BeneLink Module

Operator's Manual

CE 0123

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Revision: 5.0

WARNING

- **Federal Law (USA) restricts this device to sale by or on the order of a physician or other practitioner licensed by U.S. state law to use or order the use of this device.**

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- all installation operations, expansions, changes, modifications and repairs ofthis product are conducted by Mindray authorized personnel;
- the electrical installation of the relevant room complies with the applicable national and local requirements;
- the product is used in accordance with the instructions for use.

WARNING

- **Only skilled/trained clinical professionals should operate this equipment.**
- **It is important for the hospital or organization that employs this equipment to carry out a reasonable service/maintenance plan. Neglect of this may result in machine breakdown or personal injury.**

Service

Mindray maintains a network of service representatives and factory-trained distributors. Prior to requesting service, perform a complete operational check of the instrument to verify proper control settings. If operational problems continue to exist, contact Mindray service.

In North America contact the Service Department at (800) 288-2121, ext: 8116 for Technical Support or (201) 995-8000 for assistance in determining the nearest field service location.

Please include the instrument model number, the serial number, and a description of the problem with all requests for service.

Any questions regarding the warranty should be directed to your local sales or service representative.

Company Contact

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Contents

1 Safety

1.1 Safety Information

WARNING

- **Indicates a potential hazard or unsafe practice that, if not avoided, could result in death or serious injury.**

CAUTION

- **Indicates a potential hazard or unsafe practice that, if not avoided, could result in minor personal injury or product/property damage.**

NOTE

- **Provides application tips or other useful information to ensure that you get the most from your product.**

1.2 Warnings

WARNING

- **The BeneVision N Series monitor supports two BeneLink modules. The Passport M Series monitor supports only one BeneLink module.**
- **The BeneLink module receives parameter, alarm, and waveform data from external devices but will not modify this data. For example, the external device may display "---", but send "0" to the patient monitor.**
- **There can be differences between the alarm priorities displayed on your monitors and the priorities displayed on external devices interfaced through BeneLink. For details please see "Output signals – Alarms" section corresponding with each external device.**
- **When the monitor connects external devices via the BeneLink module, the alarm delay for disconnection is less than 10 seconds.**

1.3 Cautions

CAUTION

- **First installation and debugging should be executed by Mindray service personnel or authorized technician.**
- **Software version of BeneLink modules using in the same department should be the same.**
- **Check the compatibility of the external device and the ID adapter before connection. Not doing so may may result in failure of the two devices to work together as desired.**
- **Ports on the BeneLink module are not conventional network connectors. They are intended for connecting with the serial port of designated devices only. Do not connect them to public network interfaces.**
- **The signal labels used on the patient monitor may be different from those given on the external device. For details please see "Output signals– Parameters" section corresponding with each external device. The alarms from external devices may be delayed before transmission to the patient monitor.**

1.4 Notes

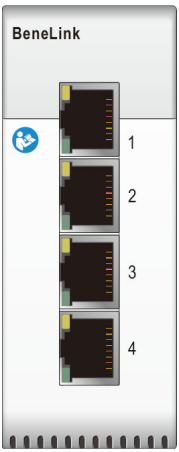
NOTE

- **Devices of the same category cannot be connected to the BeneLink module simultaneously.**
- **The alarm messages from external devices are derived from the open protocol of corresponding external device. For more information about these alarms, please see the operator's manual of corresponding devices.**
- **For the intended use and contraindication of the external devices, refer to their operator's manuals.**
- **When displayed in the monitor main screen, parameter labels of external devices are prefixed with the plug sign "+". For example, if SpO2 is from an external device, its label is displayed as "+SpO2", and its waveform label is displayed as "+Pleth".**
- **A plus sign "+" is added before each alarm message from external devices.**

2 Interfacing with External Devices

2.1 BeneLink Introduction

BeneLink module is intended for connecting external devices, such as ventilators and anesthesia machines, to the BeneVision N series monitor or Passport 12m/17m monitors. It allows information (patient data, alarms, etc.) from external devices to be displayed, saved, recorded, or printed through the monitor. If the monitor is connected with the central monitoring system (CMS) or eGateway, information from external devices can also be transmitted to the CMS or eGateway.



