



WATO™ EX-65/55

Anesthesia Machines



mindray
healthcare within reach

WATO™ EX-65/55

Anesthesia Machines

Maximum technical performance, contemporary and ergonomic design, closed with the latest modern anesthesia concept

The WATO EX-65/EX-55 is designed for ease of use, incorporating the maximum patient safety in daily anesthesia practice. A small footprint and compact size is appropriate for any environment where space is limited.

Some of the specifications are:

- Electronic flow meters for O₂, N₂O or Air with a backup tube for the emergency
- Support up to 2 vaporizer positions
- An electronically-controlled, pneumatically-driven ventilator, either mechanical ventilation or spontaneous breath, supports a variety of patients.
- Switching Auxiliary Common Gas Outlet (ACGO) allows you to use in the 3rd party's semi-open circuits
- Modular design monitoring for Anesthetic Agents, paramagnetic oxygen, EtCO₂ and BIS measurement
- Compatible with Mindray patient monitors and other medical devices
- Specific design for low flow anesthesia



Proven technology of vaporizers!

- The large color LCD screen displays all ventilator's setting data, measurement information, loops and numeric/graphic trends
- Multi-display selectable: Standard, large font or monitoring
- Intelligent alarm management, e.g. permanent silent volume/apnea alarm – especially used in the procedure of cardiopulmonarybypass (CPB)

The highest quality and reliability of Sigma Delta® Vaporizer:

- Service free
- Selectatec® compatible interlock safe systems
- Superb performance over a wide range of vapor concentration and temperature, particularly at low flow
- Available for Halothane, Enflurane, Isoflurane, Sevoflurane (Sigma Delta®) and Desflurane (Sigma Alpha®)



Friendly and intuitive user interface!

- Besides Volume and Pressure controlled ventilation, there are SIMV, Pressure Support (PSV) and Apnea Backup mode applied in Laryngeal Mask Airway (LMA), which can be assisted in patient weaning once the operation has ended
- Minimum TV downs to 20ml suitable for patients of any age, from infant to adult, by only one bellows and one circuit
- TV compensation and electrical PEEP automatically corrects for fresh gas flow, system leak and the compliance change in the circuit
- The ascending bellows can provide immediate visual information on the adequacy of fresh gas flow and gives indication of the system leaky occurrence
- Integrated pressure, volume and oxygen monitoring
- Compact device for closed and semi-closed system
- Easy to disassemble and assemble all the components - convenient for clean and maintenance
- Fully autoclavable at 134°C and nature latex free
- Heating device avoids humidity condensation in the flow sensors that are integrated and protected in the circuit
- Informative message displayed on screen to confirm the assembly of CO₂ canister.
- CO₂ bypass available for canister exchange during surgeries.
- Quick release canister



What you set is what the patient will get!



Excellent ergonomic breathing circuit!



Optional monitoring capabilities!

- Monitoring modules can be used both in WATO EX-65/55 and Beneview™ monitors
- The measurement for CO₂, N₂O, paramagnetic O₂ and 5 anesthetic agents (auto-identified) can be displayed both in numeric and curves
- BIS® measurement can reduce the recovery time of the patient and prevent drug over dose
- RJ45 port support Ethernet communication
- A connector allows the sample gas to return to the scavenging system

Active AGSS:

High flow, low vacuum

Applies with ISO 8835-3:1997

Connectors apply with BS 6834:1987

Flow of suction: 50-80L/min

Resistance: 0.75KPa @ 75L/min

Pressure release: compensation port to atmosphere

Filter: Stainless steel reseau with 140-150µm of diameter

Safety: Float sinks down while flow of suction is lower than 50L/min

With isolation transformer		
External AC power supply		
Input voltage	100 to 120V	220 to 240V
Input current	8.5 A	3.5 A
Input frequency	50/60 Hz	
Leakage current	< 500µA	
Auxiliary output supply		
Output voltage	100 to 120V	220 to 240V
Output frequency	50/60 Hz	
Output current(outlet 1)	3.8 A	1.6 A
Output current(outlet 2)	1.0 A	0.5 A
Output current(outlet 3)	1.0 A	0.5 A
Without isolation transformer		
External AC power supply		
Input voltage	100 to 240V	100 to 120V
Input current	8.5 to 3.5 A	8.5 A
Input frequency	50/60 Hz	
Leakage current	< 500µA	
Auxiliary output supply		
Output voltage	100 to 240V	100 to 120V
Output frequency	50/60 Hz	
Output current(outlet 1)	3.8 to 1.6 A	3.8 A
Output current(outlet 2)	1.0 to 0.5 A	1.0 A
Output current(outlet 3)	1.0 to 0.5 A	1.0 A

Inlet and Outlet Modules

3 outputs: without separate transformer, include:

Type	Area	Input power	3auxiliary output
With no isolated transformer	Europe	100-240V~ 6.2-2.6A 50/60Hz	100-240V~ 1.2-0.6A 50/60Hz
	UK		
	India		
	US(B type)		
	Australia		
	US	100-120V~ 5.6A 50/60Hz	100-120V~ 1.2A 50/60Hz
With isolated tranformer	Europe	220-240V~ 2.7A 50/60Hz	220-240V~ 0.6A 50/60Hz
	UK		
	India		
	US(B type)		
	Australia		
		US	100-120V~ 5.6A 50/60Hz

