fabian HFO

Quick guide

TO THE OPERATOR AND PERSON IN CHARGE OF

MAINTENANCE AND CARE OF THE UNIT:

- This Quick Guide is not a substitute for the Operation Manual. Read the Operation Manual carefully before operating the unit.
- This Quick Guide explains only some of the operations of the fabian HFO ventilator. For details about content not included in this Quick Guide refer to the Operation Manual.

Quick guide for fabian HFO ventilator

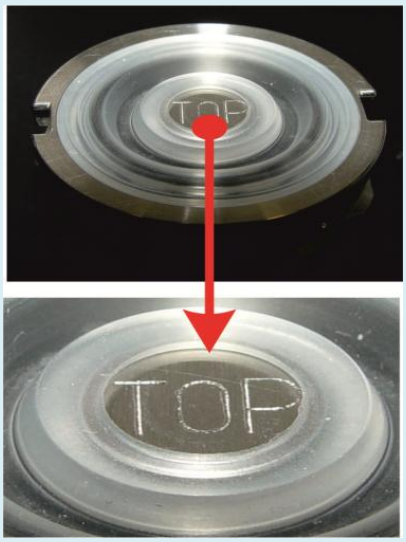
Preparations of the ventilator:

Connections: (Power cord, gas supply)

- Connect power cord with respective power source
- Connect medical gas hoses to the respective connections
- Connect power cord of humidifier to respective power source

Patient breathing circuit, exhalation valve:

- Install the exhalation valve membrane holder. Check proper insertion of the membrane. The marking **TOP** should be visible



- Connect inspiratory and expiratory hoses as shown in figure 1 with the respective connections of the ventilator. Make sure that inspiratory and expiratory hose are not connected the other way around
- Use partnumber 7209.e to connect HFO outlet with inspiratory limb of patient circuit

figure 1

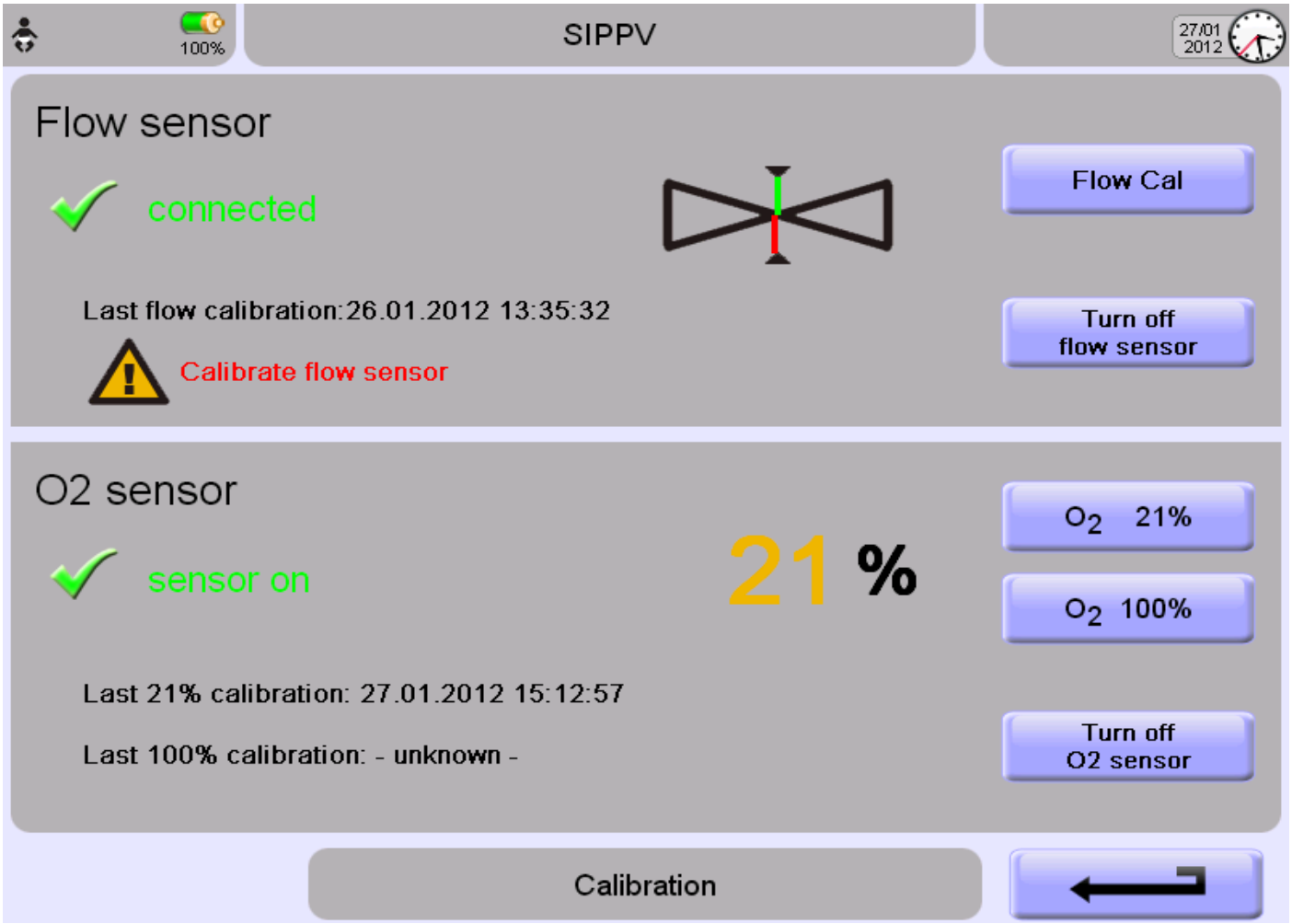
Turn ventilator on:

- Once patient circuit is set up, turn ventilator on by pushing the green ON/OFF button

- After a 20s startup and selftest routine, the calibration screen comes up

Calibrate Flow Sensor now:
- Block both ends of Flow Sensor by hand using a sterile glove
- Touch Flow Cal button > sensor is tested and calibration starts
- After 5 seconds, the green tick indicates the success of calibration procedure
- If NCPAP or DUOPAP mode are in use, the flow sensor is automatically deactivated

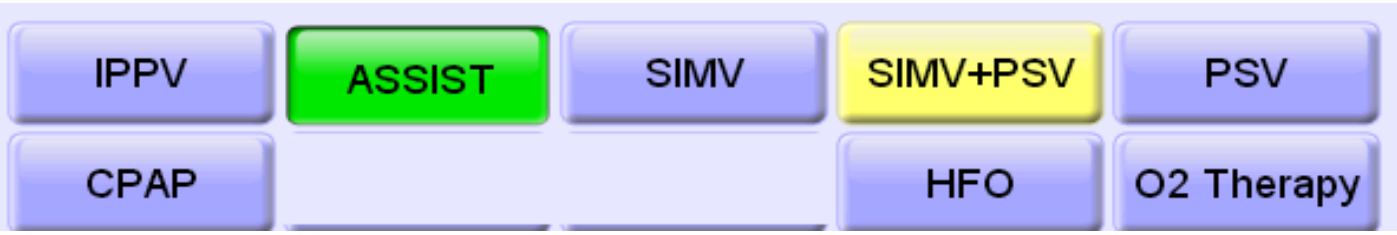
Oxygen sensor calibration:
There is no need for a manual oxygen sensor calibration (done automatically in 24 hours intervals)
There is no alteration of the gas going to patient during this procedure



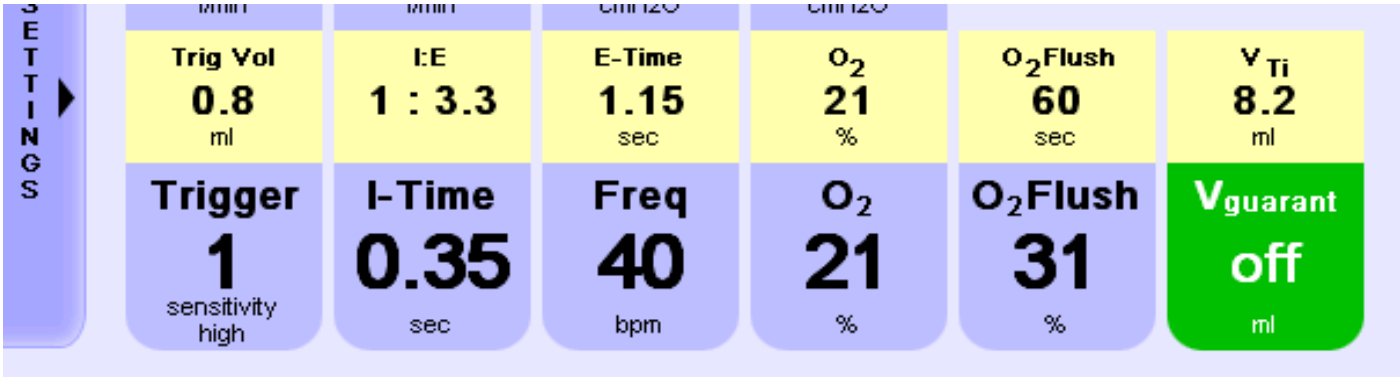
Ventilation Parameter setting:

- Select desired ventilation mode first

Important: By pushing the button, the parameters of the ventilation mode can be preset. (button turns yellow), the new ventilation mode is only activated by re-tapping!
As long as mode is not confirmed, ventilator will continue ventilation in previous mode



- Select parameter you wish to change > button turns green > Adjust parameter by turning the rotary knob and confirm setting either by tapping respective button or rotary knob > parameter button turns blue again
- Only parameters necessary for selected mode, will appear on the screen
  Trigger button for instance is only visible in modes were trigger is used



Use of Infant Flow mode: (Variable Flow Generators)

If single limb systems like the Infant Flow or MediJet are used, the connection between ventilator outlet and humidifier inlet is a special one. If standard tubing is used, there is no pressure build up!

Use Infant Flow connecting tube part number 7067!