2.2 Physical Specifications

The physical specifications of the BeneLink module are as follows:

- Size：136.5×40×102 mm
- Weight：0.35 kg

2.3 Data transmission

The Benelink module is connected with external devices via the serial ports (physical interfaces are RJ45 connectors). You can simultaneously connect up to four external devices via one BeneLink module. Parameters, alarm data from the external devices can be output. For BeneVision N Series monitors, respiratory waveforms and loops from the external devices can also be output. BeneVision N Series monitors can output the

parameter measurements, alarm limit settings, and alarm status to external devices via the DIAP protocol (Datascope Improved ASCII Protocol).

2.4 Supported Devices

Please contact Mindray service personnel for the most recent information on the supported devices.

2.4.1 Supported Anesthesia Machines

Brand	Model	ID for ID adapter	Type of serial port adapting cable
Draeger	Apollo	444FBBB1	Type C
Draeger	Fabius GS	4446BBBA	Type C
Draeger	Fabius GS Premium (for BeneVision N Series monitors)	4446BBBA	Type C
Draeger	Fabius Tiro	4446BBBA	Type C
Draeger	Perseus A500	4435BBCB	None needed
Draeger	Primus (for Passport M series monitors)	4450BBB0	Type C
GE	Aespire 7900/7100	4F37B0C9	Type D
GE	AespireView (for BeneVision N Series monitors)	4145bebb	Type D
GE	Aestiva 7900/7100	4F37B0C9	Type D
GE	Aisys	4F41B0BF	Type D
GE	Aisys CS2 (for BeneVision N Series monitors)	4F41B0BF	Type D
GE	Avance/Avance CS2	4F41B0BF	Type D
HuL	Leon (for Passport M series monitors)	484CB7B4	Type C
HuL	Leon Plus (for Passport M series monitors)	4850B7B0	Type C
MAQUET	FLOW-i	4D46B2BA	Type B
Mindray	A4/A8/A9 (for BeneVision N series monitors)	4D52B2AE	None needed
Mindray	A7/A5/A3	4D52B2AE	None needed

2.4.2 Supported Ventilators

Brand	Model	ID for ID adapter	Type of serial port adapting cable
AirLiquide	ALMS Monnal T75 (for Passport M series monitors)	4154BEAC	None needed
Carefusion	Avea(VOXP) (for BeneVision N Series monitors)	5645a9bb	Type E
Carefusion	Vela	564CA9B4	Type E
Draeger	Babylog8000/ Babylog8000 plus	4442BBBE	Type B
Draeger	Babylog VN500	4456BBAA	None needed
Draeger	Evita 2/Evita 2 dura/Evita 4/ Evita XL	4434BBCC	Type B
Draeger	Infinity V500	4456BBAA	None needed
Draeger	Savina 300	4441BBBF	Type B
GE	Carescape R860	4F52B0AE	Type B
GE	Engström Carestation	4F45B0BB	Type B
Hamilton	C1/C2/C3/T1 (Polling Protocol) (C1 and T1 are for BeneVision N Series)	3270CD90	Type B
Hamilton	G5 (Block Protocol)	3542CABE	Type B
Hamilton	G5 (Polling Protocol)	3550CAB0	Type B
Hamilton	Galileo (Polling Protocol)	4750B8B0	Type B
HuL	Leoni Plus (for Passport M series monitors)	4849B7B7	Type C
MAQUET	SERVO-i/SERVO-s	4D53B2AD	Type B
MAQUET	SERVO-U/SERVO-N	4d55B2AB	Type B
Newport	E360	4E50B1B0	Type B
Philips	Respironics V60	5636A9CA (SDNA) 5637A9C9 (VRPT)	25-pin (male) to 9-pin (female) null modem type cable (universal) + Type B
Puritan Bennett	PB840 (SNDF protocol)	5042AFBE	None needed
Puritan Bennett	PB840 (SNDA protocol)	5031AFCF	None needed

Brand	Model	ID for ID adapter	Type of serial port adapting cable
Puritan Bennett	PB980 (SNDF protocol)	5042AFBE	Type C
Puritan Bennett	PB980 (SNDA protocol)	5031AFCF	Type C
ResMed	VSIII (for Passport M series monitors)	5653A9AD	Type C

2.4.3 Supported tcGas Monitoring Devices

Brand	Model	ID for ID adapter	Type of serial port adapting cable
RADIOMETER	TCM40/TCM4 (for BeneVision N Series monitors)	5443ABBD	Type C
RADIOMETER	TCM Tosca/TCM CombiM (for Passport M Series monitors)	5443ABBD	Type C
SenTec	SenTec Digital Monitor	5354ACAC	Type C