DISTRIBUTOR:



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WATO™ EX-55

Anesthesia Machines



Technical Specifications

Physical specifications

Dimensions and Weight

Height:	1350 mm
Width:	700 mm (dual vaporizers without breathing circuit) 950 mm (dual vaporizers with breathing circuit)
Depth:	610 mm
Weight:	<120 kg (including trolley base, without vaporizer and cylinder)

Top Shelf

Weight limit:	30kg
Width:	480mm
Depth:	440mm

Retractable work surface

Height:	860 mm
Area:	1012 cm ²

LED Light

Illuminates all work surface

DIN Rail

Side of machine:	370mm
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Drawers(two)-Locking (internal dimensions)

Height:	170 mm
Width:	350 mm
Depth:	270 mm

Casters

Diameter:	125 mm
Brakes:	Individual locking

Screen

Display type:	Color active matrix TFT
Display size:	8.4 in diagonal
Resolution:	800×600
Brightness	Adjustable
Multi-display selectable:	Standard , large font or monitoring
Display Parameters:	All settings and alarm parameters(Breath rate, I: E ratio, tidal volume, minute volume, PEEP, peak pressure, Resistance, Compliance, FiO ₂ , EtCO ₂ , Pmean, Pplat and electronic flow indicated bars)
Display Graphics:	
Standard:	Waves of Pressure-Time, Flow-Time, Volume-Time;
Optional:	Wave of Co ₂
Timer:	The time of operation will be displayed on the screen

Ventilator Specifications

Standby Mode:	Machine is on call; System settings, ventilation and alarm parameters can be set
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Modes of Ventilation-Standard

Volume-Controlled Ventilation (VCV) with tidal volume compensation
Manual

Modes of Ventilation-Optional

Pressure Control Ventilation (PCV)

Ventilator Parameter Ranges

Tidal volume range:	20~1500 ml (VCV and SIMV-VC)
Incremental settings:	20~100ml (increments of 5 ml) 100~300 ml(increments of 10 ml) 300 ~1500 ml (increments of 25 ml)
Pressure (inspired) range:	5 ~60 cmH ₂ O increments of 1 cmH ₂ O
Pressure (limit) range:	10~100 cmH ₂ O increments of 1 cmH ₂ O
Rate range:	4~100 bpm increments of 1 bpm (VCV, PCV)
Inspiratory/Expiratory ratio (I:E) range:	4:1~1:8 increments of 0.5 (VCV, PCV)
Inspiratory pause time:	OFF, 5~60% of inspiratory time
Positive End Expiratory Pressure (PEEP)	
Type:	Integrated, electronically controlled
Range:	OFF, 4 ~30 cmH ₂ O increments of 1 cmH ₂ O

Ventilator Performance

Pressure range at inlet:	0.28~0.6 MPa
Peak gas flow:	100 L/min plus fresh gas
Flow valve range:	1 to 100 L/min

Ventilator Accuracy

Delivery/ monitoring accuracy	
Volume delivery:	< 75 ml, ±15ml ≥ 75 ml, ±20ml or ±10%, whichever is larger
Psupport/inspired:	±3.0 cmH ₂ O, or ±8%, whichever is larger
Plimit:	±4.0 cmH ₂ O, or ±10%, whichever is larger
PEEP delivery:	±2.0 cmH ₂ O, or ±10%, whichever is larger
Volume monitoring:	< 75 ml, ±15ml ≥ 75 ml, <1500 ml, ±20ml or ±10%, whichever is larger >1500 ml, unspecified
Pressure monitoring:	±3.0 cmH ₂ O, or ±8%, whichever is larger

WATO™ EX-55

Anesthesia Machines

Alarm Settings

Tidal volume(expiratory):	High: 5~1600 ml Low: 0~1595 ml
Rate :	High: 4 ~ 100bpm Low: 2~98bpm
Minute volume(expiratory):	High: 0.2~100 Low: 0~99
Inspired oxygen:	High: 20~100% Low: 18~98%
Low airway pressure:	0~98 cmH ₂ O
High pressure:	2~100cmH ₂ O
Apnea alarm:	20s

Ventilator Monitoring

Minute volume range (expiratory) :	0~100 L/min
Tidal volume range (expiratory) :	0~2500 ml
Inspired oxygen(FiO ₂):	18~ 100%
Peak pressure :	- 20~120 cmH ₂ O
Mean pressure:	- 20~120 cmH ₂ O
Plateau pressure:	- 20~120 cmH ₂ O
Sweep speed:	6.25 mm/s or 12.5 mm/s
Positive End Expiratory Pressure (PEEP):	0~70 cmH ₂ O

Trend Chart: Continuous trend information together with time discrete events are stored and shown by lines for the latest 24 hours with 5 seconds resolution for TV_E, P_{peak}, MV, P_{plat}, PEEP, P_{mean}, Rate and optional FiO₂, EtCO₂. New trend chart will be recorded when restart the machine

