Baxter
Q-NRG+
INDIRECT CALORIMETRY

COSMED
The Metabolic Company

# Indirect Calorimetry Device Comparison and Q-NRG+ Features

## BACKGROUND

- Indirect Calorimetry (IC) is considered the gold standard to determine daily energy requirements of critically ill patients.[1,2,3]
- ESPEN recommends and ASPEN suggests the use of IC on critically ill mechanically ventilated patients to determine Energy Expenditure (EE), if available.[5,6]
- Q-NRG+ overcomes current barriers of use with other IC devices by having minimal warm-up/calibration times, faster test time, ease of use and demonstrated accuracy.[4]

## THE NEED

- EE is highly variable according to the initial injury, severity of disease, nutritional status, lean body mass, frequent changes in clinical condition, and treatment interventions.[4,7]
- Predictive formulas used to calculate EE are inaccurate and not clinically relevant.[4,8,9]
- Inaccurate Resting Energy Expenditure (REE) may lead to under- or overfeeding.[4,8,9]

## COMPARISON OF DEVICE FEATURES

Technical features of the Q-NRG+ and comparator indirect calorimeters. All systems are open-circuit devices.
The table below of listed features can be found in the respective user manuals.

| Device Name | | Technology (Chamber type) | Patient Type | Warm-up Time | Fraction of Inhaled Oxygen ($FiO_2$) Range | Calibration (w/syringe) | Power Supply |
|---|---|---|---|---|---|---|---|
| **Q-NRG+ (COSMED, Italy)[4,12]** |  | Mixing chamber | Spontaneously breathing<br>Ventilated | 5 min upon device start | ≤70% | Monthly | Li-Ion battery & AC Power |
| **Deltatrac II* (Datex, Finland)[4,13]** |  | Mixing chamber | Spontaneously breathing<br>Ventilated | 30 min prior to every test | ≤60% | Daily | AC Power Only (no battery) |
| **Quark RMR (COSMED, Italy)[4,14]** |  | Breath by breath | Spontaneously breathing<br>Ventilated | 30 min prior to every test | ≤60% | Daily | AC Power Only (no battery) |
| **Vmax Encore (Vyaire, California)[4,15]** |  | Breath by breath<br>Mixing chamber | Spontaneously breathing<br>Ventilated | 30 min prior to every test | ≤60% | Daily | AC Power Only (no battery) |
| **E-COVX (Datex-Ohmeda, Finland)[4,16]** |  | Breath by breath | Ventilated only | 30 min when module transferred to new ventilator | ≤65% | N/A | Vent/Monitor dependent |
| **CCM Express (MGC, Minnesota)[4,17]** |  | Breath by breath | Spontaneously breathing<br>Ventilated | 30 min prior to every test | ≤60% | Daily | AC Power Only (no battery) |

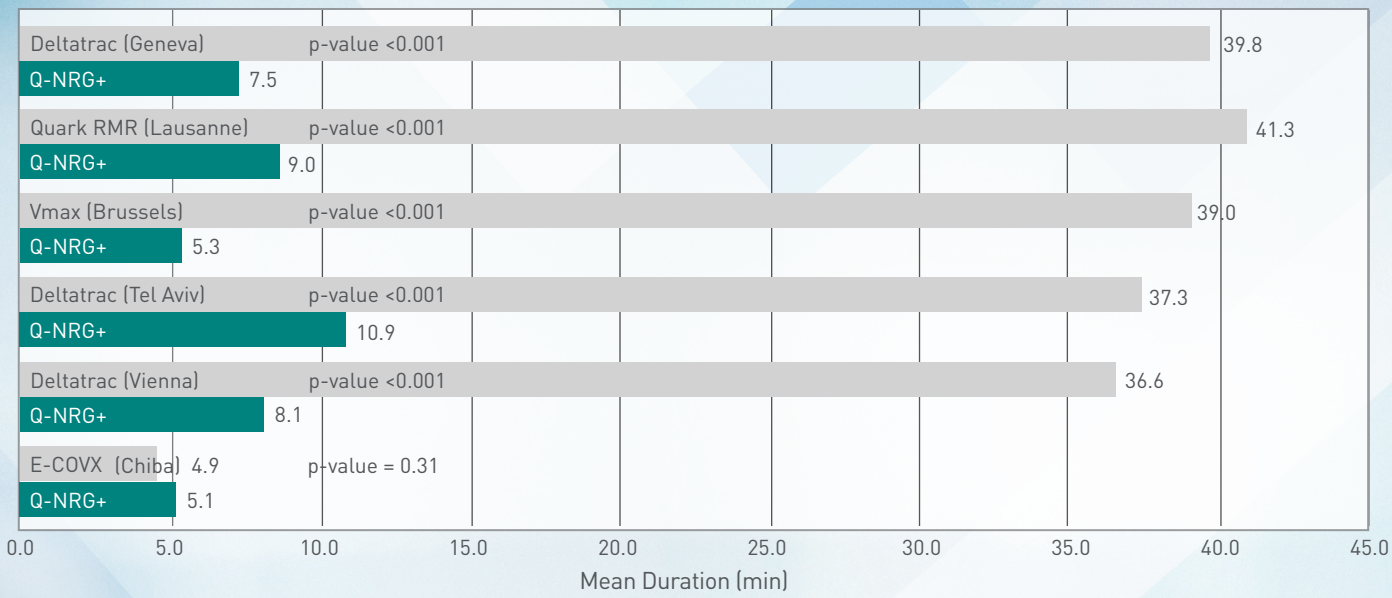
*No longer commercially available.