2.4.4 Supported Infusion System (for BeneVision N Series Monitors)

Brand	Model	ID for ID adapter	Type of serial port adapting cable
B.Braun	Perfusor Space(Single pump connection is not supported)	4250BDB0	Type F
Fresenius	Agilia Injectomat(It supports both single pump and Link+ connections.)	4650b9b0	Type G
Fresenius	Agilia Injectomat MC(It supports both single pump and Link+ connections.)	4650b9b0	Type G
Fresenius	Agilia Injectomat TIVA(It supports both single pump and Link+ connections.)	4650b9b0	Type G
Fresenius	Agilia Volumat(It supports both single pump and Link+ connections.)	4650b9b0	Type G

Brand	Model	ID for ID adapter	Type of serial port adapting cable
Fresenius	Agilia Volumat MC(It supports both single pump and Link+ connections.)	4650b9b0	Type G
Fresenius	Link+(It supports both Agilla pump and Link+ connections.)	4650b9b0	4-port metal: Type G 8-port metal + plastic: Type C

2.4.5 Supported Other Devices

Brand	Model	ID for ID adapter	Type of serial port adapting cable
Masimo/ pulse CO-oximeter	Radical 7 (for BeneVision N Series)	5241ADBF	Type C (connecting Radical 7 via Docking Station) USB to serial port cable (connecting Radical 7 via Root)
Organon/ NMT monitoring device	TOF Watch SX®	5457ABA9	Type C

2.5 Connecting External Devices via DIAP Protocol (for BeneVision N Series Monitors)

The ID adapter can be configured to support the DIAP protocol. When the ID adapter is connected to the BeneLink module, the third party device can obtain the measurement numerics and alarm limit settings of the current patient through the DIAP protocol.

2.5.1 Setting Parameter Output Properties

You must configure the DIAP protocol to realize the communication between the monitor and the third party device. To do so, proceed as follows:

1. Select the **Main Menu** quick key → from the **System** column select **Maintenance**→ input the required password → select↵.
2. Select the **Others** tab →**Parameter Output Setup**.
3. Set **Baud Rate**, **Parity Mode**, **Data Bits** or **Stop Bits** as desired.

2.5.2 Setting the ID of the ID Adapter

The ID of the virtual serial port is 6000a000. For the method of setting the ID, refer to ***2.6 Configuring the ID Adapter***.

2.5.3 Parsing the Monitor Data

To parse the monitor data, refer to ***DIAP Communication Protocol Service Manual (PN: KF-H-0070-10-0307)***.

2.6 Configuring the ID Adapter

To configure the ID adapter to work with your external device, follow this procedure:

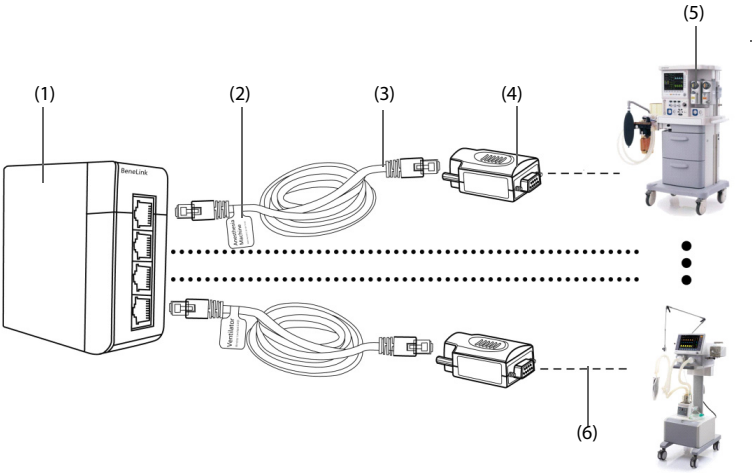
1. Select **Update ID module**:
   - For BeneVision N Series monitor, select the **Main Menu** quick key → from the **System** column select **Maintenance** → input the factory maintenance password → select **Ok** → select the **Factory Maintenance** tab → select the **Setup** tab → select **Update ID module**.
   - For Passport 12m/17m, select **Main Menu** → **Factory Maintenance>>** → input the factory maintenance password → **Update ID module**.
2. Set **Benelink Module Port** and **ID**.
   - The setting of **Benelink Module Port** shall be consistent with the port the RJ45 connecting cable is connected to.
   - You must connect the RJ45 connecting cable to the selected port when configuring the ID adapter. Otherwise, ID adapter configuration will fail.
   - Set **ID** to configure a new ID to the ID adapter. Refer to Column "ID for ID Adapter" in the tables of ***2.4 Supported Devices*** to obtain the ID information for each external device.

