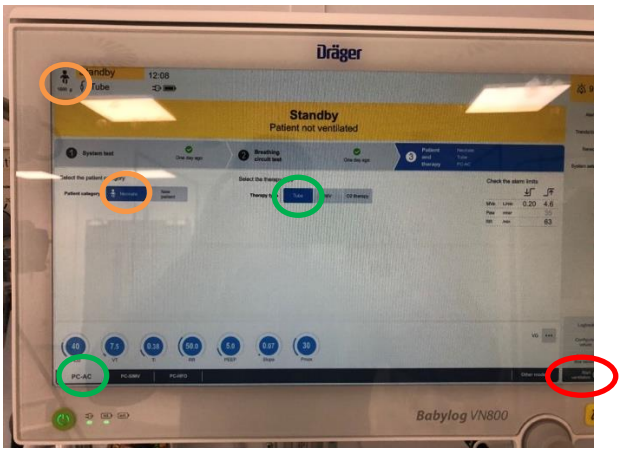
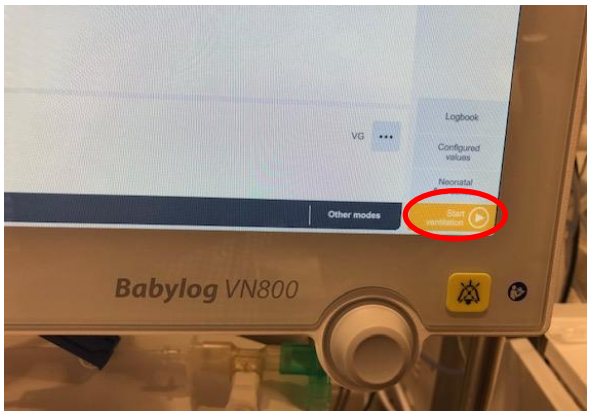
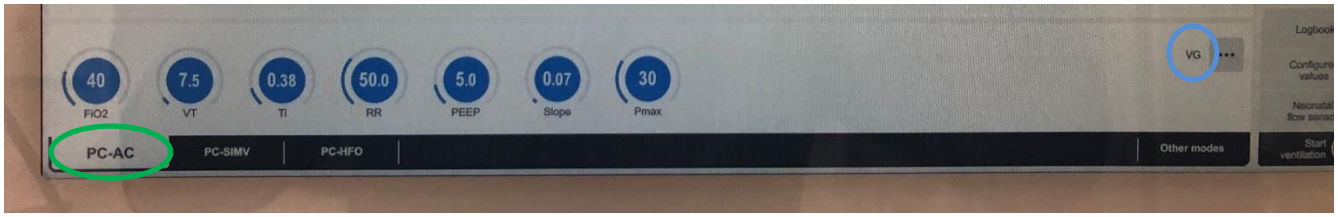
USING THE DRAEGER VN800/VN600 VENTILATOR TO DELIVER VOLUME TARGETED VENTILATION

Thank you to Dr Jonathan Hurst and Liverpool Women's Hospital for producing the contents of this guide & giving permission to share

Setting up Volume Targeted Ventiliation (PC-AC VG) on the Dräger Babylog VN800 or VN600







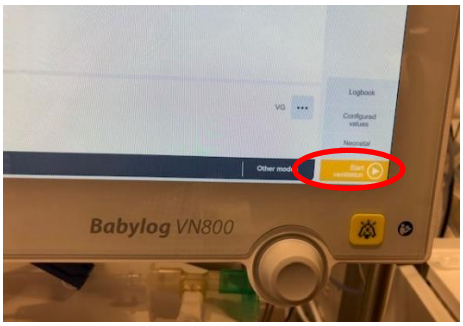
The default setting on the ventilators is usually **PC-AC VG** (pressure controlled – assist controlled with volume guarantee), as per the screen above.