Trend Table: Continuous trend information together with time discrete events are stored and shown by table for the latest 24 hours for TV_E, P_{peak}, MV, P_{plat}, PEEP, P_{mean}, Rate and optional FiO₂, EtCO₂. Resolution: 30s, 1min, 5 min, 30 min, optional. New trend table will be recorded when restart the machine

Vaporizer

Type: Penlon Sigma Delta® or Sigma Alpha® vaporizer, options include Desflurane, Isoflurane, Enflurane, Sevoflurane and Halothane vaporizers

Position of vaporizer: one or dual-positions

Installation mode: selectatec® with interlock

Electrical Specifications

Power and Battery Backup

Battery backup:	60 min for 1 piece battery (powered by new fully-charged batteries with 25°C ambient temperature) 120 min for 2 piece battery (powered by new fully-charged batteries with 25°C ambient temperature)
Battery type:	Build-in Li-ion battery, 11.1 VDC, 4400 mAh
Number of batteries:	1 or 2 pieces
Time to shutdown:	5 min at least (powered by new fully-charged batteries after the first low-power alarm)

Power cord: 5 m

Inlet and Outlet Modules

Interface Specifications

Wire network: RJ 45 connector 100-Base-TX support HL7 communication license and upgrading of main unit

Pneumatic Specifications

Switching Auxiliary Common Gas Outlet(ACGO)

Connector: ISO 22 mm OD and 15 mm ID

The outlet locates at the inspiratory limb

Gas Supply

Pipeline input range: 0.28~0.6MPa

Pipeline connections: NIST or DISS

Cylinder input: PISS

Maximum 2 cylinders, optional

Primary regulator nominal output: 207kPa

Electronic display and mechanical control flow meters

O₂ range: 0~10 L/min

N₂O range: 0~10 L/min

Air range: 0~10L/min

Accuracy: <± 10% of indication

Auxiliary O₂ Flowmeter (Optional)

Range: 0~15 L/min

Indicator: Flow tube

Hypoxic Guard System

Type: Mechanical

Range: Provides a nominal minimum 25% concentration of oxygen in O₂ /N₂O mixture

O₂ Controls

Method: N₂O shut off with loss of O₂ pressure

Supply failure alarm: <220kPa

O₂ Flush: 25~75 L/min

Breathing Circuit Specification

System Pressure Gauge:

Range: -20~100 cmH₂O

Accuracy: ±2. 5% full scale

Bag/Mechanical Ventilation Switch:

Type: Bi-stable

Control: the switch between manual ventilation and ventilator

Adjustable Pressure Limiting (APL) valve:

Range: 1~75 cm H₂O

Tactile knob indication at: >30 cm H₂O

Accuracy: ± 10 cm H₂O or ± 15%. whichever is larger

start pressure : 1 cm H₂O

Breathing Circuit Parameters:

Compliance:	≅4mL/100Pa Automatically compensates for compression loss with in the breathing circuit in mechanical mode
Expiration resistance:	< 6 cm H ₂ O @60 L/min
Inspiration resistance:	< 6 cm H ₂ O @60 L/min
Material:	The material contact exhaled gas is autoclavable except flow sensors, O ₂ cell and mechanical pressure meter; All material contact exhaled gas is natural latex free.
Operational Modes:	Closed and semi-closed circuit system
Volume of CO ₂ canister:	about 1500 mL
Water Trap:	6mL, easy to be disassembled
Port and Connectors:	
Inspiration/ expiration connector:	22 mm OD and 15 mm ID conical connector
Manual bag port:	22 mm OD and 15 mm ID conical connector

Gas Monitoring

Carbon Dioxide (CO₂) Modules

Method:	Infrared absorption
Module type:	Mindray side-stream, Capnostat mainstream and Oridion micro-stream, optional
Work mode:	Standby or Measurement
Displayed numerics:	EtCO ₂ , FiCO ₂
Wave forms:	Capnography
Wave type:	The CO ₂ wave is displayed as a filled area.
Sweep:	6.25 mm/s, 12.5 mm/s

Mindray Side-stream Carbon Dioxide (CO₂) Module

Measurement range:	0~99 mmHg
Accuracy:	±2 mmHg (0~40 mmHg) ±5% of reading (41~76 mmHg) ±10% of reading (77~99 mmHg)
Resolution:	1 mmHg
Gas compensations:	N ₂ O, O ₂ and Anesthetic Gas(only for Desflurane) compensation, optional
Humidity compensation:	BTPS or ATPD
BTPS:	Body Temperature and Pressure, Saturated Gas
ATPD:	Ambient Temperature and Pressure, Dry Gas
Sampling rate:	70 or 100ml/min
Sampling rate accuracy:	±15% or 15ml/min whichever is larger
Start-up time:	Less than 1 min to enter ISO accuracy mode; 10 minute later to enter full accuracy status;
Response time:	When measured with a neonatal watertrap and a 2.5 m-long neonatal sampling line: <3.5 s @ 100 ml/min <4 s @ 70 ml/min When measured with an adult watertrap and a 2.5 m-long adult sampling line: <5.5 s @ 100 ml/min <7 s @ 70 ml/min
Delay time:	When measured with a neonatal watertrap and a 2.5m-long neonatal sampling line: <3 s @ 100 ml/min <3.5 s @ 70 ml/min When measured with an adult watertrap and a