# Q-NRG+: Fast and Accurate

In a prospective, unblinded, observational, multicenter study with 277 adult, mechanically ventilated ICU patients, Q-NRG+ consistently led to faster test times (5.1 - 10.9 min).

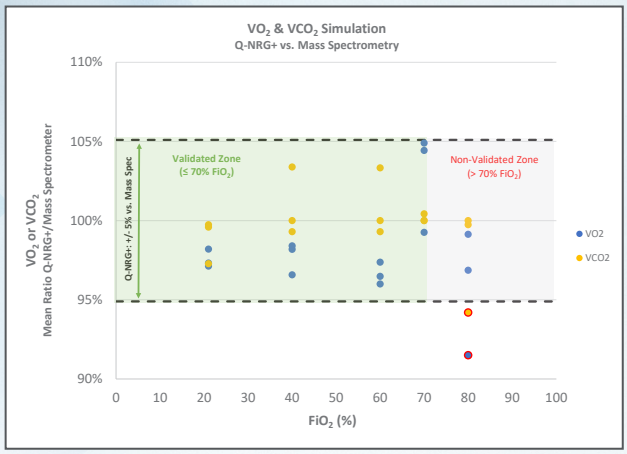
### Q-NRG+ vs. Currently Used Indirect Calorimeters[4]

Adapted from: Oshima T, et al. Clin Nutr 2020




### Validation of Indirect Calorimetry vs. Mass Spectrometry[11]

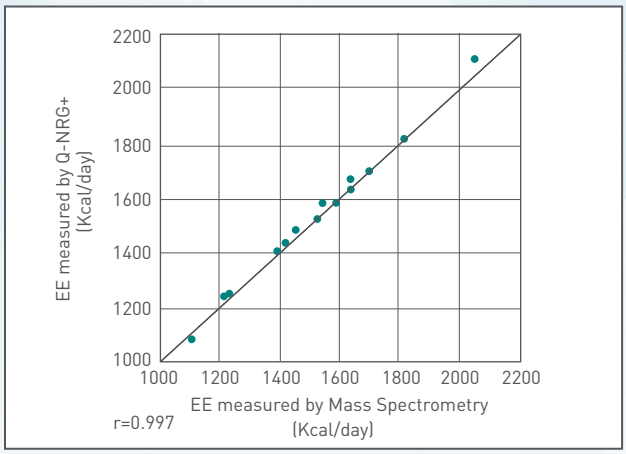
Adapted from: Oshima T, et al. Clin Nutr ESPEN 2019




Q-NRG+ was able to generate results within pre-defined limits (+/-5%) for $VO_2$ and $VCO_2$ simulations at $FiO_2$ settings of 21-70%.[11]

### Validation of Canopy Mode vs. Mass Spectrometry[10]

Adapted from: Delsoglio M, et al. Clin Nutr 2019




High correlation shown between the Q-NRG+ canopy mode and mass spectrometry for EE (r=0.997; p <0.001).[10]

## OVERALL CONCLUSIONS

1) Q-NRG+ is an indirect calorimeter that provides results within 10 to 15 minutes (includes warm-up, calibration, and test times). It does not require daily syringe calibration.[4]
2) Q-NRG+ is the only current indirect calorimeter on the market that offers the ability to measure REE in mechanically ventilated patients with $FiO_2$ up to 70%.[11]
3) Q-NRG+ is accurate and validated vs. mass spectrometry for use with a canopy hood in addition to use in ventilator mode.[10,11]

**Intended Use:** This device is intended for the measurement of REE for spontaneously breathing and ventilated patients, with some limitations in accordance with labeling, within the following population: spontaneously breathing subjects >15 Kg (33 lb), when tested with the Canopy dilution technique, ventilated subjects >age 10 and >10 Kg (22lb), and spontaneously breathing subjects > age 6 and >10 Kg (22 lb), when tested with Face Mask. This device is not suitable for operating in presence of flammable anesthetic gases or gases other than $O_2$, $CO_2$, $N_2$ and water vapor. The device is to be used by physicians or by trained personnel under the responsibility of a physician. The device is not intended as a continuous monitoring device for surveillance of vital physiological processes. **Warnings:** This device measures clinical parameters used to aid diagnosis and it is intended only as an adjunct device in patient assessment. In case of disturbing conditions, the shutdown is allowed because the safety of the device towards patients and operators is not affected, since the final evaluation is performed on the outcome data measured during a complete test. No modification of this device is allowed. For more information on this medical device, please refer to the User Manual.

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