CAUTION

- **ID adapter setup should only be conducted by Mindray authorized personnel.**

2.7 Connecting External Devices

The external devices are connected with the BeneLink module through an ID adapter, which supports only its matching device. Please refer to the following procedure to connect an external device:



(1) BeneLink module (2) Label

(3) RJ45 connecting cable (4) ID adapter

(5) External device (6) Serial port adapting cable (optional)

1. Make sure that BeneLink module contains the device drivers which match the devices you want to connect.

   - For BeneVision N Series monitor, to check the installed device drivers, select the **Main Menu** quick key from the **System** column, select **Maintenance** → input required password → select **Ok** → select the **Version** tab, check **BeneLink Module Version**]. If desired device drivers are not installed, contact Mindray service to inquire about solutions.
   - For Passport 12m/17m, to check the installed device drivers, contact Mindray service.

2. Insert the BeneLink module into the SMR or module rack.
3. Connect the ID adapter that matches the external device to the BeneLink module with an RJ45 connecting cable.
4. Plug the ID adapter into the RS232 port on the external device. Some external devices may have ports incompatible with the ID adapter. In this case, a serial port adapting cable is required.

5. Adhere a device name label to the RJ45 connecting cable at the end close to the BeneLink module. When the BeneLink module is connected to several external devices, you can identify devices easily with these labels.
6. Switch on the external device.

After the external device is connected to the monitor, the indicators on both the ID adapter and the BeneLink module illuminate to show that the monitor is successfully communicating with the external device.

2.8 Accessories

PN	Description
115-007277-00	ID adapter
009-001767-00	Serial port adapting cable, Type A, male to female, cross-over
009-001768-00	Serial port adapting cable, Type B, male to male, straight-through
009-001769-00	Serial port adapting cable, Type C, male to male
009-002943-00	Serial port adapting cable, Type D, 9-pin to 15-pin
009-004613-00	Serial port adapting cable, Type E, 9-pin to RJ45 connector
009-008485-00	Serial port adapting cable, Type F, 9-pin
009-008624-00	Serial port adapting cable, Type G, 9-pin
009-009488-00	Serial port adapting cable, Type J
009-004286-00	Serial cable assembly
047-004857-00	ID adapter label
047-004859-00	Network line label
009-001770-00	RJ45 connecting cable

3 Integrating the Anesthesia Machine

3.1 Draeger Apollo

3.1.1 Output Signals - Parameters

Monitor output: parameters from Draeger Apollo anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	Yes
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes
Pplat	cmH2O, hPa, mbar	Plateau pressure	Yes
Pmean	cmH2O, hPa, mbar	Mean pressure	Yes
TVi	ml	Inspired tidal volume	Yes
MV	L/min	Minute volume	Yes
fspn	bpm	Spontaneous respiratory rate	Yes
Compl	ml/cmH2O,ml/ hPa,ml/mbar	Compliance	Yes
$RRCO_2$	bpm	Respiratory rate of CO_2	Yes
$EtCO_2$	%,kPa,mmHg	End-tidal carbon dioxide	Yes
$FiCO_2$	%,kPa,mmHg	Fraction of inspired carbon dioxide	Yes
FiO_2	%,kPa,mmHg	Fractional concentration of O_2 in inspired gas	Yes
EtO_2	%,kPa,mmHg	End-tidal O_2	Yes
ΔO_2	%,kPa,mmHg	Difference between inspiratory and expiratory O_2	No
Apnea Tinsp	sec	Apnea time	No

Monitor output: parameters from Draeger Apollo anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
FiN_2O	%	Inspired anesthetic agent	Yes
FiIso	%		
FiDes	%		
FiEnf	%		
FiSev	%		
FiHal	%		
EtN_2O	%	End-tidal anesthetic agent	Yes
EtEnf	%		
EtDes	%		
EtIso	%		
EtSev	%		
EtHal	%		
FiAA	%	Inspired anesthetic agent	Yes
EtAA	%	End-tidal anesthetic agent	Yes
FiAA 2nd	%	2nd Insp. Agent	Yes
EtAA 2nd	%	2nd Exp. Agent	Yes
Insp. MAC	\	Inspired minimum alveolar concentration	No
Exp. MAC	\	Expired minimum alveolar concentration	No
HALLev	ml	Anesthetic agent consupmtion	No
ENFLev	ml		
ISOLev	ml		
DESLev	ml		
SEVLev	ml		
N_2O Flow	L/min	N_2O flow	Yes
Air Flow	L/min	Air flow	Yes
O_2 Flow	L/min	O_2 flow	Yes
SpO_2	%	Arterial oxygen saturation from pulse oximetry	Yes

