

# WATO EX-20

## Anesthesia Machines

### Physical Specifications

#### Dimensions and Weight

Height	1375 mm
Width	715 mm (without breathing system) 880 mm (with breathing system)
Depth	620 mm
Weight	<120 kg (without vaporizers and cylinders)

#### Top Shelf

Weight limit	30 kg
Length	550 mm
Width	265 mm

#### Work Surface

Height	820 mm
Width	500 mm
Depth	310 mm

#### Drawer (Internal Dimension)

Height	135 mm
Width	390 mm
Depth	315 mm

#### Bag Arm

Height	1030 mm
Length	320 mm
Connection	ISO 22mm OD, 15mm ID

#### Casters

Diameter	125 mm
Brakes	All four casters with brakes

#### Screen

Display type	Color active matrix TFT
Display size	7.0 in diagonal
Pixel format	800 x 480
Brightness	Disadjustable
Display parameters	All setting and alarm parameters (including Breath rate, I/E ratio, Tidal volume, Minute



volume, PEEP, MEAN, PEAK, PLAT, and O<sub>2</sub> concentration)

Display waveforms P-T, F-T, V-T

### Ventilator Specifications

#### Modes of Ventilation

Manual/Spontaneous Ventilation/Bypass  
Volume Control Ventilation (VCV) with PLV function  
Pressure Mode Ventilation (P-mode)

#### Ventilation Parameters Range

Tidal volume	40~1500 mL ( (Volume Mode) 5~1500 mL (Pressure Mode)
Pinsp	5~60 cmH <sub>2</sub> O (increments of 1 cmH <sub>2</sub> O)
Plimit	10~100 cmH <sub>2</sub> O (increments of 1 cmH <sub>2</sub> O)
Rate	4~100 bpm (increments of 1 bpm)
I:E	4:1 - 1:8 (increments of 0.5)
Inspiratory pause	OFF, 5% - 60% (increments of 5%)

#### Positive End Expiratory Pressure (PEEP)

Type	Integrated, electronic controlled
Range	OFF, 4~30 cmH <sub>2</sub> O (increments of 1 cm H <sub>2</sub> O)

#### Ventilator Performance

Driving pressure	280 kPa to 600 kPa
Peak gas flow	120 L/min + Fresh Gas Flow

#### Monitoring Parameters

Minute volume	0 ~ 100 L/min
Tidal volume	0~2500 ml
Inspired oxygen (FiO <sub>2</sub> )	18% ~ 100%
Peak airway pressure	-20 ~ 120 cmH <sub>2</sub> O
Mean pressure	-20 ~ 120 cmH <sub>2</sub> O
Plateau pressure	-20 ~ 120 cmH <sub>2</sub> O
PEEP	0 ~ 70 cmH <sub>2</sub> O
Sweep speed	12.5 or 6.25 mm/s

### Control Accuracy

Volume delivery	< 75 ml: $\pm 15$ ml $\geq 75$ ml: $\pm 20$ ml or $\pm 10\%$ of the set value, whichever is greater
Plimit	$\pm 4.0$ cmH <sub>2</sub> O or $\pm 10\%$ of the set value, whichever is greater
Pinsp	$\pm 3.0$ cmH <sub>2</sub> O or $\pm 8\%$ of the set value, whichever is greater
$\Delta P_{\text{supp}}$	$\pm 3.0$ cmH <sub>2</sub> O or $\pm 8\%$ of the set value, whichever is greater
PEEP delivery	$\pm 2.0$ cmH <sub>2</sub> O or $\pm 10\%$ of the displayed value, whichever is greater

### Monitoring Accuracy

Volume monitoring	< 75 ml: $\pm 15$ ml $\geq 75$ ml and < 1500 ml: $\pm 20$ ml or $\pm 10\%$ of the reading, whichever is greater >1500ml: not defined
Pressure monitoring	$\pm 3.0$ cmH <sub>2</sub> O or $\pm 8\%$ of the reading, whichever is greater
PEEP monitoring	0 to 30 cmH <sub>2</sub> O: $\pm 2.0$ cmH <sub>2</sub> O or $\pm 10\%$ of the reading, whichever is greater >30 cmH <sub>2</sub> O: not defined
MV monitoring	0 to 30L/min: $\pm 1$ L/min or $\pm 15\%$ of the displayed value, whichever is greater Other range: not defined

### 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 Tve, Ppeak, MV, Pplat, PEEP, Pmean,Rate and optional FiO<sub>2</sub>. 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 TVe, Ppeak, MV, Pplat, PEEP, Pmean,Rate and optional FiO<sub>2</sub>.