When setting up the ventilator, at admission, it is vital that you ensure the following:

1. The weight is entered into the ventilator correctly (**orange** circles) – the default tidal volume setting (VT) is **5ml/kg** based on this weight. Entering the weight will also preset the Slope, Ti and RR (though the latter will need changing as per flow chart 1.1)
2. Ensure that the invasive ventilation mode is activated and **PC-AC** highlighted on the bottom of the screen (**green** circles).
3. Ensure that the volume guarantee function is activated, by seeing the letters 'VG' to the right of the ventilation settings bar (**blue** circle), which is the default setting. If this is not seen, VG will need to be turned on by pressing the '…' button next to the blue circle & switching VG on.
4. Ensure that the ventilation parameters are set correctly
5. Once you are happy with the settings as above, touch the 'start ventilation' button, in the bottom right of the screen, and confirm with pushing the rotary knob (**red** circle)

Note: for <u>any</u> change made on the screen, the rotary knob will flash orange and need to be pressed for each individual change to confirm it.

To turn off Volume Guarantee



In situations where you wish to turn off volume guarantee, this is done by pressing the "VG …" button above. In this sub menu is the option to toggle on or off VG.

2.2 The PC-AC VG interface (on Dräger Babylog VN800)

Baby's current working

Mode highlighted & in invasive

Measured tidal volume (Leak-compensated) in ml/kg

PIP (in VG) – large number
Pmean – smaller number

Ensure leak is below 65% for

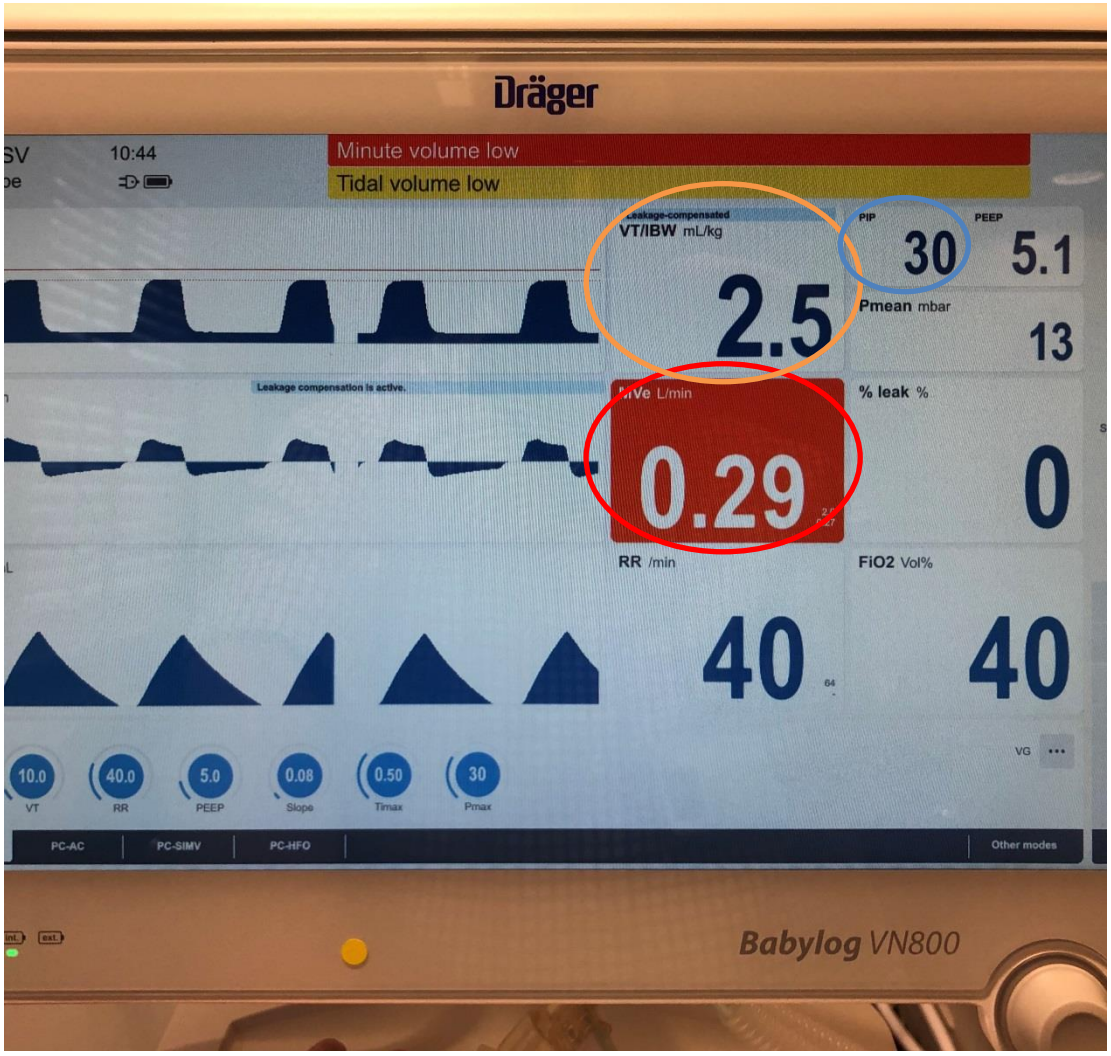
tidal volume (in mls) You will need to calculate the exact value you wish and input here