Turn off of the ventilator:

- fabian HFO has an integrated safety system in case of accidentally turning off the ventilator
- To turn off the device press the green button  for at least 5 seconds until all the blue points in the status line are gone
- Press alarm mute button to confirm action 

Fix keys:

 Manual breath

 Preoxygenation, flush

 Nebulizer Aeroneb® (optional)

 Home screen (parameter setting)

 Calibration menu (flow sensor)

 Alarm mute for 2 min. and reset of visual alarm

 ON / OFF

 START / STOP ventilation, stand-by

 Graphics, waves, loops, trends

 Alarm limits, alarm history, loudness

Ventilation modes

Description of the ventilation modes on fabian HFO ventilator:
Available modes are:

IPPV (CMV)	Intermittent Positive Pressure Ventilation
SIPPV (ASSIST)	Synchronised Intermittent Positive Pressure Ventilation (Assist Controlled Ventilation)
SIMV	Synchronised Intermittent Mandatory Ventilation
SIMV+PSV	Synchronised Intermittent Mandatory Ventilation with Pressure Support
PSV	Pressure Support Ventilation
CPAP	Continuous Positive Airway Pressure Ventilation
nCPAP	Nasal CPAP with Flow Generators
duoPAP	Two Level Nasal CPAP with Flow Generators
HFO	High Frequency Oscillatory Ventilation
O_2 Therapy	High or Low Flow Oxygen Therapy (with nasal cannulas)
VG	Volume Guaranteed Ventilation
VL	Volume Limited Ventilation

IMPORTANT:
Volume Guarantee function is available in the following modes:

IPPV, SIPPV (ASSIST), SIMV, SIMV+PSV, PSV and HFO

In the SIMV modes, the Volume Guarantee function is only valid for the SIMV breath and not for the PSV breath.

In PSV mode, the VG function is active for the PSV breath as well as for the back up breath in case of APNEA.

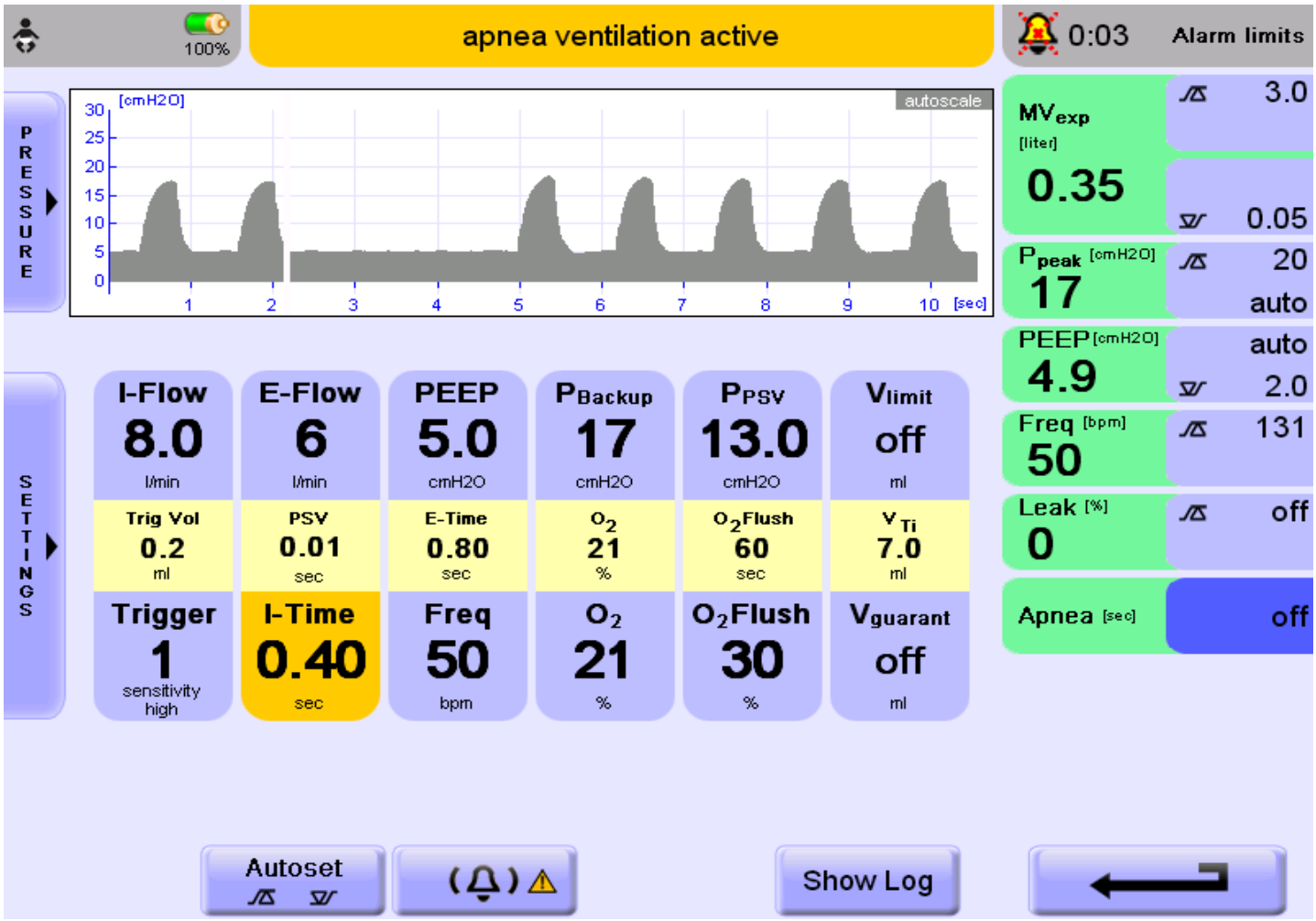
The backup ventilation will start after the set apnea time. If apnea alarm is set to OFF, the backup ventilation starts right after one period of expiratory time (Te).

Alarm screen, alarm limit setting

To access the alarm limits screen, push the alarm limits button

To adjust alarm limits, move cursor to the parameter, push rotary knob and adjust value according your clinical guidelines

Note!
In PSV mode, the apnea delay time determines after which delay the backup ventilation will start. To allow the baby breathing with short periods of apnea, the apnea time should be set somewhere in between 3 seconds and 6 seconds.



Autoset	Sets the alarm limit automatically based on measured value
MV	upper limit 80% above measured value, lower limit 50% below measured value
Frequency,	50% above measured value
Apnea,	10 seconds
Ppeak	3 cmH_2O above measured value
PEEP	3 cmH_2O below measured value

Alarm loudness can be set in 3 different levels.
Show Log opens the alarm history logfile.

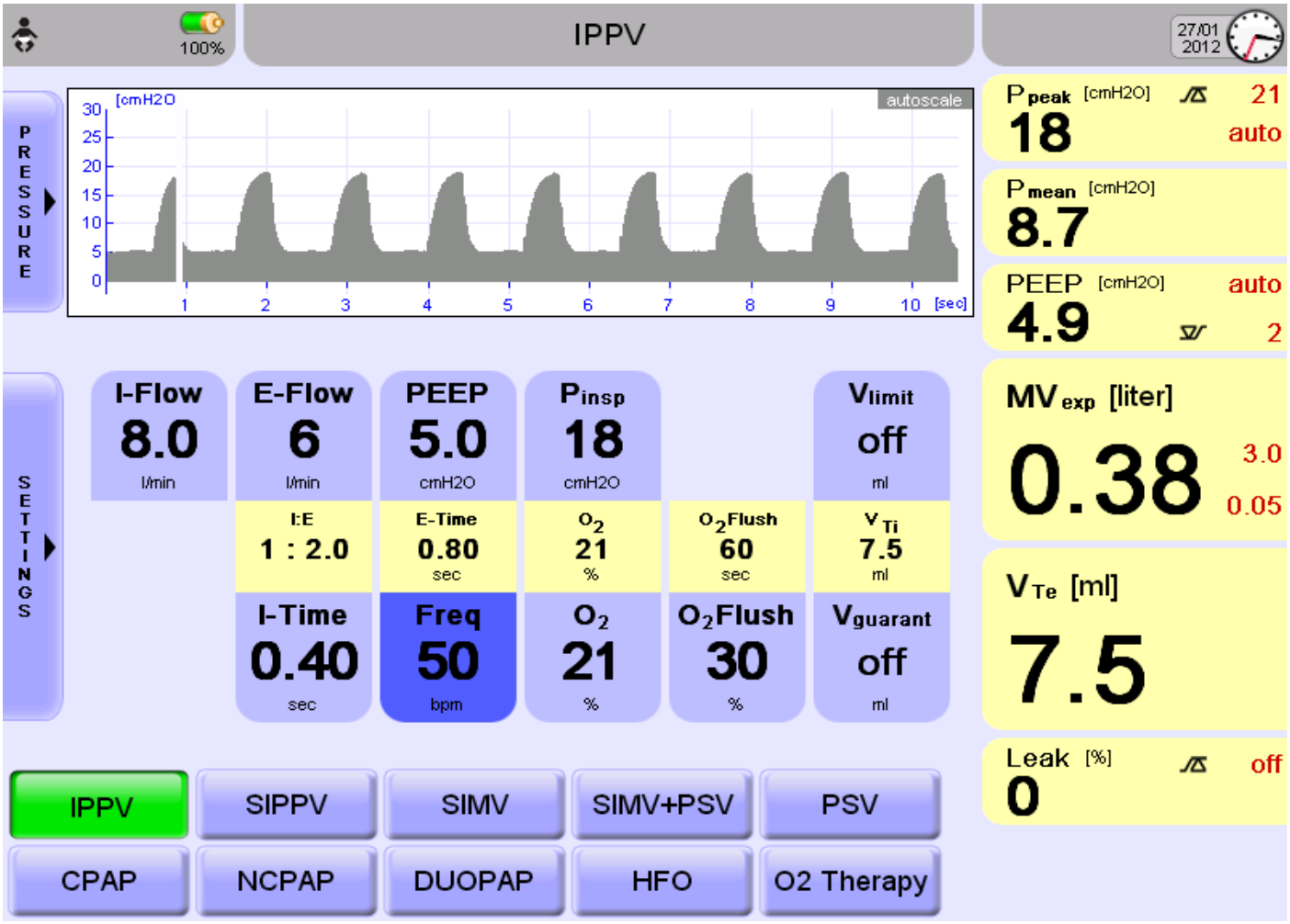
IPPV (CMV)

In IPPV, there is no synchronisation with patients breathing pattern. This mode should only be used for patients without spontaneous breathing efforts. Sedated patients for instance.
Settings to start with:

I-Flow	between 8 LPM
E-Flow	same as I-Flow
Rate	between 55 and 60 bpm
Inspiratory time Ti	between 0.3 sec and 0.4 sec
P_{insp}	between 15 – 18 cmH_2O
PEEP	4 - 6 cmH_2O

To adjust wave form, use I-Flow. For square waveform increase, for decelerating or sine wave decrease I-Flow.