Monitor output: parameters from Draeger Apollo anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
PR	bpm	Pulse rate	Yes
VO2	ml/min	Oxygen consumption	Yes
TVe	ml	Expiratory tidal volume	Yes
EtO2%	%	End-tidal O_2	Yes
FiO2%	%	Fractional concentration of O_2 in inspired gas	Yes
EtCO2%	%	Fraction of inspired carbon dioxide	Yes
FiCO2%	%	End-tidal carbon dioxide	Yes
ΔO_2%	%	Difference between inspiratory and expiratory O_2	No
Setting Parameters			
TVi	ml	Inspired tidal volume	No
f	bpm	Breath rate	No
FreqMIN	bpm	Minimum breath frequency	No
TIP:TI	%	Percentage of inspiratory plateau time in inspiratory time	No
Tslope	sec	Time for the pressure to rise to target pressure	No
Tinsp	sec	Time of inspiration	No
Pinsp	cmH2O, hPa, mbar	Pressure control level of inspiration	No
△Psupp	cmH2O, hPa, mbar	Pressure support level	No
Pmax	cmH2O, hPa, mbar	Maximal breathing pressure	No
F-Trig	L/min	Inspiratory trigger level (flow trigger)	No

3.1.2 Output Signals - Alarms

Monitor output: alarms from Draeger Apollo anesthesia machine		
Mindray Patient Monitor		**Draeger Apollo Alarm**
Priority	**Label**	**Label**
Physiological Alarms		
High	Apnea	Apnea/Apnea Vent
High	Volume Apnea > 2 min	Apnea Vol
High	Pressure Apnea	Apnea Pres
High	PAW High	Paw High
High	PAW Low	Paw Negtive
High	FiO_2 Low	% O2 LOW
High	CONT PRES	PEEP > Pressure Threshold for 15 sec
High	CO_2 Apnea	Apnea CO2
High	No Pulse	SPO2 NO PULS
High	PR Low	SPO2 PULS LO
High	SpO_2 Low	SPO2 LOW
Medium	FiO_2 High	FiO2 High
Medium	TVe Low	TIDAL VOL?
Medium	MV High	MIN Vol HIGH
Medium	MV Low	MIN Vol Low
Medium	PEEP High	Peep High
Medium	$EtCO_2$ High	EtCO2 High
Medium	$EtCO_2$ Low	EtCO2 Low
Medium	$FiCO_2$ High	INSP CO2 HIGH
Medium	FiN_2O High	FI N2O HIGH
Medium	EtHAL High	EXP. HAL HIGH
Medium	FiHal High	%HAL HIGH
Medium	FiHal Low	%HAL Low
Medium	EtENF High	EXP. ENF HIGH
Medium	FiENF High	%ENF HIGH

Monitor output: alarms from Draeger Apollo anesthesia machine		
Mindray Patient Monitor		**Draeger Apollo Alarm**
Priority	**Label**	**Label**
Medium	FiENF Low	%ENF Low
Medium	EtISO High	EXP.ISO HIGH
Medium	FiISO High	%ISO HIGH
Medium	FiISO Low	%ISO Low
Medium	EtSEV High	EXP.SEV HIGH
Medium	FiSEV High	%SEV HIGH
Medium	FiSEV Low	%SEV Low
Medium	EtDES High	EXP.DES HIGH
Medium	FiDES High	%DES HIGH
Medium	FiDES Low	%DES Low
Medium	MAC Low	MAC Low?
Medium	PR High	SPO2 PULS HI
Medium	SpO_2 High	SPO2 HIGH
Technical alarms		
High	O_2 Supply Failure	O2 Supply?
High	No Fresh Gas	NO Fressh gas
High	Circuit Occluded	CIRCLE OCCL
High	VENT DISC	VENT DISC

Monitor output: alarms from Draeger Apollo anesthesia machine		
Mindray Patient Monitor		**Draeger Apollo Alarm**
Priority	**Label**	**Label**
High	High Technical Alarm	If the monitor shows the alarm [**High Technical alarms**], the external device may have the alarms: VENT ERR INT.TMP.HIGH O_2CYL.DISCON CHK N_2O CYL NO N_2O DELIV NO AIR DELIV FG-OVER? VENT. UNLOCK AW-TEMP HIGH NO N_2O NO O2 DELIV
Medium	Patient Circuit Leak	LEAKAGE
Medium	Fresh Gas?	FRESH GAS?
Medium	AG Module abnormal	If the monitor shows the alarm [**AG Module abnormal**], the external device may have the following alarms: MIXED AGENT CO_2/AGT ERR N_2O ERR AGT ERR 2ND AGENT
Medium	CO_2 Module abnormal	If the monitor shows the alarm [**CO2 Module abnormal**], the external device may have the following alarms: CO2 LINE BLK