Resolution 30s, 1min, 2min or 4min optional

New trend form will be recorded when restart the machine

### Alarm Setting

Tidal volume	Low: 0 ~ 1595 ml High: 5 ~ 1600 ml
Minute volume	Low: 0 ~ 99 L/min High: 0.2 ~ 100 L/min

Inspired oxygen	Low: 18% ~ 98% High: 20% ~ 100%
Apnea alarm	20s
Low airway pressure	0 ~ 98 cmH <sub>2</sub> O
High airway pressure	2 ~ 100 cmH <sub>2</sub> O

### Vaporizers

Vaporizer	Mindray V60 Anesthetic Vaporizer or Penlon Sigma Delta or Sigma Alpha Anesthetic Vaporizer
Support agents	Desflurane, Halothane, Enflurane, Isoflurane, Sevoflurane
Position	MAX.2
Mounting mode	Selectatec®, with interlocking function Plug-in®, with interlocking function

### Electrical Specifications

#### Current Leakage

100 ~ 240V	< 500 $\mu$ A
------------	---------------

#### Power And Battery Backup

Power input	without isolation transformer: 100-240 Vac, 50/60 Hz, 6.2~2.6A 100-120 Vac, 50/60 Hz, 5.6A with isolation transformer: 100-120 Vac, 50/60 Hz, 5.6A 220-240 Vac, 50/60 Hz, 2.7A
Battery backup	90 min for 1 piece battery (powered by new fully-charged batteries with 25°C ambient temperature) 150 min for 2 pieces 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

#### Auxiliary output supply

Output voltage	220 to 240 V, 100 to 120 V
Output frequency	50/60 Hz
Output current	220 to 240 V : 0.6 A 100 to 120 V : 1.2 A
Fuse	T2AH/250V

## Interface

Wire network	RJ 45 connector 100-Base-TX support upgrading of main unit
--------------	---

## Pneumatic Specifications

### ACGO (Auxiliary Common Gas Outlet)

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, DISS
Cylinder input	PISS, Maximum 2 cylinders, optional
Primary regulator nominal output:	207kPa

### O<sub>2</sub> Controls

Method	N <sub>2</sub> O shut off with loss of O <sub>2</sub> pressure
Supply failure alarm	≤ 220.6 kPa
O <sub>2</sub> Flush	25 ~ 75 L/min

### O<sub>2</sub>-N<sub>2</sub>O Link system

Type	Mechanical
Range	Provides a nominal minimum 25% concentration of oxygen in O <sub>2</sub> /N <sub>2</sub> O mixture

### Auxiliary O<sub>2</sub> Flowmeter (optional)

Range	0 ~ 15 L/min
Indicator	Flow tube

### Mechanical Control Flow Meters

O <sub>2</sub> flow range	Two flow tubes with the ranges of 0 ~ 1 L/Min and 1 ~ 15 L/min
Air flow range	Two flow tubes with the ranges of 0 ~ 1 L/Min and 1 ~ 15 L/min
N <sub>2</sub> O flow range	Two flow tubes with the ranges of 0 ~ 1 L/Min and 1 ~ 10 L/min
Accuracy	± 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°C
Relative humidity	15% ~ 95% (noncondensing)
Barometric (Kpa)	70 ~ 106 kPa

## Storage

Temperature	-20 ~ 60°C for main unit, -20 ~ 50°C for O <sub>2</sub> sensor
Relative humidity	10% ~ 95% (noncondensing)
Barometric	50 ~ 106 kPa

## Breathing Circuit Specification

### Breathing system volume

Automatic ventilation	2600 ml
Manual ventilation	1800 ml
Operational Modes	closed and semi-closed circuit system
Volume of CO <sub>2</sub> canister	about 1500 mL
Water Trap	6 mL, easy to be disassembled

### Breathing Circuit Parameters

Compliance	≤4 mL/100Pa (bag mode) Automatically compensates for compression losses within the breathing circuit in mechanical mode
Expiration resistance	< 6.0 cm H <sub>2</sub> O @60 L/min
Inspiration resistance	< 6.0 cm H <sub>2</sub> O @60 L/min

### System Pressure Gauge

Range:	-20 ~ 100 cmH <sub>2</sub> O
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

### Adjustable Pressure Limiting (APL) Valve

Range	1 ~ 75 cmH <sub>2</sub> O
Tactile knob indication at above 30 cmH <sub>2</sub> O	
Accuracy	± 10 cmH <sub>2</sub> O or ± 15% of the setting value, which is greater
Start pressure	≤ 2 cmH <sub>2</sub> O

### Anesthetic Gas Scavenging System (AGSS)

Size (H x W x D)	430 x 132 x 114 mm
------------------	--------------------

Type of disposal system

Active: High-flow or Low-flow

Passive

Applicable standard ISO 80601-2-13

Pump rate 75 ~ 105 L/min (High-flow)

25 ~ 50 L/min (Low-flow)

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).

Filter Stainless screen with hole diameter of 140 ~ 150  $\mu\text{m}$

Connector of the disposal system: ISO 9170-2

**Materials**

All materials in contact with exhaled patient gases are autoclavable and natural latex free, except flow sensors, O<sub>2</sub> sensor, and mechanical pressure gauge.

-----  
Please contact your local Mindray sales representative for the most current information.

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: intl-market@mindray.com www.mindray.com

**mindray** | Healthcare with reach are registered trademarks or trademarks owned by Shenzhen Mindray Bio-medical Electronics Co., LTD  
© 2017 Shenzhen Mindray Bio-medical Electronics Co., Ltd. All rights reserved. Specifications subject to changes without prior notice.  
P/N: ENG-WATO EX-20 datasheet-210285X4P-20180122

**mindray**