Recommended alarm settings:
- Low minute volume
- Low PEEP
- P_{peak}



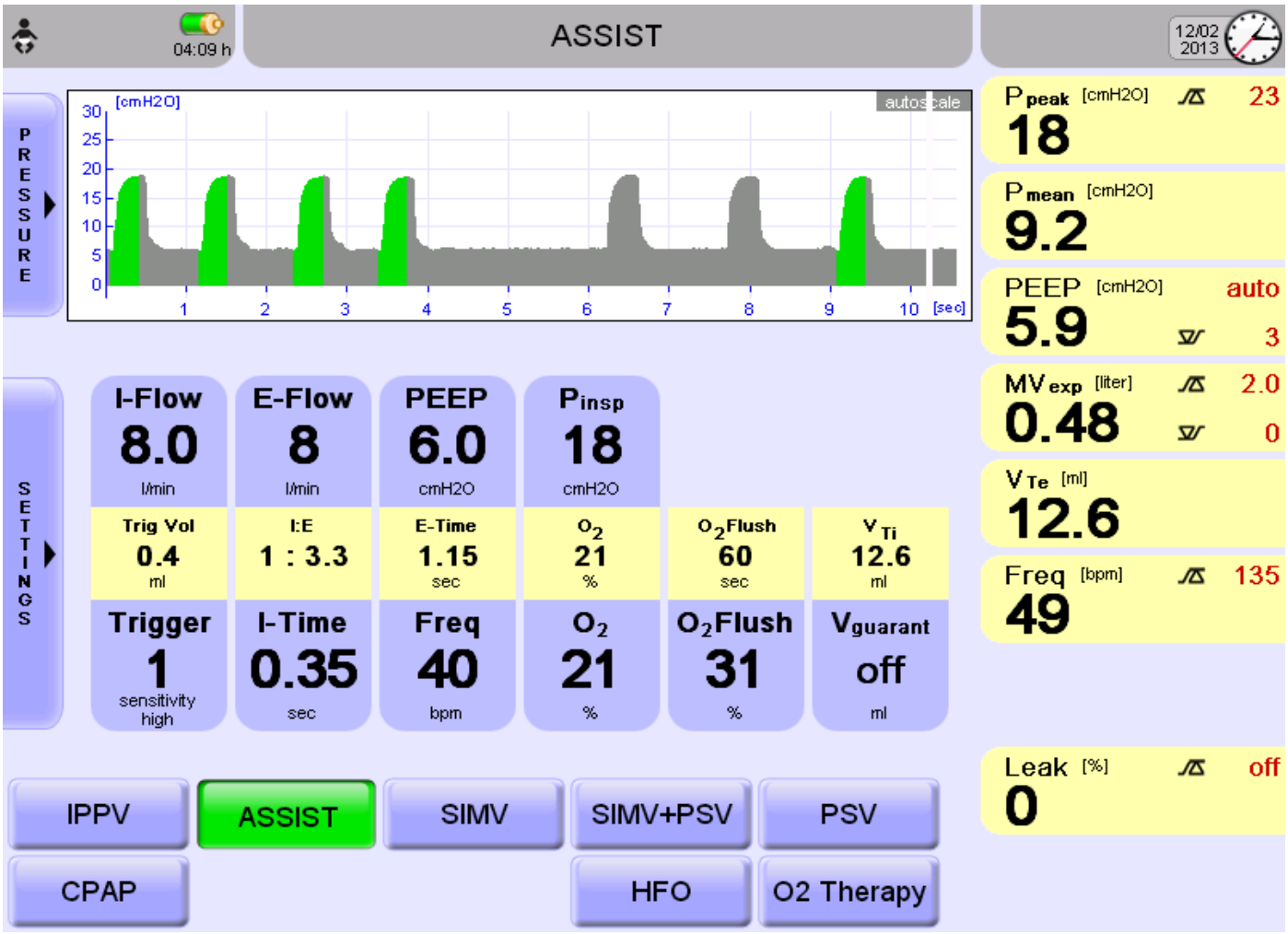
SIPPV (ASSIST)

Every inspiratory effort triggers a breath with a fixed inspiratory time and inspiratory pressure. The minimum rate per minute is the preset one. A patient triggered breath is coloured green, a none triggered is grey.
Note: It is important that the Ti is watched carefully in this mode – too long a set Ti in an infant with tachypnoea will result in a short expiratory time (Te) and leads to air trapping, with the risk of air leak.
Settings to start with:

I-Flow	8 LPM
E-Flow	same as I-Flow
Rate	40 bpm
Inspiratory time	between 0.3 sec and 0.4 sec
P_{insp}	between 16 – 18 cmH_2O
PEEP	4 - 6 cmH_2O

Recommended alarms:
Same as IPPV but in addition Respiratory Rate to alert in case of Hyperventilation

Try to achieve an exhaled tidal volume of about 5 – 6 ml/kg bodyweight. To increase Tidal Volume, increase P_{insp} and eventually rise PEEP



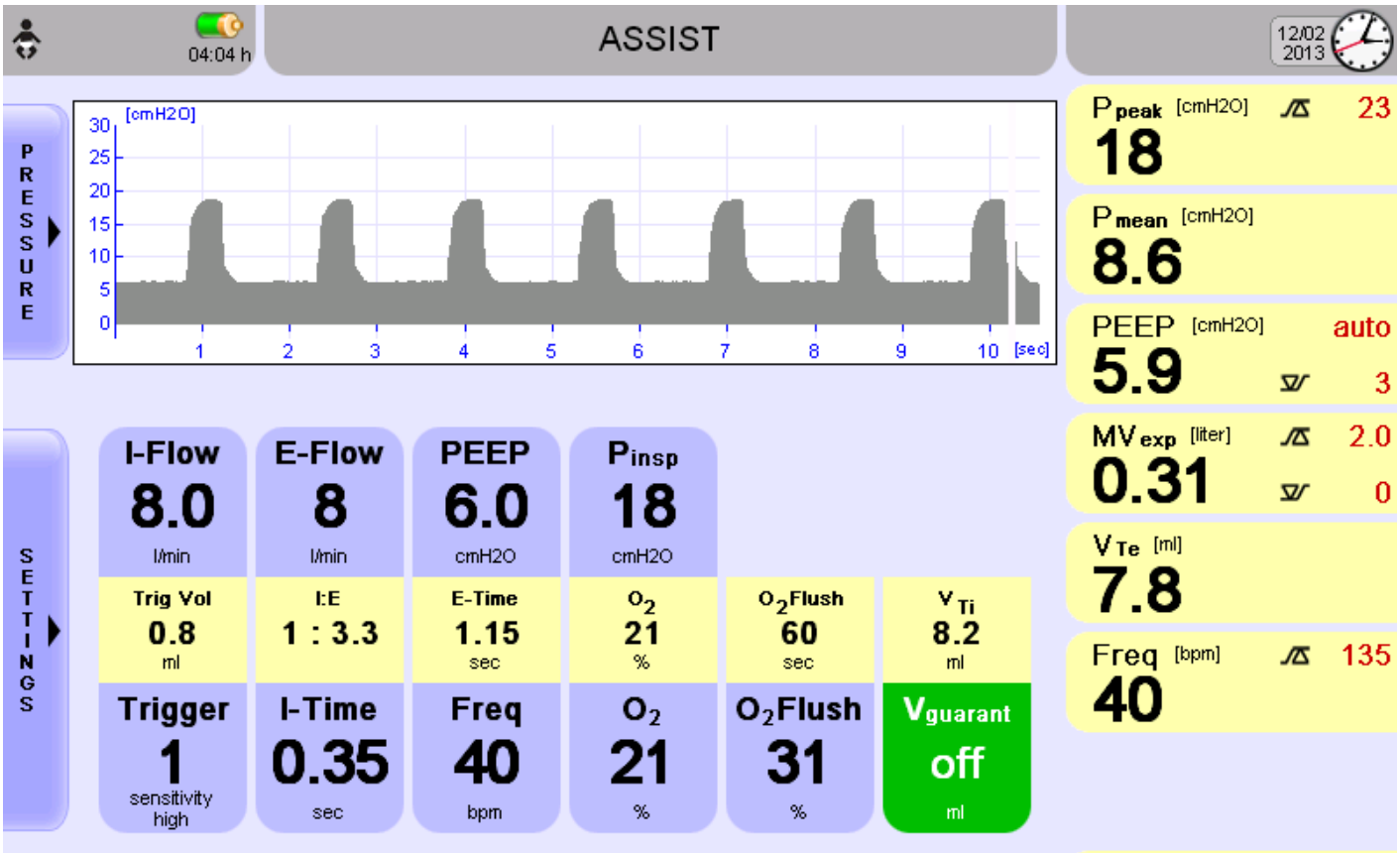
SIPPV (ASSIST) with VG (Volume Guarantee)

If VG is added to the SIPPV (ASSIST) ventilation, each breath is maintained at same exhaled tidal volume. In case of an improvement of lung compliance, the P_{insp} is automatically reduced.