Monitor output: alarms from Draeger Apollo anesthesia machine		
Mindray Patient Monitor		**Draeger Apollo Alarm**
Priority	**Label**	**Label**
Medium	Medium Technical Alarm	If the monitor shows the alarm [**Medium Technical alarms**], the external device has one or more of the following alarms: POWER FAIL BATTERY LOW N_2O SUPPLY? PRESSURE LIM MIXER INOP P MAX? SAFETY O_2 ON FG FLOW LIM LOSS OF DATA % O_2 ERR SET CANCELED FG TOO HIGH FG ACTIVE FG AIR SENS? FG O_2 SENS? FG N_2O SENS?
Low	NO AIR	NO AIR
Low	NO O_2 SUPPLY	NO O2 SUPPLY
Low	SpO_2 Module abnormal	If the monitor shows the alarm [**SpO_2 Module abnormal**], the external device may have the following alarms: SPO_2SEN DISC SPO_2 ALRM OF SPO_2 ERR

Monitor output: alarms from Draeger Apollo anesthesia machine		
Mindray Patient Monitor		**Draeger Apollo Alarm**
Priority	**Label**	**Label**
Low	Low Technical Alarm	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: FAN ERR PWR SPLY ERR PRESS ERR VOL ERR LO O_2 SUPPLY CHK O_2 CYL O_2 CYL OPEN N_2O CYLOPEN AIR CYL OPEN COM VENT ERR APOLLO COM1? APOLLO COM2? N_2O CYL .SENS? AIR CYL SENS? O_2 CYL .SENS? AIR CYL? PRESS RELIEF INSP VOL ERR

3.1.3 Output Signals - Waveforms (For BeneVision N series Monitors)

Label	Units
Paw	cmH2O, mbar, hpa
Flow	L/min
CO2	mmHg, kPa,%

3.2 Draeger Fabius GS/Fabius GS Premium/Fabius Tiro

NOTE

- **Only the Benevision N Series monitor supports integration with the Fabius GS Premium anesthesia machine.**

3.2.1 Output Signals - Parameters

Monitor output: parameters from Draeger Fabius GS/Fabius GS Premium/Fabius Tiro anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	Yes
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes
Pplat	cmH2O, hPa, mbar	Plateau pressure	Yes
Pmean	cmH2O, hPa, mbar	Mean pressure	Yes
TVe	ml	Expiratory tidal volume	Yes
MV	L/min	Minute volume	Yes
fspn	bpm	Spontaneous respiratory rate	Yes
$RRCO_2$	bpm	Respiratory rate of CO_2	Yes
$EtCO_2$	%,kPa,mmHg	End-tidal carbon dioxide	Yes
$FiCO_2$	%,kPa,mmHg	Fraction of inspired carbon dioxide	Yes
FiO_2	%,kPa,mmHg	Fractional concentration of O_2 in inspired gas	Yes
FiN_2O	%	Fraction of inspired nitrous oxide	Yes
EtN_2O	%	End-tidal N_2O	Yes
FiDes	%	Inspired anesthetic agent	Yes
FiSev	%		Yes
FiEnf	%		Yes
FiIso	%		Yes
FiHal	%		Yes

Monitor output: parameters from Draeger Fabius GS/Fabius GS Premium/Fabius Tiro anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
EtEnf	%	End-tidal anesthetic agent	Yes
EtDes	%		Yes
EtIso	%		Yes
EtSev	%		Yes
EtHal	%		Yes
FiAA	%	Inspired anesthetic agent	Yes
EtAA	%	End-tidal anesthetic agent	Yes
N_2O Flow	L/min	N_2O flow	Yes
Air Flow	L/min	Air flow	Yes
O_2 Flow	L/min	O_2 flow	Yes
FiO2%	%	Fractional concentration of O_2 in inspired gas	Yes
FiCO2%	%	Fraction of inspired carbon dioxide	Yes
EtCO2%	%	End-tidal carbon dioxide	Yes
Setting Parameters			
TVi	ml	Inspired tidal volume	No
f	bpm	Breath rate	No
I:E	/	Inspiratory time:Expiratory time ratio	No
TIP:TI	%	Percentage of inspiratory plateau time in inspiratory time	No
Tinsp	sec	Time of inspiration	No
Pinsp	cmH2O, hPa, mbar	Pressure control level of inspiration	No
△Psupp	cmH2O, hPa, mbar	Pressure support level	No
Pmax	cmH2O, hPa, mbar	Maximal breathing pressure	No
F-Trig	L/min	Inspiratory trigger level (flow trigger)	No
Insp Flow	L/min	Inspiration flow	No