2.5m-long adult sampling line:

<5 s @ 100 ml/min

<6.5 s @ 70 ml/min

Alarm limit: EtCO₂ high:(low limit+2) to 99mmHg

EtCO₂ low: 0 to (high limit-2) mmHg

FiCO₂ High: 0 to 99mmHg

Increments of 1 mmHg

Capnostat Mainstream CO₂ 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:	0.1mmHg(0~69mmHg) 0.25mmHg(70~150mmHg)
Response time:	< 60 ms
Gas compensations:	O ₂ compensations, AG compensations, Balance gas(room air or N ₂ O)compensations.
Alarm limit:	EtCO ₂ High:(low limit+2) to 150mmHg EtCO ₂ Low: 0 to (high limit-2) mmHg FiCO ₂ High:0 to 150mmHg Increments of 1 mmHg

Micro-Stream CO₂ Module

Measurement range:	0~99 mmHg
Accuracy:	±2 mmHg(0~38 mmHg) ±5% (39~99 mmHg)
Resolution:	Waveform: 0.1mmHg Value: 1mmHg
Sampling rate:	50ml/min
Sampling accuracy:	-7.5 ml/min~+15 ml/min
Initialization time:	30s(typical) reaches 5% steady-state accuracy within 3 minutes
Response time:	2.9s(typical) including the rising time and the delay time (adopting the Filter Line of standard length)
Rising time:	<190ms(rising from 10% to 90%)
Delay time:	2.7s (typical)
Alarm range:	EtCO ₂ high:(low limit+2) to 99mmHg EtCO ₂ low: 0 to (high limit-2) mmHg FiCO ₂ High: 0 to 99mmHg Increments of 1 mmHg

Environment specification

Operation conditions	
Temperature:	10~40°C
Relative humidity:	15~95%(noncondensing)
Barometric (KPa):	70~106 kPa

Storage conditions

Temperature:	-20~55°C
Relative humidity:	10~95%(noncondensing)
Barometric (KPa):	50~106 kPa

EEG Bandwidth: 0.25 - 100 Hz
 Patient Leakage: <10uA
 Alarm limit: BIS high: (low limit +2)~100
 BIS low: 0~ (high limit -2)
 Calculated parameters: SQI,EMG, SR, SEF, TP
 Impedance range: 0~999Kohm

*: 10 % to 90 %, gas sample flow rate 120ml/min, using the DRYLINE™ watertrap and neonatal DRYLINE™ sampling line (2.5m)
 **: 10 % to 90 %, gas sample flow rate 200ml/min, using the DRYLINE™ water trap and adult DRYLINE™ sampling line (2.5m).

Environment specification

Operation conditions
 Temperature: 10~40°C
 Relative humidity: 15~95%(noncondensing)
 Barometric (KPa): 70~106 kPa

Storage conditions

Temperature: -20~55°C
 Relative humidity: 10~95%(noncondensing)
 Barometric (KPa): 50~106 kPa (optional Artema Multi-Gas module: 70~106 kPa)

Active AGSS:

High flow, low vacuum
 Applies with ISO 8835-3:1997
 Connectors apply with BS 6834:1987
 Flow of suction: 50-80L/min
 Resistance: 0.75KPa @ 75L/min
 Pressure release: compensation port to atmosphere
 Filter: Stainless steel reseau with 140-150µm of diameter
 Safety: Float sinks down while flow of suction is lower than 50L/min

With isolation transformer		
External AC power supply		
Input voltage	100 to 120 V	220 to 240 V
Input current	8.5 A	3.5 A
Input frequency	50/60 Hz	
Leakage current	< 500µA	
Auxiliary output supply		
Output voltage	100 to 120 V	220 to 240 V
Output frequency	50/60 Hz	50/60 Hz
Output current(outlet 1)	3.8 A	1.6 A
Output current(outlet 2)	1.0 A	0.5 A
Output current(outlet 3)	1.0 A	0.5 A
Without isolation transformer		
External AC power supply		
Input voltage	100 to 240 V	100 to 120 V
Input current	8.5 to 3.5 A	8.5 A
Input frequency	50/60 Hz	
Leakage current	< 500µA	
Auxiliary output supply		
Output voltage	100 to 240 V	100 to 120 V
Output frequency	50/60 Hz	50/60 Hz
Output current(outlet 1)	3.8 to 1.6 A	3.8 A
Output current(outlet 2)	1.0 to 0.5 A	1.0 A
Output current(outlet 3)	1.0 to 0.5 A	1.0 A

Inlet and Outlet Modules

3 outputs: without separate transformer, include:

Type	Area	Input power	3auxiliary output
With no isolated transformer	Europe	100-240V~ 6.2-2.6A 50/60Hz	100-240V~ 1.2-0.6A 50/60Hz
	UK		
	India		
	US(B type)		
	Australia		
With isolated transformer	US	100-120V~ 5.6A 50/60Hz	100-120V~ 1.2A 50/60Hz
	Europe	220-240V~ 2.7A 50/60Hz	220-240V~ 0.6A 50/60Hz
	UK		
	India		
	US(B type)		
	Australia		
US	100-120V~ 5.6A 50/60Hz	100-120V~ 1.2A 50/60Hz	