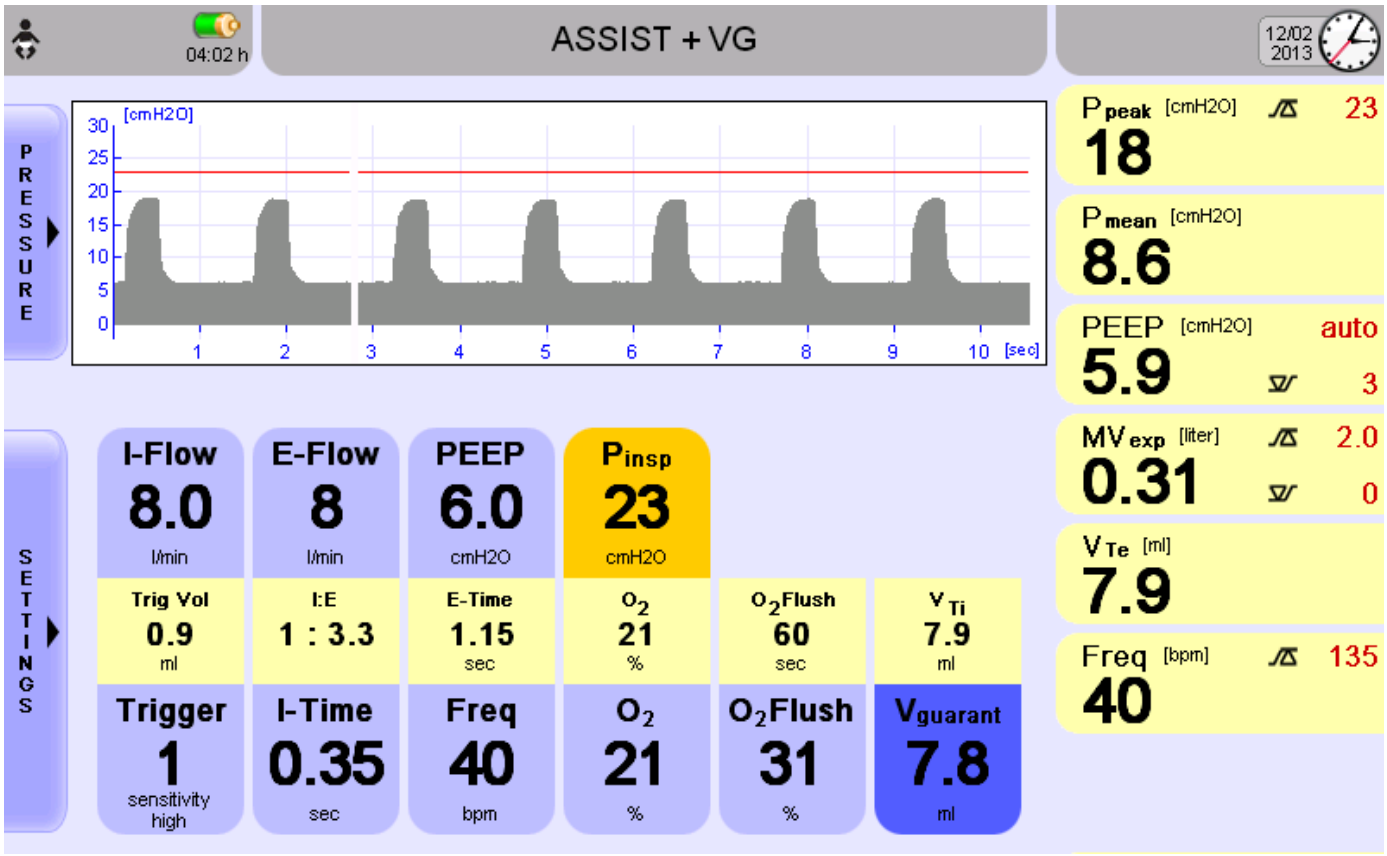
Every single inspiratory effort of the patient is supported with a mechanical breath with fixed inspiratory time and fixed Inspiratory Pressure. If the breath was triggered by patient, it is coloured green, if none triggered, grey. The baby controls the rate of ventilation.
Settings to start with:

I-Flow	8 LPM
E-Flow	same as I-Flow
Rate	between 35 and 40 bpm
Inspiratory time	between 0.3 sec and 0.4 sec
Pinsp	between 16 – 18cmH_2O
PEEP	4 - 6 cmH_2O

How to start VG function:
Step 1
Setup ventilator in SIPPV (ASSIST) and start ventilation
Step 2
Once the Exhaled Tidal Volume V_{Te} reading is constant, press $V_{guarant}$ button > turns green



Step 3
Turn rotary knob clockwise > current Tidal Volume V_{Te} is taken from readings. P_{insp} button changes to orange colour and P insp is automatically increased by 5 cmH_2O to allow ventilator to compensate for a changing lung compliance. Confirm setting by pushing rotary knob. Setting is accepted if button turns to blue colour again.
Triggered and none triggered breath are independently supported based on lung compliance.

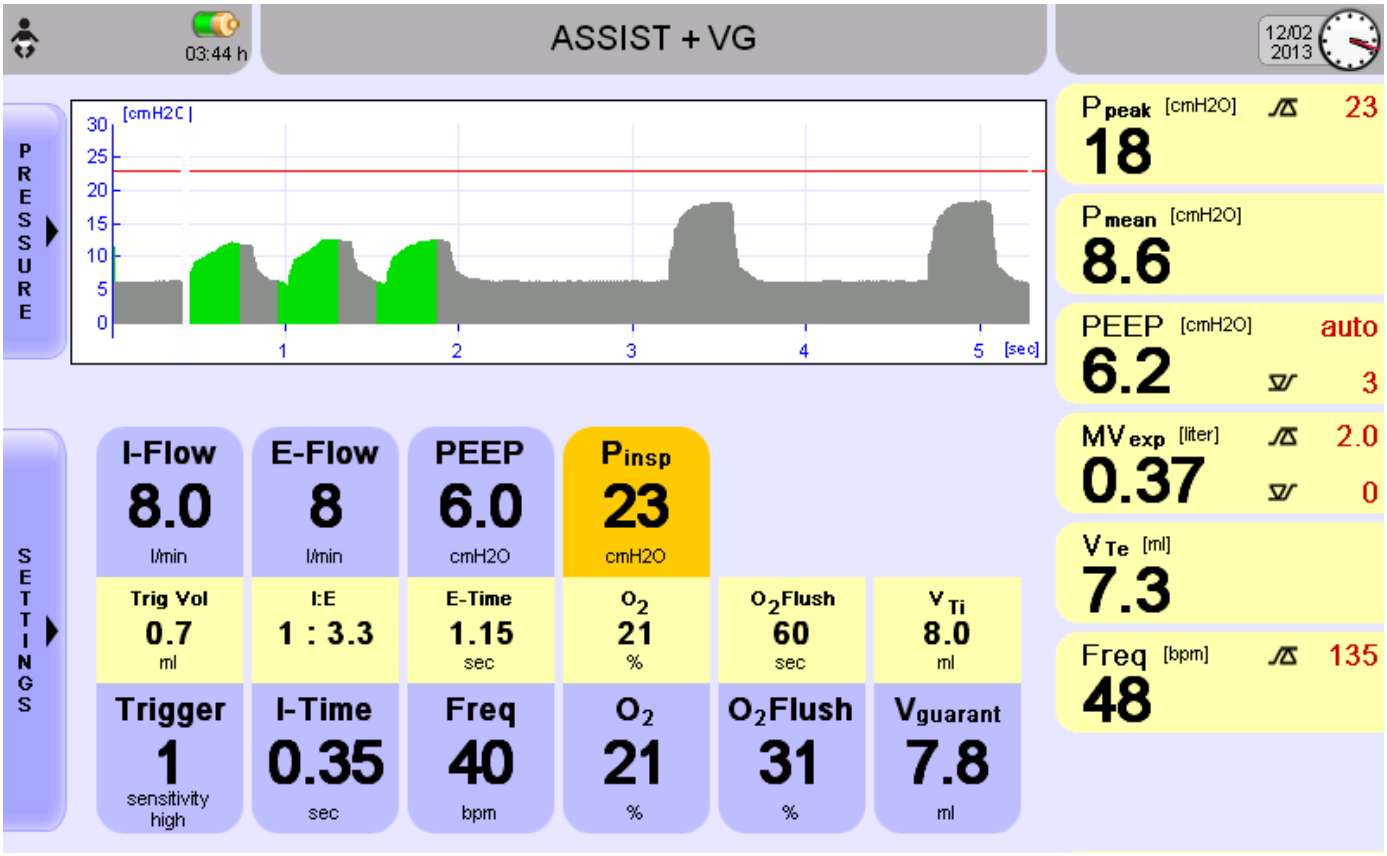


Step 4
If Volume Guarantee function is deactivated, the P_{insp} pressure which was necessary to deliver preset target volume, will be used. In case of a flow sensor failure, the ventilator automatically memorizes the last correct P_{peak} value and continues ventilation at this level, until flow sensor problem is solved.

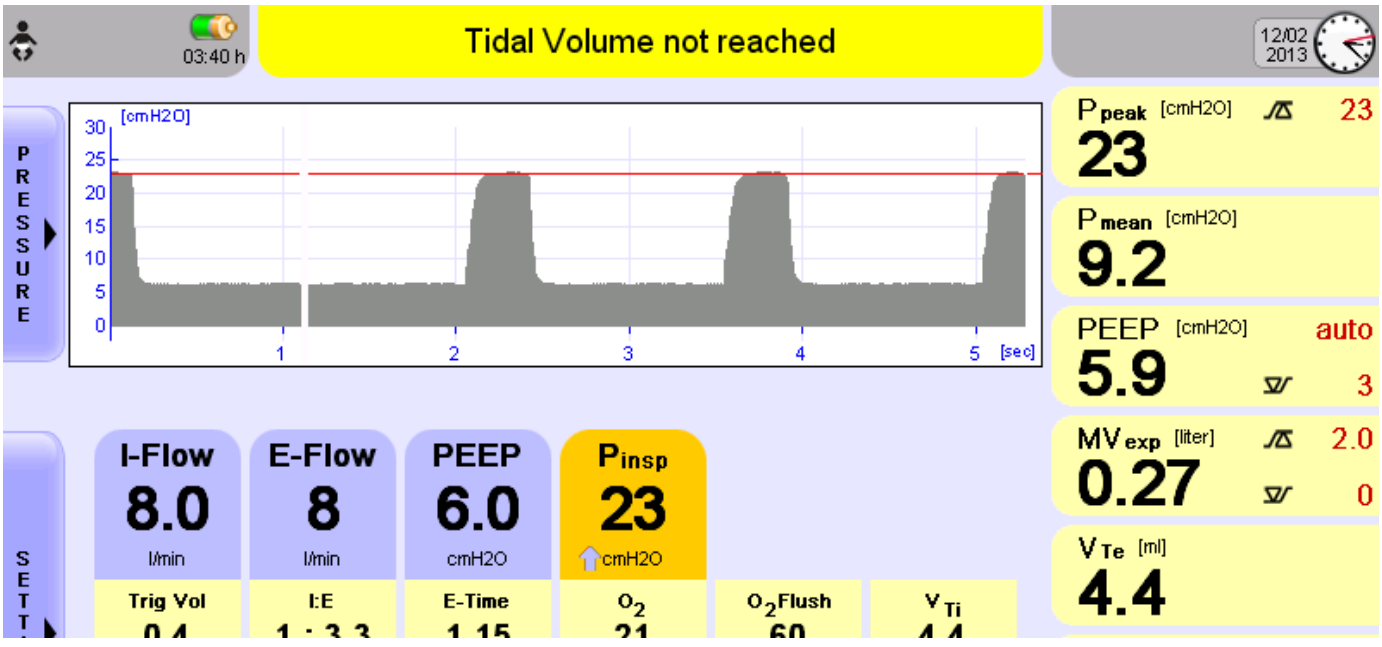
Meaning of the orange P_{insp} button:

Maximum pressure to achieve target volume, allowed by the user, but ventilator will always use lowest possible P_{peak} to deliver the target volume.