respiratory rate (minimum 'back-up' in PC-AC) – this will be set when the weight in inputted but should be adjusted

Ensure VG is stated here (should be default, unless has been turned off in another mode first)

Troubleshooting / alarms

- **Tidal volume low (amber) / Minute volume low (red)**



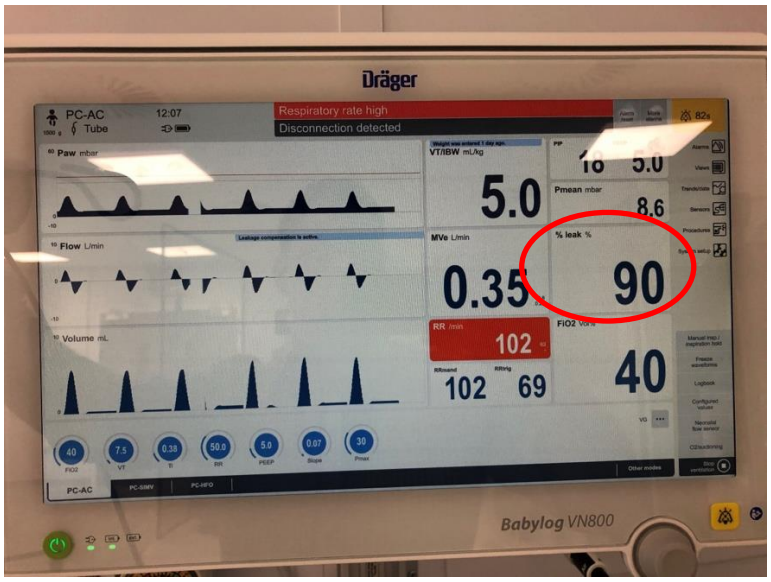
These two alarm messages can appear together, and in this case, the Pmax limit has also been reached (**blue** circle) in order to try and achieve the tidal volume delivery. The top bar of the ventilator will also illuminate so that this can be visible from a distance.

- Check that the leak on the ET tube is still less than 65%
- Ensure that the Pmax has been set correctly (see above)
- Ensure that there has not been a sudden deterioration (**DOPE**)
    - **Displacement** of ET tube
    - **Obstruction** of ET tube – (which would present like the picture above)
    - **Pneumothorax**
    - **Equipment** failure – e.g. kinking of ET tube / ventilator tubing (see above)

If there are no issues with the infant and the ventilator, and no deterioration in oxygenation, consider if the set TV can be reduced whilst maintaining adequate ventilation. If not HFOV may be required.