DISTRIBUTOR:



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WATO™ EX-65

Anesthesia Machines



Technical Specifications

Physical specifications

Dimensions and Weight

Height:	1350 mm
Width:	700 mm (dual vaporizers without breathing circuit) 950 mm (dual vaporizers with breathing circuit)
Depth:	610 mm
Weight:	<120 kg (including trolley base, without vaporizer and cylinder)

Top Shelf

Weight limit:	30kg
Width:	480mm
Depth:	440mm

Retractable work surface

Height:	860 mm
Area:	1012 cm ²

LED Light

Illuminates all work surface

DIN Rail

Side of machine:	370mm
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Drawers(two)-Locking (internal dimensions)

Height:	170 mm
Width:	350 mm
Depth:	270 mm

Casters

Diameter:	125 mm
Brakes:	Individual locking

Screen

Display type:	Color active matrix TFT
Display size:	10.4 in diagonal
Resolution:	800×600
Brightness:	Adjustable
Multi-display selectable:	Standard , large font or monitoring
Display Parameters:	All settings and alarm parameters(Breath rate, I: E ratio, tidal volume, minute volume, PEEP, peak pressure, Resistance, Compliance, FiO ₂ , EtCO ₂ , Pmean, Pplat and electronic flow indicated bars)
Display Graphics:	
Standard:	Waves of Pressure-Time, Flow-Time, Volume-Time;
Optional:	Loops of Pressure-Volume and Flow-Volume , Wave of Co ₂ , Trend of EEG and BIS.
Timer:	The time of operation will be displayed on the screen
Loops:	F-V, P-V and F-P loops

Ventilator Specifications

Standby Mode: Machine is on call; System settings, ventilation and alarm parameters can be set

Modes of Ventilation-Standard

Volume-Controlled Ventilation (VCV) with tidal volume compensation
Manual
Pressure Control Ventilation (PCV)

Modes of Ventilation-Optional

Synchronized Intermittent Mandatory Ventilation (SIMV) (volume and pressure)
Pressure Support Ventilation (PSV) with Apnea backup

Ventilator Parameter Ranges

Tidal volume range:	20~1500 ml (VCV and SIMV-VC)
Incremental settings:	20~100ml (increments of 5 ml) 100~300 ml (increments of 10 ml) 300~1500 ml (increments of 25 ml)
Pressure (inspired) range:	5~60 cmH ₂ O increments of 1 cmH ₂ O
Pressure (limit) range:	10~100 cmH ₂ O increments of 1 cmH ₂ O
Pressure (support) range:	5 to 60 cmH ₂ O increments of 1 cmH ₂ O
Rate range:	4~100 bpm increments of 1 bpm (VCV, PCV) 4~60 bpm

Inspiratory/Expiratory ratio (I:E) range:	4:1~1:8 increments of 0.5 (VCV, PCV)
Inspiratory time:	0.4~5.0 seconds increments of 0.1 seconds (SIMV)
Trigger window:	5~90% increments of 5% (SIMV)
Pressure trigger:	-20 ~ -1 cmH ₂ O increments of -1 cmH ₂ O (SIMV, PSV)
Flow trigger:	0.5~15L/min increments of 0.5 L/min (SIMV, PSV)
Inspiratory termination level:	5~60% of peak inspiratory flow increments of 5% (PSV)
Backup time:	5-30 seconds increments of 5 seconds (PSV)
Inspiratory pause time:	OFF, 5~60% of inspiratory time
Positive End Expiratory Pressure (PEEP)	Type: Integrated, electronically controlled Range: OFF, 4~30 cmH ₂ O increments of 1 cmH ₂ O

Ventilator Performance

Pressure range at inlet:	0.28~0.6 MPa
Peak gas flow:	100 L/min plus fresh gas
Flow valve range:	1 to 100 L/min

Ventilator Accuracy

Delivery/ monitoring accuracy	
Volume delivery:	< 75 ml, ±15ml ≥ 75 ml, ±20ml or ±10%, whichever is larger
Psupport/inspired:	±3.0 cmH ₂ O, or ±8%, whichever is larger
Plimit:	±4.0 cmH ₂ O, or ±10%, whichever is larger
PEEP delivery:	±2.0 cmH ₂ O, or ±10%, whichever is larger
Volume monitoring:	< 75 ml, ±15ml ≥ 75 ml, <1500 ml, ±20ml or ±10%, whichever is larger >1500 ml, unspecified
Pressure monitoring:	±3.0 cmH ₂ O, or ±8%, whichever is larger

Alarm Settings

Tidal volume(expiratory):	High: 5~1600 ml Low: 0~1595 ml
Minute volume(expiratory):	High: 0.2~100 Low: 0~99
Inspired oxygen:	High: 20~100% Low: 18~98%
Low airway pressure:	0~98 cmH ₂ O
High pressure:	2~100 cmH ₂ O
Apnea alarm:	20s
Rate :	High: 4~100bpm Low: 2~98bpm