The following graphic shows different support of triggered and none triggered breath. To maintain the preset exhaled tidal volume, the ventilator changes the P_{peak} breath to breath by maximum change of 3 cmH_2O.



Note:
If the preset target volume is not achievable within the set P_{insp}, a warning message „Tidal Volume not reached“ is displayed in the status line underlined by an acoustic beep every 10s. An arrow in the P_{insp} button pointing upward indicating use of a higher P_{insp} is necessary to achieve target volume

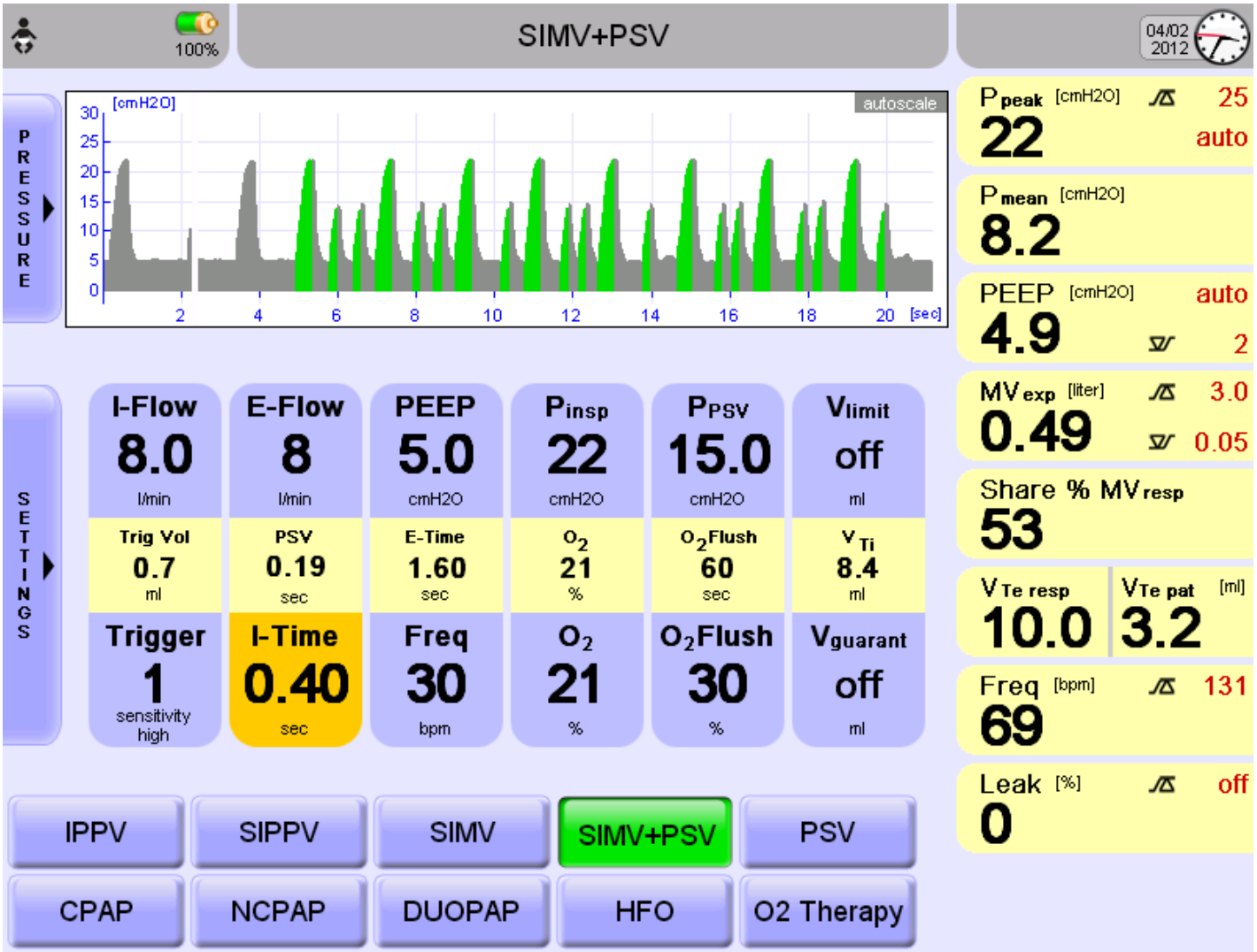


SIMV+PSV

The ventilator synchronizes patient's inspiratory efforts and delivers a fixed amount of synchronised mechanical breath with preset inspiratory time. Spontaneous inspiratory efforts in between mechanical breath are supported with pressure support level P_{PSV} . Patient determines begin and end of PSV breath depending on the preset flow termination criteria.
The I-Time button has changed to orange, indicating that the set I-Time is only valid for SIMV breath and represents maximal I-Time in case flow termination criteria isn't met. (i.e. in case of high ET tube leakage)
Settings to start with:

I-Flow	8 LPM
E-Flow	same as I-Flow
Rate	between 20 to 30 bpm
Inspiratory time	between 0.3 sec and 0.4 sec
Pinsp	between 16 – 18 cmH_2O
P psv	16 – 18 cmH_2O
PEEP	4 - 6 cmH_2O

The minimum pressure difference between PEEP and P_{PSV} is always 2 cmH_2O and P_{PSV} is max same level as P_{insp}.
If Volume Guarantee is added, the VG criteria is only valid for the SIMV breath. Not for the PSV breath.

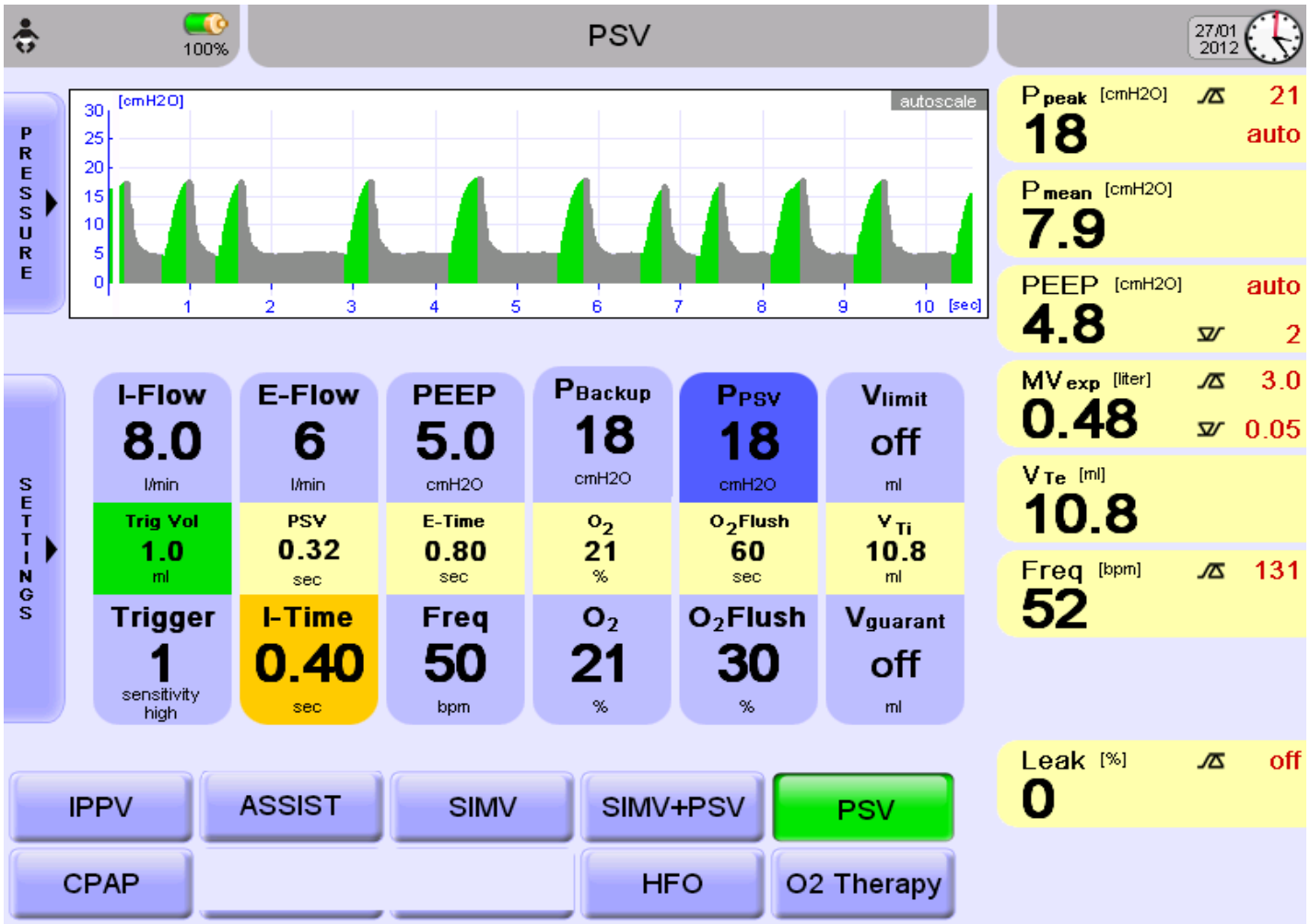


PSV

The ventilator synchronizes the patients inspiratory effort and delivers a breath at fixed pressure levels but variable I-Time is controlled by patient based on preset flow termination criteria. The rate is controlled by the patient.
Settings to start with:

I-Flow	8 LPM
E-Flow	same as I-Flow
Rate	between 30 to 40 bpm
Inspiratory time	between 0.3 sec and 0.4 sec
Pinsp	between 16 – 18 cmH_2O
P psv	16 – 18 cmH_2O
PEEP	4 - 6 cmH_2O

Important:
In PSV mode, the apnea backup ventilation will start after the preset apnea delay set in the alarm menu. Make sure to set this apnea delay to about 4 – 6 seconds, because babies tend to have short periods of apnea and you don‘t want the ventilator to kick in to early. If apnea is set to OFF, the ventilator starts backup after E-Time.
The minimum pressure difference between PEEP and P_{PSV} is always 2 cmH_2O and P_{PSV} is max same level as P_{insp}.