- **Respiratory rate high (red) / Disconection detected**

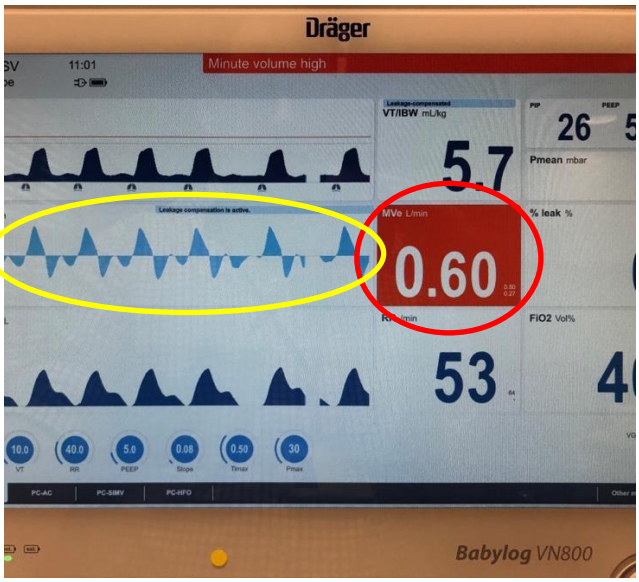
When ET tube leaks **above 65%** are detected by the ventilator, the delivery of volume guarantee breaths is suboptimal (7). The ventilator will try to compensate for this and the respiratory rate (and consequent minute volume) will increase to try to deliver the settings.



- Ensure that there is no **displacement** of the ET tube (as has occurred in the picture above)
- Ensure that there are no leaks in the ventilator circuit
- Consider replacement of ET tube / switching to PC-SIMV (+ Psupp)

- **Auto triggering**

It is important that the ventilator and flow sensor are set up correctly to detect the small amounts of air flow created during an infant's breath. However there is the risk that the ventilator can be triggered by external stimuli, e.g. water in the ventilation tubing / movement artefact from the ventilator tubing. When this occurs, the ventilator will detect an "infant breath" when they are not actually breathing and will deliver a ventilator breath. This usually occurs when the infant is in the expiratory or resting phase. This leads to ventilator-infant asynchrony, and is called **autotriggering**. On the ventilator, this usually presents as multiple breaths which are not in line with the infant's breathing pattern, and the infant can become agitated. The alarms may not sound initially, with the **Minute volume high** being the first alarm to sound (see below).

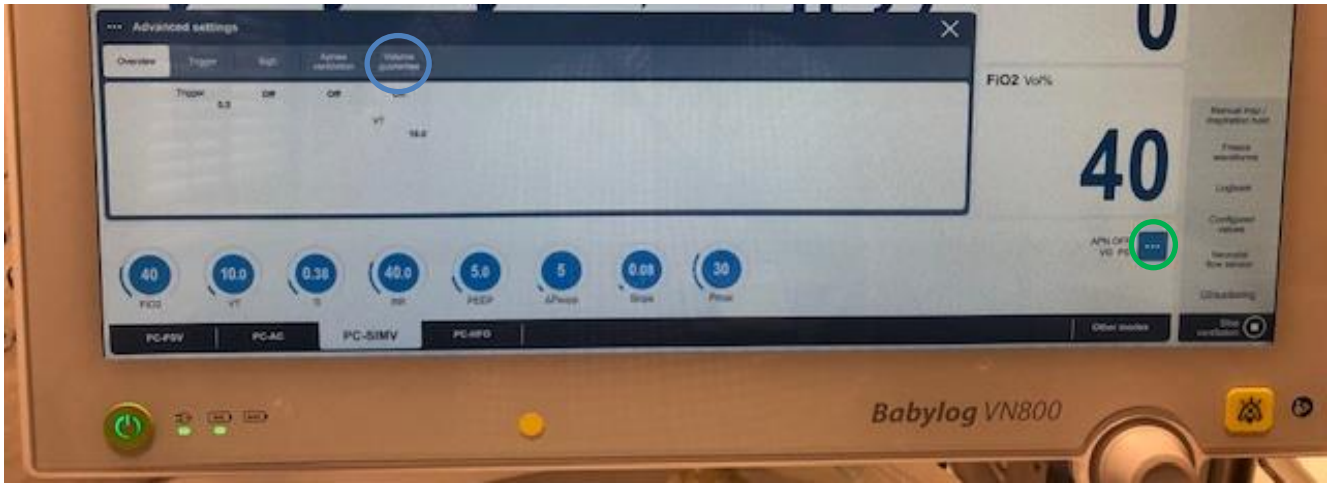


If this occurs:
- Check to make sure there is no movement of the ventilator tubing causing the disturbance
- Inspect the ventilator tubing / ET tube for free water. If present, this needs to be released by:
  - Emptying the water from the circuit
  - Drying the flow sensor
- If these have been excluded, consideration may need to be given to sedation and trigger settings (though only if you have experience in doing this).