Ventilator Monitoring

Minute volume range (expiratory) :	0~100 L/min
Tidal volume range (expiratory) :	0~2500 ml
Inspired oxygen(FiO ₂):	18~100%
Peak pressure:	-20~120 cmH ₂ O
Mean pressure:	-20~120 cmH ₂ O
Plateau pressure:	-20~120 cmH ₂ O
Sweep speed:	6.25 mm/s or 12.5 mm/s
Positive End Expiratory Pressure (PEEP):	0~70 cmH ₂ O

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Anesthesia Machines

Trend Chart: Continuous trend information together with time discrete events are stored and shown by lines for the latest 24 hours with 5 seconds resolution for TV_E, P_{peak}, MV, P_{plat}, PEEP, P_{mean}, Rate and optional FiO₂, EtCO₂, BIS.
New trend chart will be recorded when restart the machine

Trend Table: Continuous trend information together with time discrete events are stored and shown by table for the latest 24 hours for TV_E, P_{peak}, MV, P_{plat}, PEEP, P_{mean}, Rate and optional FiO₂, EtCO₂, BIS.
Resolution: 30s, 1min, 5 min, 30 min, optional
New trend table will be recorded when restart the machine

Vaporizer

Type: Penlon Sigma Delta® or Sigma Alpha® vaporizer, options include Desflurane, Isoflurane, Enflurane, Sevoflurane and Halothane vaporizers
Position of vaporizer: one or dual-positions
Installation mode: selectatec® with interlock

Power and Battery Backup

Battery backup: 60 min for 1 piece battery (powered by new fully-charged batteries with 25°C ambient temperature)
120 min for 2 piece battery (powered by new fully-charged batteries with 25°C ambient temperature)
Battery type: Build-in Li-ion battery, 11.1 VDC, 4400 mAh
Number of batteries: 1 or 2 pieces
Time to shutdown: 5 min at least (powered by new fully-charged batteries after the first low-power alarm)
Charge time: Approximately 8 hours (in running status or stand by mode)
Power cord: 5 m

Inlet and Outlet Modules

Interface Specifications

Wire network: RJ 45 connector 100-Base-TX support HL7 communication license and upgrading of main unit

Pneumatic Specifications

Switching Auxiliary Common Gas Outlet (ACGO)

Connector: ISO 22 mm OD and 15 mm ID
The outlet locates at the inspiratory limb

Gas Supply

Pipeline input range: 0.28~0.6MPa
Pipeline connections: NIST or DISS
Cylinder input: PISS
Maximum 2 cylinders, optional
Primary regulator nominal output: 207kPa

Electronic display and mechanical control flow meters

O₂ range: 0~10 L/min
N₂O range: 0~10 L/min
Air range: 0~10L/min
Accuracy: <± 10% of indication

Auxiliary O₂ Flowmeter (Optional)

Range: 0~15 L/min
Indicator: Flow tube

Hypoxic Guard System

Type: Mechanical
Range: Provides a nominal minimum 25% concentration of oxygen in O₂/N₂O mixture

O₂ Controls

Method: N₂O shut off with loss of O₂ pressure
Supply failure alarm: <220kPa

O₂ Flush: 25~75 L/min

Breathing Circuit Specification

System Pressure Gauge:
Range: -20~100 cmH₂O
Accuracy: ±2.5% full scale
Bag/Mechanical Ventilation Switch:
Type: Bi-stable
Control: the switch between manual ventilation and ventilator

Adjustable Pressure Limiting (APL) valve:

Range: 1~75 cm H₂O
Tactile knob indication at: >30 cm H₂O
Accuracy: ± 10 cm H₂O
start pressure: 1 cm H₂O

Breathing Circuit Parameters:

Compliance: ≅ 4mL/100Pa
Automatically compensates for compression loss with in the breathing circuit in mechanical mode
Expiration resistance: < 6 cm H₂O @60 L/min
Inspiration resistance: < 6 cm H₂O @60 L/min
Material: The material contact exhaled gas is autoclavable except flow sensors, O₂ fell cell and mechanical pressure meter; All material contact exhaled gas is natural latex free.
Operational Modes: Closed and semi-closed circuit system
Volume of CO₂ canister: about 1500
Water Trap: 6mL, easy to be disassembled
Port and Connectors:
Inspiration/ expiration connector: 22 mm OD and 15 mm ID conical connector
Manual bag port: 22 mm OD and 15 mm ID conical connector

Gas Monitoring

Carbon Dioxide (CO₂) Modules

Method: Infrared absorption
Module type: Mindray side-stream, Capnostat mainstream and Oridion micro-stream, optional
Standby or Measurement
Work mode:
Displayed numerics: EtCO₂, FiCO₂
Wave forms: Capnography
Wave type: The CO₂ wave is displayed as a filled area.
Sweep: 6.25 mm/s, 12.5 mm/s