PSV+VG

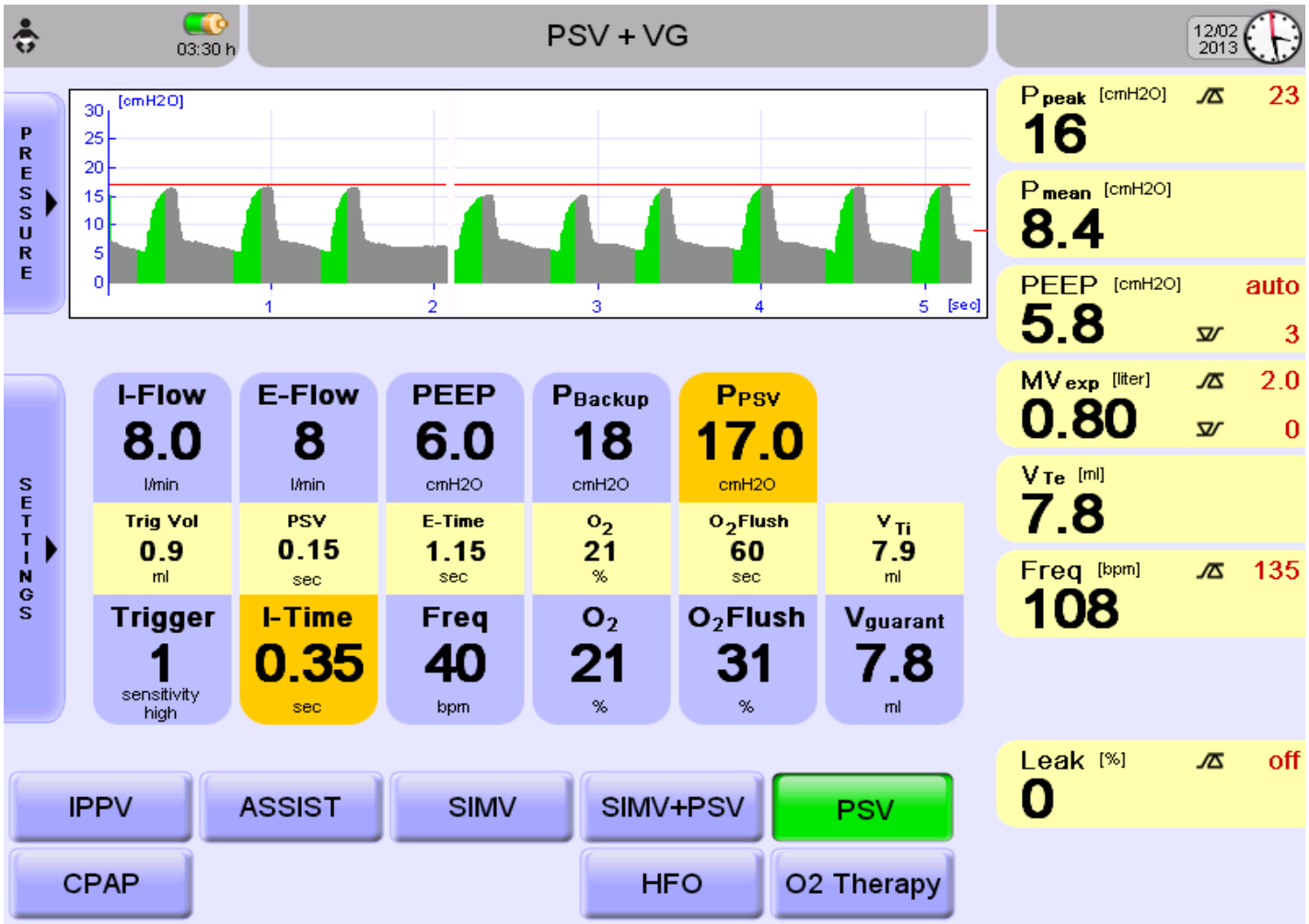
If Volume Guarantee is added to PSV, the ventilator automatically is adjusting the P_{PSV} level necessary to maintain preset target volume. In case of an apnea, the ventilator will start cycling at preset rate and P_{Backup}. As soon as spontaneous activity restarts, the backup stops.

Settings to start with:

I-Flow	8 LPM	
E-Flow	same as I-Flow	
Rate	between 30 to 40 bpm	Safety backup rate in case of apnea
Inspiratory time	between 0.3 sec and 0.4 sec	Used for backup and as max I-Time
$P_{backup} = P_{insp}$	between 16 – 18 cmH_2O	P_{Backup} is the P_{insp} used during apnea backup ventilation
P_{PSV}	16 – 18 cmH_2O	
PEEP	4 - 6 cmH_2O	

The minimum pressure difference between PEEP and P_{PSV} is always 2 cmH_2O and P_{PSV} is max same level as P_{insp}.

Note:
PSV breath as well as apnea backup breath are volume targeted breath in this mode.
The delay to start backup ventilation is set with the apnea time in alarm limit screen.
If apnea is set to OFF > backup starts after E-Time

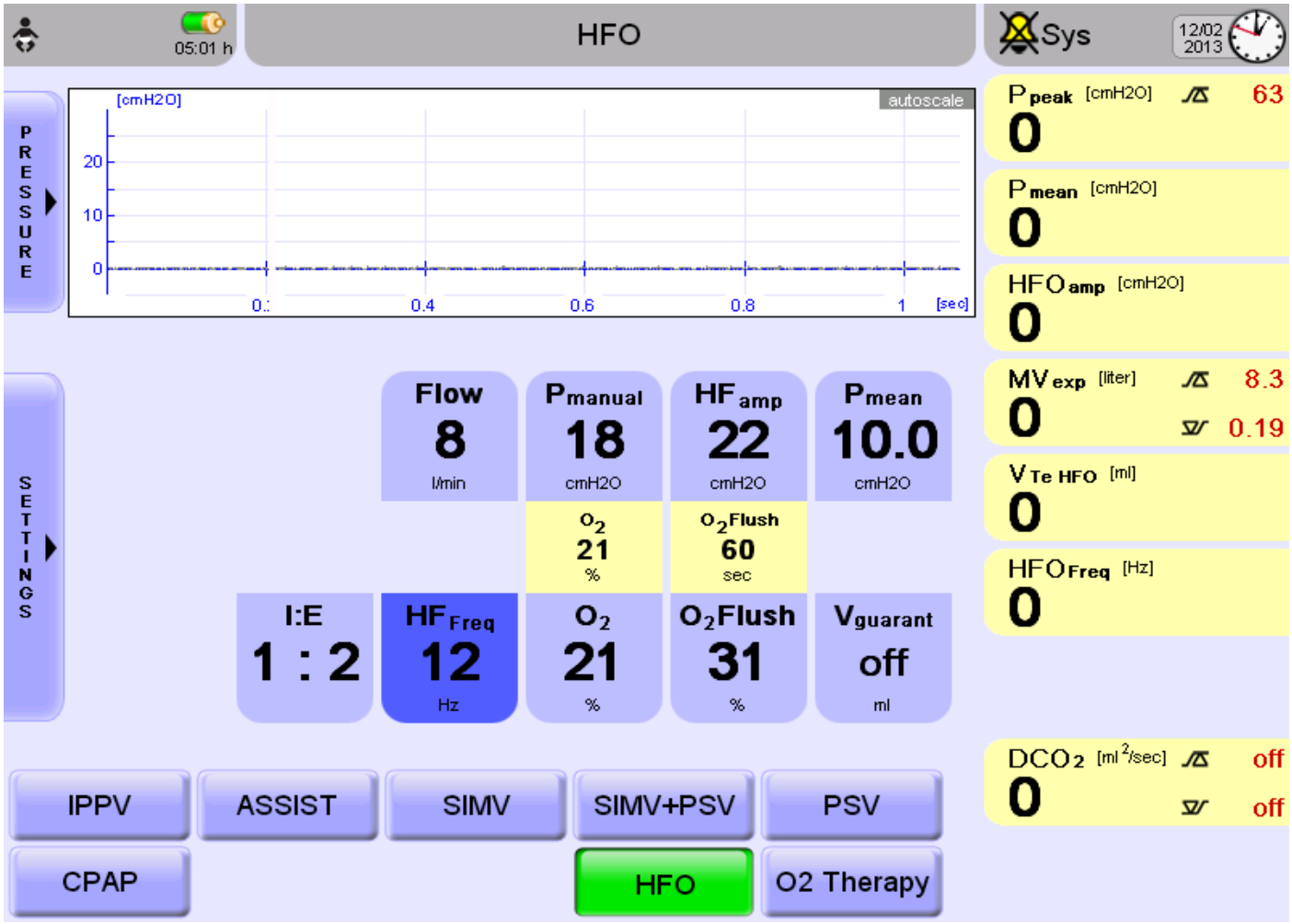


HFO Ventilation

High Frequency Oscillatory ventilation uses the following settings:

Settings to start with:

Flow	8 LPM
MAP	about 2 cmH_2O above MAP used for conventional ventilation
Amplitude	start at about 22 cmH_2O
Frequency	12 to 15 Hz for babies below 1kg and 8 – 12 Hz for babies above
1kg I:E Ratio	1:2
P_{manual}	If used in your clinical guidelines for lung recruitment, otherwise deactivate in ventilation menu
$V_{guarant}$	Set at 2 ml per kg bodyweight depending your clinical guidelines