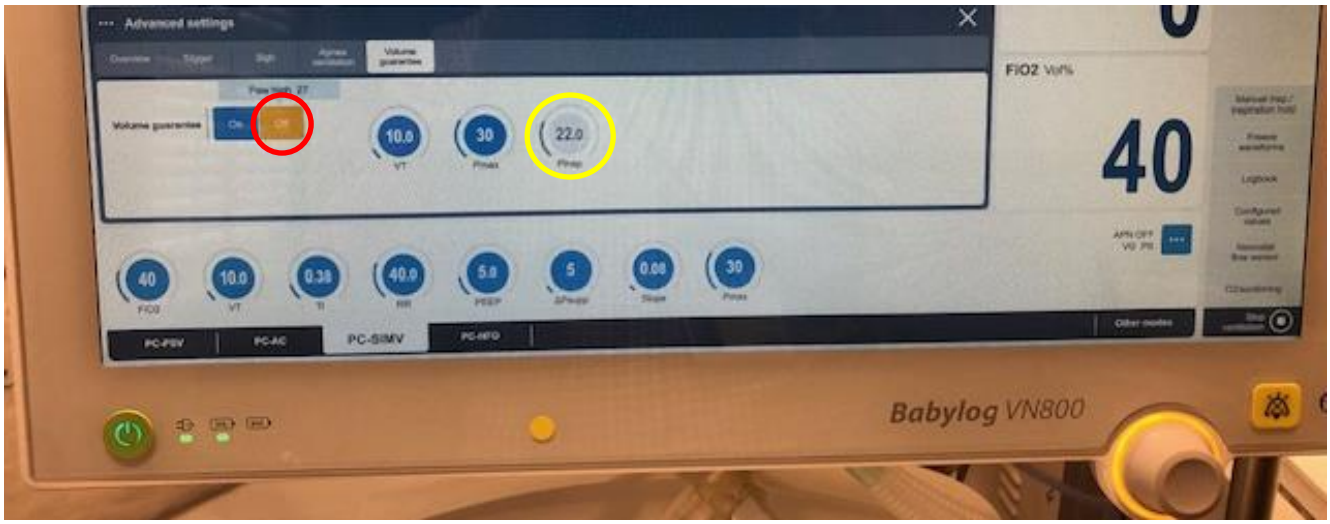
- **<u>Changing from PC-AC VG to PC-SIMV mode</u>**

When changing from PC-AC VG to PC-SIMV mode, there are several steps that need to be undertaken in order to turn the VG off (see below):

1. Touch the PC-SIMV box on the bottom of the ventilator screen (**orange** circle). This should be the second tab along, and it will highlight orange when touched, with the PC-SIMV settings available.



2. When this tab is lit, press the … button on the settings bar (**green** circle). This will open the 'Advanced settings box' (see above). Once this is visible, press on the 'volume guarantee' tab (**blue** circle).



3. Then click on the 'off' button (**red** circle) and click the rotary knob to confirm. This will then grey out the volume settings and allow you to set your Pinsp (peak inspiratory pressure) (**yellow** circle), and then confirm your setting by pressing the rotary knob again.

NB. When changing from this mode to any other mode, the VG will now be turned off. If the VG is needed again,the steps above can be performed to switch it back on.

4. Once the settings for PC-SIMV are inputted and confirmed by pressing the rotary knob, the PC-CIMV screen will appear as above. (PC-SIMV is now highlighted in the top left of the ventilator, the bottom ventilation mode bar, and the VG should now be off).

VN800 / VN600 Glossary of terms

The VN800 settings and terminology that may be unfamiliar to the practitioner setting up the ventilator, especially on first setting. If this is the case, always check the settings with someone who has prior experience. Below is a table of terms, with explanations.