Mindray Side-stream Carbon Dioxide (CO₂) Module

Measurement range: 0~99 mmHg
Accuracy: ± 2 mmHg (0~40 mmHg)
± 5% of reading (41~76 mmHg)
± 10% of reading (77~99 mmHg)
Resolution: 1 mmHg
Gas compensations: N₂O, O₂ and Anesthetic Gas (only for Desflurane) compensation, optional
Humidity compensation: BTPS or ATPD
BTPS: Body Temperature and Pressure, Saturated Gas
ATPD: Ambient Temperature and Pressure, Dry Gas
Sampling rate: 70 or 100ml/min
Sampling rate accuracy: ± 15% or 15ml/min whichever is larger
Start-up time: Less than 1 min to enter ISO accuracy mode;
10 minute later to enter full accuracy status;
Response time: When measured with a neonatal watertrap and a 2.5 m-long neonatal sampling line:
<3.5 s @ 100 ml/min
<4 s @ 70 ml/min
When measured with an adult watertrap and a 2.5 m-long adult sampling line:
<5.5 s @ 100 ml/min
<7 s @ 70 ml/min
Delay time: When measured with a neonatal watertrap and a 2.5m-long neonatal sampling line:
<3 s @ 100 ml/min
<3.5 s @ 70 ml/min
When measured with an adult watertrap and a 2.5m-long adult sampling line:
<5 s @ 100 ml/min
<6.5 s @ 70 ml/min
Alarm limit: EtCO₂ high: (low limit+2) to 99mmHg
EtCO₂ low: 0 to (high limit-2) mmHg
FiCO₂ High: 0 to 99mmHg
Increments of 1 mmHg

Capnostat Mainstream CO₂ 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: 0.1 mmHg (0~69 mmHg)
0.25 mmHg (70~150 mmHg)
Response time: < 60 ms
Gas compensations: O₂ compensations, AG compensations, Balance gas (room air or N₂O) compensations.

Alarm limit: EtCO₂ High:(low limit+2) to 150mmHg
 EtCO₂ Low: 0 to (high limit-2) mmHg
 FiCO₂ High:0 to 150mmHg
 Increments of 1 mmHg

Micro-Stream CO₂ Module

Measurement range: 0~99 mmHg
 Accuracy: ±2 mmHg(0~38 mmHg)
 ±5% (39~99 mmHg)
 Resolution: Waveform: 0.1mmHg
 Value: 1mmHg
 Sampling rate: 50ml/min
 Sampling accuracy: -7.5 ml/min~+15 ml/min
 Initialization time: 30s(typical)
 reaches 5% steady-state accuracy within 3 minutes
 Response time: 2.9s(typical) including the rising time and the delay time (adopting the Filter Line of standard length)
 Rising time: <190ms(rising from 10% to 90%)
 Delay time: 2.7s (typical)
 Alarm range: EtCO₂ high:(low limit+2) to 99mmHg
 EtCO₂ low: 0 to (high limit-2) mmHg
 FiCO₂ High: 0 to 99mmHg
 Increments of 1 mmHg

Anesthetic Agent (AA) Module

Module type: Module with three slots (optional for BIS module and O₂ module)
 Measurement mode: Side-stream
 Warm-up time: 45s (ISO accuracy mode); 10 min(full accuracy mode)
 ISO accuracy specifications:
 Most errors the same as full accuracy specifications, a few different as follows:
 Add ±0.3%ABS to error for CO₂;
 Add ±8%REL to error for all anesthetic agents;
 N₂O error is ±(8%REL+2%ABS).
 Pump rate: 120/ min ,150/ min ,200 ml/min,optional;
 Accuracy: ±10ml/min or ±10%, whichever is greater.
 Monitored parameters: CO₂, N₂O,AA, MAC,Paramagnetic O₂ and BIS (optional)
 AA(Anesthetic Agent) :
 Enflurane(Enf),Isoflurane(Iso),Sevoflurane(Sev), Desflurane(Des) and Halothane(Hal)
 Refreshing rate: 1 second
 Displayed numerics: EtCO₂, FiCO₂, EtN₂O, FiN₂O, EtAA, FiAA, MAC,FiO₂, EtO₂ and BIS(optional)
 Wave type: Fill
 Fill: The CO₂ wave is displayed as a filled area.
 Sweep: 6.25 mm/s,12.5 mm/s

Carbon dioxide(CO₂)

EtCO₂: End-tidal CO₂ concentration
 FiCO₂: Inspired CO₂ concentration
 Range: 0 to 30%
 Accuracy: Concentration(%REL) Error(%ABS)
 0 to 1 ±0.1
 1 to 5 ±0.2
 5 to 7 ±0.3
 7 to 10 ±0.5
 >10 Unspecified

Adjustable low and high alarm limits for EtCO₂ and FiCO₂

Oxygen(O₂, Paramagnetic)

FiO₂: Inspired O₂ concentration
 EtO₂: End-tidal O₂ concentration
 Range: 0 to 100%
 Accuracy: Concentration(%REL) Error(%ABS)
 0 to 25 ±1
 25 to 80 ±2
 80 to 100 ±3

Adjustable low and high alarm limits for EtO₂ and FiO₂

Nitrous Oxide(N₂O)

FiN₂O: Inspired N₂O concentration
 EtN₂O: End-tidal N₂O concentration
 Range: 0 to 100 %
 Accuracy: Concentration(%REL) Error(%ABS)
 0 to 20 ±2
 20 to 100 ±3

Adjustable low and high alarm limits for EtN₂O and FiN₂O

Anesthetic Agent(AA)