CPAP

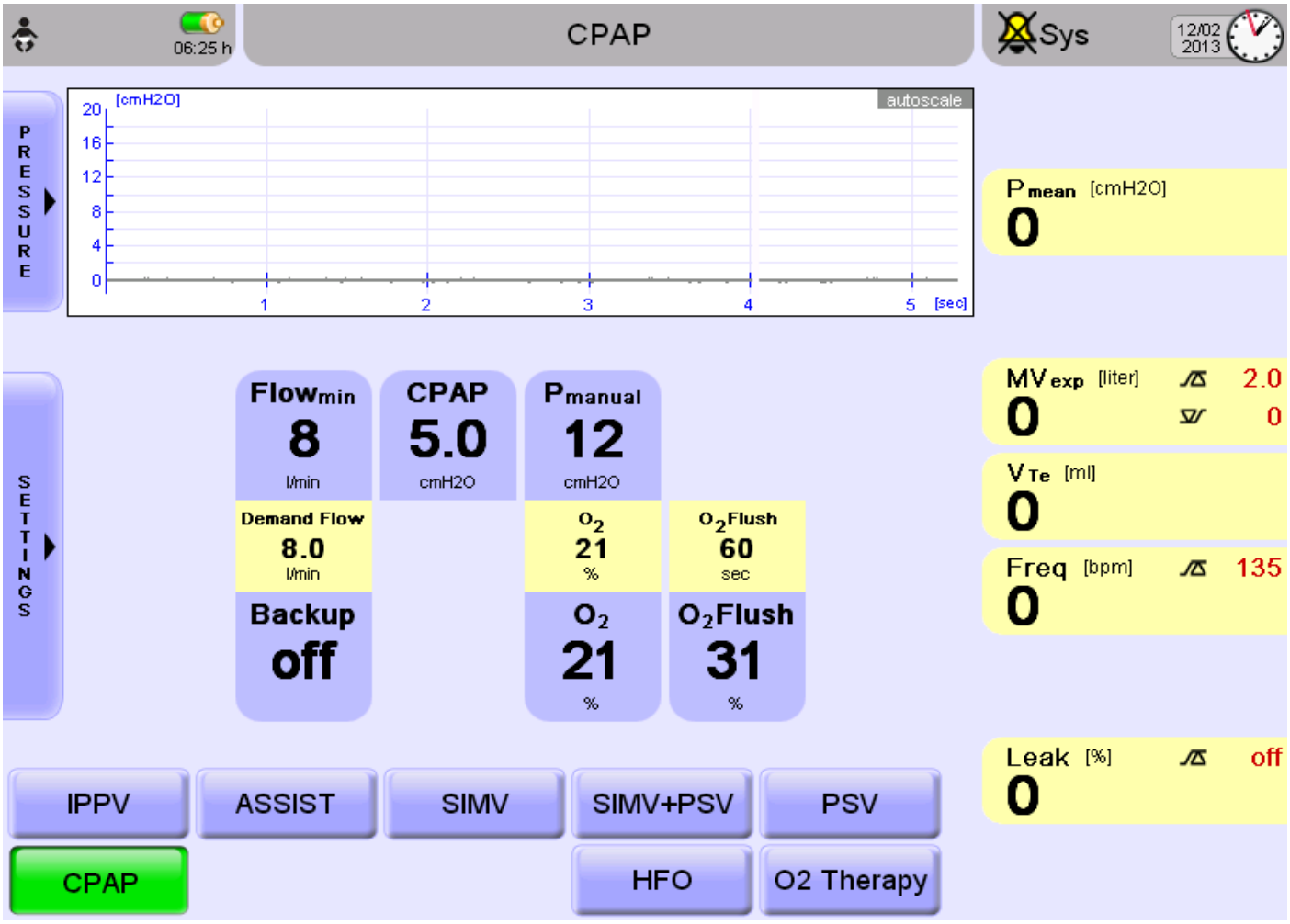
The CPAP mode can be used for intubated patient as well as for nasal CPAP. If used with nasal CPAP systems like F&P bubble CPAP, Hudson or similar, the Flow Sensor must be deactivated manually in the calibration screen.
The ventilator automatically compensates leaks by increasing flow to max $Flow_{min}$ plus100% to avoid CPAP pressure drop.

Settings to start with:

$FLOW_{min}$	8 LPM
CPAP	5 cmH_2O
P_{manual}	12 cmH_2O
Backup	OFF

Important:
Make sure the flow sensor is deactivated, otherwise the apnea alarm is triggered all times. Use alternative system for apnea detection.

For Variable Flow systems like Infant Flow®, Inspire™ or MediJet®, please use the option NCPAP and DUOPAP if available in your unit.

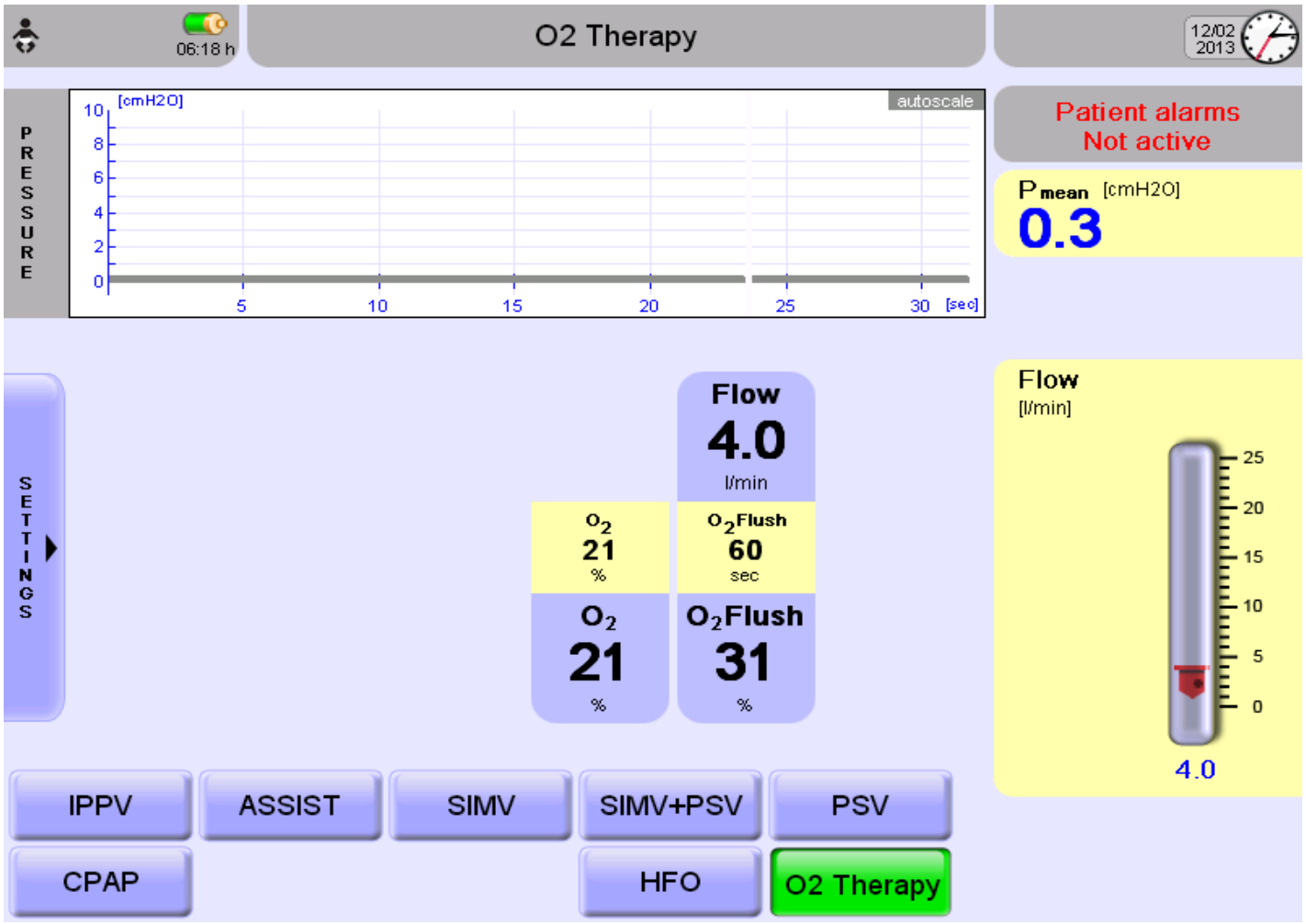


O_2 Therapy

O_2 Therapy is an option which allows use of a continuous flow of blended gas, from 1 – 15 LPM. Nasal cannulas of various makes like F&P, Atom or similar can be used. There are no alarm functions active in this mode, except for the set FiO_2

For weaning purposes, this mode can also be used in conjunction with variable flow systems like Infant Flow®, Inspire™ or MediJet®, however there won't be any alarm settings on pressure monitoring.

Note:
This mode can also be used to put the ventilator in standby mode. By setting a flow of 4 LPM, the humidifier dual servo temperature controls remain active, so no need to switch it off in case of short term standby mode.