3.2.2 Output Signals - Alarms

Monitor output: alarms from Draeger Fabius GS/Fabius GS Premium/Fabius Tiro anesthesia machine		
Mindray Patient Monitor		**Fabius GS/GS Premium/Tiro Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	Apnea	APNEA VENT
High	Volume Apnea > 2 min	APNEA VOL
High	Pressure Apnea	APNEA PRES
High	FiO_2 Low	% O2 LOW
High	Paw High	PAW HIGH
High	Paw Low	PAW NEGATIVE
High	CONT PRES	CONT PRES
Medium	FiO_2 High	% O2 HIGH
Medium	MV High	MIN VOL HIGH
Medium	MV Low	MIN VOL LOW
Medium	PEEP High	PEEP HIGH
Medium	PRESS EXP High	PRESS EXP High
Low	PRESSURE LIM	PRESSURE LIM
Technical alarms		
High	O_2 Supply Failure	LO O2 SUPPLY
High	APL VALVE?	APL VALVE ?
High	No Fresh Gas	NO FRESHGAS
High	High Technical alarms	If the monitor shows the alarm [**High Technical alarms**], the external device may have the alarms: VENT ERR.
Medium	EXP-VALVE?	EXP-VALVE ?
Medium	FRESH GAS?	FRESH GAS ?

Monitor output: alarms from Draeger Fabius GS/Fabius GS Premium/Fabius Tiro anesthesia machine		
Mindray Patient Monitor		**Fabius GS/GS Premium/Tiro Alarm**
Priority	**Label**	**Label**
Medium	Medium Technical alarms	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the following alarms: BATTERY LOW PRESS ERR VOL ERR
Low	Low Technical alarms	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: SPEAKER FAIL POWER FAIL CAL% O_2? % O_2 ERR TIME LIMITED RS232COM ERR PORT 1 ERROR PORT 2 ERROR THRESHOLD LO

3.3 Draeger Perseus A500

3.3.1 Output Signals - Parameters

Monitor output: parameters from Draeger Perseus A500 anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
ftotal	bpm	Total respiratory rate	Yes
RAW	cmH2O/L/s,hPa/L/s,mbar/L/s	Airway resistance	Yes
VCO_2	ml/min	CO_2 production	No

Monitor output: parameters from Draeger Perseus A500 anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
HALLev	ml	Anesthetic agent consupmtion	No
ENFLev	ml		
ISOLev	ml		
DESLev	ml		
SEVLev	ml		
VO_2	ml/min	Oxygen consumption	Yes
Pmean	cmH2O, hPa, mbar	Mean pressure	Yes
Pplat	cmH2O, hPa, mbar	Plateau pressure	Yes
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	Yes
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes
Insp. MAC	\	Inspired minimum alveolar concentration	No
Exp. MAC	\	Expired minimum alveolar concentration	No
FiN_2O	%	Inspired anesthetic agent	Yes
FiIso	%		
FiDes	%		
FiEnf	%		
FiSev	%		
FiHal	%		
EtN_2O	%	End-tidal anesthetic agent	Yes
EtEnf	%		
EtDes	%		
EtIso	%		
EtSev	%		
EtHal	%		
MVspn	L/min	Spontaneous breathed minute volume	Yes
MV	L/min	Minute volume	Yes