FiAA : Inspired AA concentration
 EtAA : End-tidal AA concentration
 Range: 0 to 30 %
 Accuracy: Concentration(%REL) Error(%ABS)
 Des 0 to 1 ±0.15
 1 to 5 ±0.2
 5 to 10 ±0.4
 10 to 15 ±0.6
 15 to 18 ±1
 >18 Unspecified
 Sev 0 to 1 ±0.15
 1 to 5 ±0.2
 5 to 8 ±0.4
 >8 Unspecified
 Iso, Enf, Hal 0 to 1% ±0.15
 1 to 5% ±0.2
 > 5 % Unspecified

Rise time*:

CO₂ ≤250 ms (fall time: 200ms)
 N₂O ≤250 ms
 O₂ ≤600 ms
 Hal, Iso, Sev, Des ≤300 ms
 Enf ≤350 ms

Rise time**

CO₂ ≤250 ms (fall time: 200 ms)
 N₂O ≤250 ms
 O₂ ≤500 ms
 Hal, Iso, Sev, Des ≤300 ms
 Enf ≤350 ms

Delay time:

<4s

Refreshing time:

one second

Calibration:

once per year

Adjustable low and high alarm limits for EtAA and FiAA

Alarm limit

CO₂ alarm limit: EtCO₂ High : (low limit + 2) to 76 mmHg
 EtCO₂ Low : 0 to (high limit - 2)mmHg
 FiCO₂ High : (low limit + 2) to 76 mmHg
 FiCO₂ Low : 0 to (high limit - 2)mmHg
 Increments of 1mmHg

O₂ alarm limit:

EtO₂ High : (low limit + 0.3) to 100 %
 EtO₂ Low : 18 to (high limit - 0.3)%
 FiO₂ High : (low limit + 0.3) to 100 %
 FiO₂ Low : 18 to (high limit - 0.3)%
 Increments of 0.1

N₂O alarm limit:

EtN₂O High: (low limit + 2) to 100 %
 EtN₂O Low :0 to (high limit - 2)%
 FiN₂O High : (low limit + 2) to 100 %
 FiN₂O Low :0 to (high limit - 2)%
 Increments of 1%

Des alarm limit:

EtDes High : (low limit + 0.2) to 18.0 %
 EtDes Low : 0 to (high limit - 0.2)%
 EtDes High : (low limit + 0.2) to 18.0 %
 EtDes Low : 0 to (high limit - 0.2)%
 Increments of 0.1%

Sev alarm limit:

EtSev High : (low limit + 0.2) to 8.0 %
 EtSev Low : 0 to (high limit - 0.2)%
 FiSev High : (low limit + 0.2) to 8.0 %
 FiSev Low : 0 to (high limit - 0.2)%
 Increments of 0.1%

Iso /Enf/ Hal alarm limit :

EtHal/Enf/Iso High : (low limit + 0.2) to 5.0 %
 EtHal/Enf/Iso Low :0 to (high limit - 0.2)%
 FiHal/Enf/Iso High: (low limit + 0.2) to 5.0 %
 FiHal/Enf/Iso Low: 0 to (high limit-0.2)%
 Increments of 0.1%

BIS (Bispectral Index) monitoring

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): <0.3uV (0.25 - 50 Hz)
 Input Signal Range: +/- 1mV



Wato

[110 A.D. - 207 A.D.]

The first Chinese surgeon who developed the use of anesthesia and furthered the Chinese knowledge of anatomy

Order Information

Main unit includes ventilator, ACGO, Electronic flowmeters and 1 backup flowmeter, breathing circuit with 1 CO ₂ absorber, 2 drawers, LED light, alarm light, 1 lithium battery (60min), switch and user manual and quick guide.		
	WATO™ EX-55	WATO™ EX-65
Color LCD screen	8.4 inch	10.4 inch
Gas supply (electronic flowmeters)	O ₂ , O ₂ +N ₂ O, O ₂ +N ₂ O+Air, O ₂ +Air	O ₂ , O ₂ +N ₂ O, O ₂ +N ₂ O+Air, O ₂ +Air
Back-up cylinder yokes	O ₂ /O ₂ +O ₂ /O ₂ +N ₂ O/O ₂ +Air	O ₂ /O ₂ +O ₂ /O ₂ +N ₂ O/O ₂ +Air
Retractable work surface	Standard	Standard
Module rack	Standard	Standard
Position for vaporizers	1 or 2	1 or 2
Vaporizers(Selectatec® compatible)	Isoflurane, Enflurane, Sevoflurane, Halothane, Desflurane	Isoflurane, Enflurane, Sevoflurane, Halothane, Desflurane
Volume-controlled ventilation	20-1500ml, with tidal volume compensation	20-1500ml, with tidal volume compensation
Electronic PEEP	Yes	Yes
Pressure-controlled ventilation	Optional	Yes
SIMV	Optional	Optional
PSV with Apnea Backup	Optional	Optional
Airway pressure monitoring	Yes	Yes
Inspired oxygen monitoring	Yes	Yes
Paramagnetic oxygen monitoring	N/A	Optional
CO ₂ monitoring	Optional	Optional
Anesthetic Agents monitoring	N/A	Optional
BIS® monitoring	N/A	Optional
PV, FV and FP loops	N/A	Optional

For more information, please contact Mindray sales representatives

DISTRIBUTOR:



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mindray

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