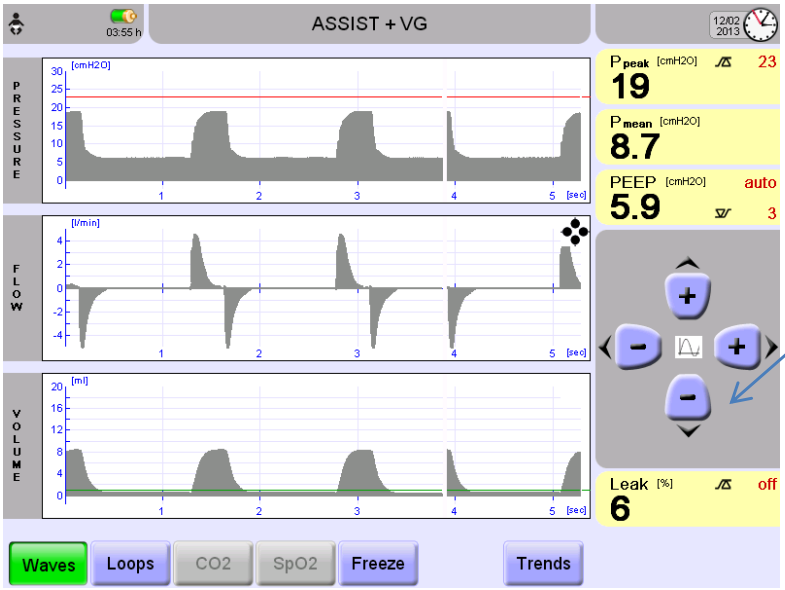


Features

Graphics:

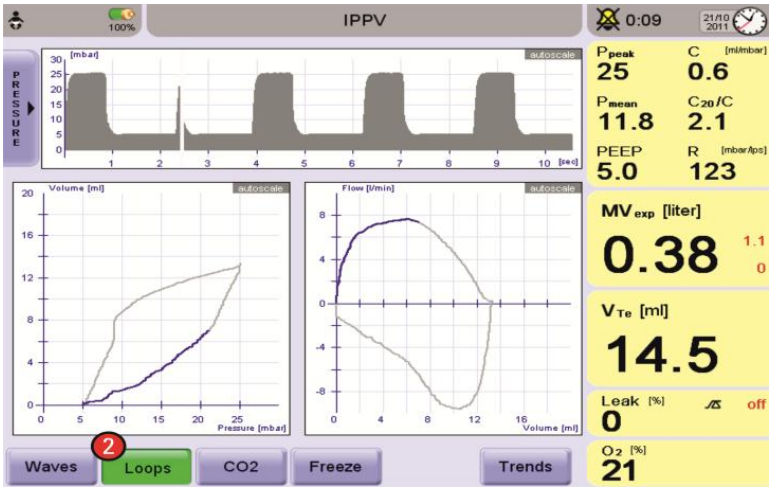
Waves:	Displays 3 waveforms, Pressure, Flow and Volume simultaneously
Freeze:	Freezes the waves or Loops
Loops:	Pressure-Volume and Flow-Volume Loops
Trends:	up to 5 days trending of measured values
Save Loop:	The save Loop function stores one Loop and keep it as reference until a new Loop is saved

Waves:

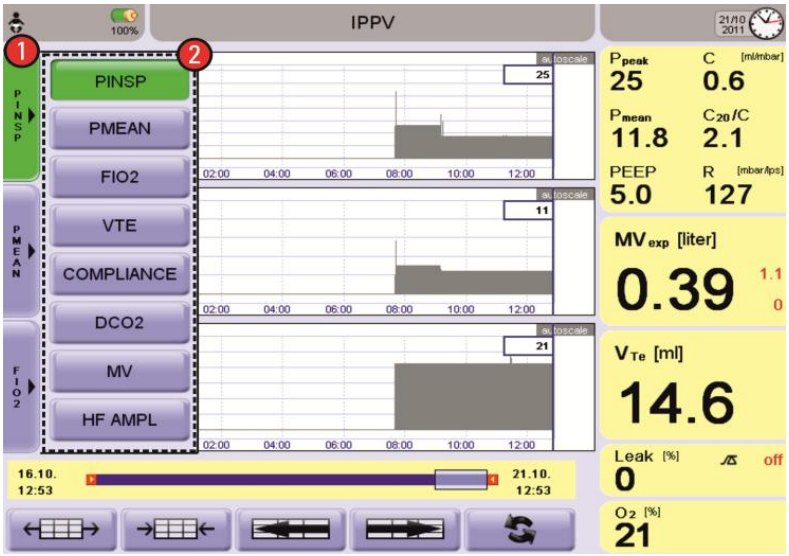


Manual scaling mode. Use up and down keys for scaling graphics

Loops:



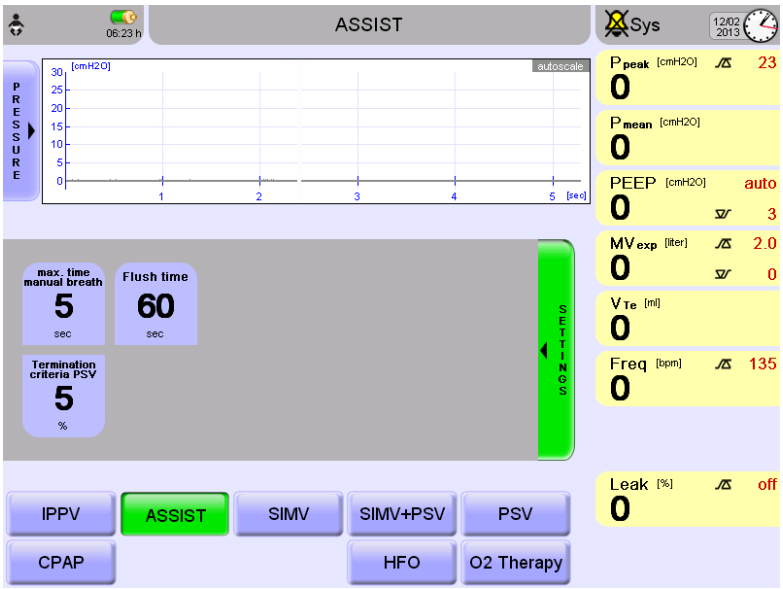
Trends:



Sub Menu:

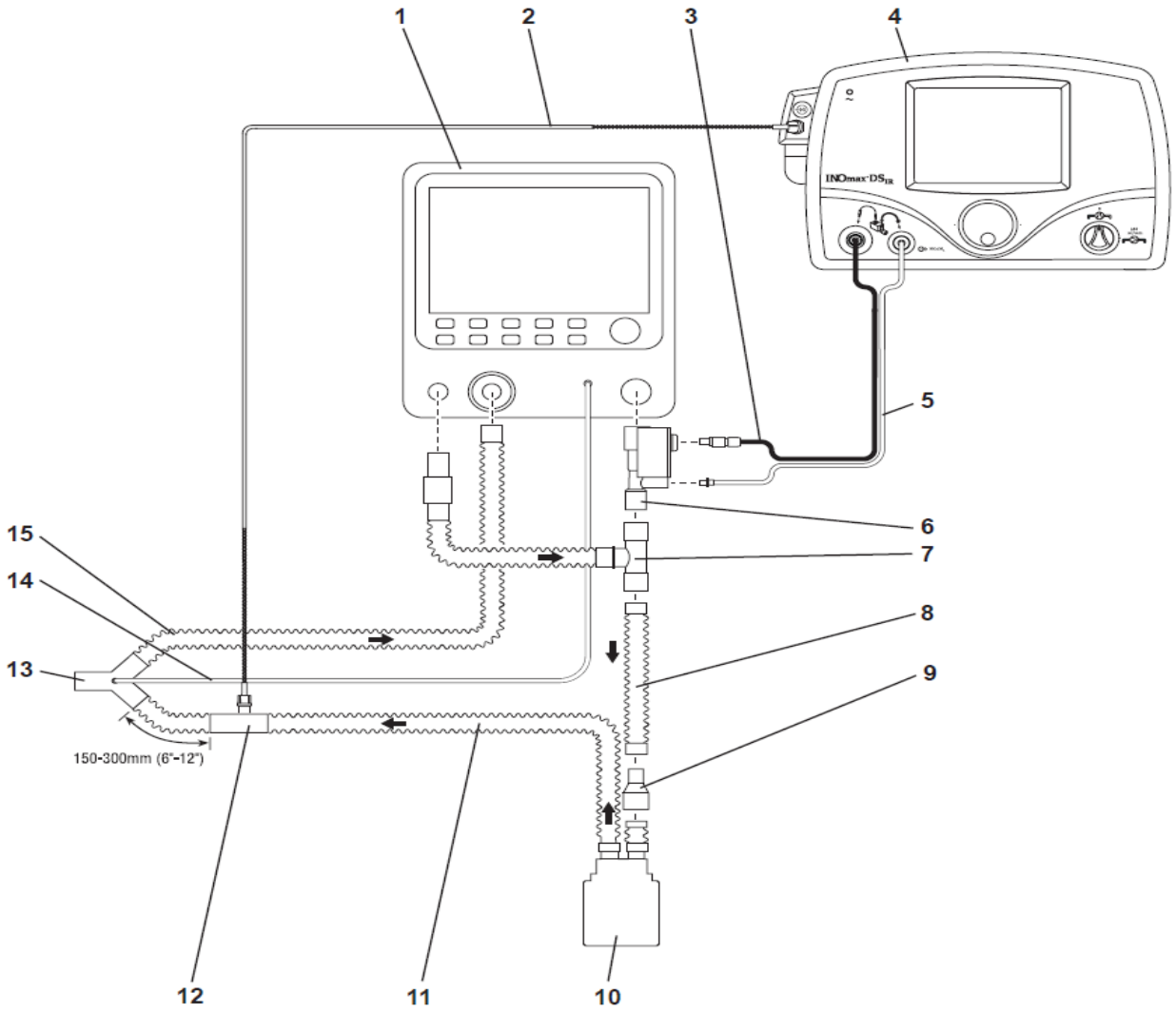
The submenu allows access to fine-tune some of the ventilation modes, i.e.:

- Manual breath
- Flow termination criteria for PSV ventilation
- Flush time
- ……



NO (Nitric Oxide) Therapy

Important:
If Nitric Oxide Delivery Systems like INOvent® or INOMax DS_{IR} are used to deliver NO, make sure the setup of the circuit is done as per below graphic. It is important to place the Flow Sensor of the NO delivery system directly at the fresh gas outlet of the fabian HFO.
The measuring line shall be placed close to patient in inspiratory limb.



1. Fabian HFO Ventilator
2. Patient Gas Sample Line with Nafion
3. Injector Module Electrical Cable
4. INOmax DS_{IR}
5. NO/N_2 Injector Tube
6. Injector Module
7. T-Connector Assembly, #7209.e
8. Connecting Tube (15 inches)
9. 22F X 15M Adapter
10. Humidifier
11. Inspiratory Breathing Circuit Hose
12. Gas Sample Tee
13. Patient Wye
14. Proximal Pressure Tube
15. Expiratory Breathing Circuit Hose