float falls below the "MIN" mark on the sight glass when the disposal system does not work or the pump rate is lower than 25 L/min (Low-flow) or 75 L/min (high-flow).
Connector of the disposal system: ISO 9170-2-2008	
Suction Device	
Venturi Suction Regulator	
Gas source:	Air, from system gas source
Minimum negative pressure:	25 kPa at supply gas pressure of 280 kPa
Minimum flow:	20 L/min
Continuous Suction Regulator	
Supply:	Negative Pressure Suction
Maximum vacuum:	≥72 kPa at supply gas pressure of 280 kPa; ≥73 kPa at supply gas pressure of 600 kPa
Maximum flow:	39 L/min to 40 L/min with external vacuum applied of 540mmHg and 40 L/min free flow
Minimum flow:	20 L/min