Term item	Description & setting information
FiO2 (setting)	Fraction of inspired oxygen concentration delivered (%)
VT (setting)	**Target (or set)** tidal volume – this is in **mls** (not ml/kg) – increments of 0.1mls You will have to calculate the exact mls that you want to deliver. To do this, multiply the desired tidal volume by the baby's weight. E.g. A 1.5g baby with RDS will need: 1.5 x 5ml = 7.5ml. It is important that the baby's weight is correctly set in the ventilator, as any measured value (also labelled 'VT') will take this weight into account.
Ti (setting)	Inspiratory time (set) (s). By entering the weight into the start page of the ventilation, the Ti becomes preset and should be around 0.32 – 0.38s. This can be adjusted as required (by those trained to do so and understand its implications)
RR (setting)	In PC-AC or PSV mode, this is the **minimum** number of breaths the ventilator will support This should initially be set at **40** (>1000g) or **60** (<1000g). If the infant has no spontaneous respiratory effort, the ventilator will provide this number of breaths. In PC-SIMV mode, this is the number of breaths supported by the ventilator at the settings you have inputted. Any breaths the baby added above this will be goverened by their own support (or set pressure support – see below)
PEEP	Positive end-expiratory pressure This is usually preset to **5cmH_2O** (though will need to be lowered if pulmonary hypoplasia). Only if trained to do so, the PEEP may be altered to aid lung recruitment.
Slope (setting)	Pressure rise time (s) This is a preset value (when weight entered in start page) of the time taken for the ventilator to achieve the pressure required for the breath and should be around **0.06 – 0.1.** It should not ordinarily be adjusted.
Pmax (setting)	**Maximum** pressure allowed to be used by the ventilator to deliver the target tidal volume (cmH_2O). This should be set at a **maximum of 25cm H_2O** in the first instance. In VG modes, the inspiratory pressure will vary breath-by breath to deliver the set tidal volume. The Pmax is a safety limit. The ventilator will alarm when this limit is reached. Pmax should be weaned as the delivered pressures wean to be approximately 5cmH_2O above the delivered PIP
Pinsp (setting) in PC-SIMV	This is the **set** peak inspiratory pressure in this mode. It will produce a peak pressure corresponding to the **absolute** value stated (i.e. not above PEEP). E.g. Pinsp of 22 will generate a PIP of 22cmH_2O.

ΔPsupp (setting)	This is the set pressure support, when used in PC-SIMV mode. It should be defaulted to 5cmH_2O. This value is the added pressure **above PEEP** that will be given to support any breaths the baby performs above the mandatory set rate in this mode.
VT/IBW (measurement)	This is the **leak-compensated** tidal volume measured divided by the baby's body weight (that inputted into the top left of the ventilator). It is measured in **ml/kg**. The ventilator is set up so that, up to around 65% leak, the ventilator will alter the flow of gas required to compensate for the measured leak. (The waveform displays should also be corrected for leak). The number in this box, should be close to the set / prescribed tidal volume in ml/kg as long as the leak remains below 65%.
MVe (measurement)	This is the expired minute volume produced by the baby. It is measured in L/min (i.e. does **not** take into account the baby's weight). In order to get the MVe by body weight, you have to divide the displayed MVe by the baby's weight (in kg): For a 2kg baby and a MVe displayed as 0.45L/min, the MV/body weight would be 0.45 / 2 = 0.225 L/min/kg (this is important with respect to the setup flow chart 1.1) Conversely, when checking the MV alarms (that are usually preset when the weight is entered, these are also displayed as L/min, so you would have to ensure that these are appropriate for the baby's weight)
RR (measurement)	This is the total respiratory rate, including the ventilator-supported and any extra provided by the baby. **RRtrig** – this is the number of breaths that the baby has triggered the ventilator to support **RRmand** – this is the number of mandatory breaths supported by the ventilator settings (in PC-AC modes, this will equal the total RR; in PC-SIMV modes, this will be equal to the set RR)
PIP (measurement)	Peak inspiratory pressure (this will alter in the VG modes breath-by-breath in order to deliver the set tidal volume)
Pmean (measurement)	Mean airway pressure (this is used to assess suitability for extubation – see flow chart 1.3)