Monitor output: parameters from Draeger Perseus A500 anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
Apnea Tinsp	sec	Apnea time	No
ΔO_2	%,kPa,mmHg	Difference between inspiratory and expiratory O_2	No
$RRCO_2$	bpm	Respiratory rate of CO_2	Yes
$FiCO_2$	%,kPa,mmHg	Fraction of inspired carbon dioxide	Yes
$EtCO_2$	%,kPa,mmHg	End-tidal carbon dioxide	Yes
N_2O Flow	L/min	N_2O flow	Yes
Air Flow	L/min	Air flow	Yes
O_2 Flow	L/min	O_2 flow	Yes
FiAA	%	Inspired anesthetic agent	Yes
EtAA	%	End-tidal anesthetic agent	Yes
FiAA 2nd	%	2nd Insp. Agent	Yes
EtAA 2nd	%	2nd Exp. Agent	Yes
FiO_2	%,kPa,mmHg	Fractional concentration of O_2 in inspired gas	Yes
EtO_2	%,kPa,mmHg	End-tidal O_2	Yes
TVi	ml	Inspired tidal volume	Yes
FiCO2%	%	Fraction of inspired carbon dioxide	Yes
EtCO2%	%	End-tidal carbon dioxide	Yes
ΔO_2 %	%	Difference between inspiratory and expiratory O_2	No
EtO2%	%	End-tidal O_2	Yes
FiO2%	%	Fractional concentration of O_2 in inspired gas	Yes
Setting Parameters			
TVi	ml	Inspired tidal volume	No
f	bpm	Breath rate	No
Tinsp	sec	Time of inspiration	No

Monitor output: parameters from Draeger Perseus A500 anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
PS above PEEP	cmH2O, hPa, mbar	PS above PEEP	No
Pmax	cmH2O, hPa, mbar	Maximum airway pressure	No
F-Trig	L/min	Inspiratory trigger level (flow trigger)	No
TIP:TI	%	Percentage of inspiratory plateau time in inspiratory time	No
Tslope	sec	Time for the pressure to rise to target pressure	No
FG	ml/min	Fresh gas flow	No
Pinsp	cmH2O, hPa, mbar	Pressure control level of inspiration	No
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	No

3.3.2 Output Signals - Alarms

Monitor output: alarms from Draeger A500 anesthesia machine		
Mindray Patient Monitor		**Draeger A500 Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	Apnea	APNEA or APNEA VOL
High	FiO_2 Low	%O2 LOW
High	CO_2 Apnea	APNEA CO2
High	Pressure Apnea	APNEA PRES
High	Paw High	PAW HIGH
High	Paw Low	PAW LOW / PAW NEGATIVE
High	CONT PRES	CONT PRES
Medium	FiHal High	% HAL HIGH
Medium	FiEnf High	% ENF HIGH
Medium	FiIso High	% ISO HIGH

Monitor output: alarms from Draeger A500 anesthesia machine		
Mindray Patient Monitor		**Draeger A500 Alarm**
Priority	**Label**	**Label**
Medium	MV Low	MIN VOL LOW
Medium	FiSev High	% SEV HIGH
Medium	FiDes High	% DES HIGH
Medium	$EtCO_2$ Low	ET CO2 LOW
Medium	$EtCO_2$ High	ET CO2 HIGH
Medium	FiHal Low	% HAL LOW
Medium	FiEnf Low	% ENF LOW
Medium	FiIso Low	% ISO LOW
Medium	FiDes Low	% DES LOW
Medium	FiSev Low	% SEV LOW
Medium	$FiCO_2$ High	INSP CO2 HI
Medium	MV High	MIN VOL HIGH
Medium	PEEP High	PEEP HIGH
Medium	TVe High	TIDAL VOL HI
Medium	MAC Low	MAC LOW?
Medium	FiN_2O High	% N2O HIGH
Technical alarms		
High	O_2 Supply Failure	O2 SUPPLY?
High	NO Fresh Gas	NO FRESHGAS
High	VENT DISC	VENT ASSEMBL

Monitor output: alarms from Draeger A500 anesthesia machine		
Mindray Patient Monitor		**Draeger A500 Alarm**
Priority	**Label**	**Label**
High	High Technical Alarm	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: VENT ERR MIXER INOP INT.TMP.HIGH AIR PRESS HI HI O_2 SUPPLY SYSTEM FAULT N_2O CYL.? NO N_2O NO OXYGEN NO AIR FG EXTERN?
Medium	FRESH GAS?	FRESH GAS?
Medium	EXP–VALVE?	EXP-VALVE?
Medium	Medium Technical Alarm	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the following alarms: BATTERY LOW % O_2 ERR N_2O SUPPLY? POWER FAIL SAFETY O_2 ON FG LIMITED LOSS OF DATA SET.CANCELED FG TOO HIGH FG ACTIVE ABS.PRESENT?
Medium	Medium Technical Alarm	HOSES MIXED? WRONG HOSES? AIR ENTRAIN VENT PAUSE?

Monitor output: alarms from Draeger A500 anesthesia machine		
Mindray Patient Monitor		**Draeger A500 Alarm**
Priority	**Label**	**Label**
Medium	CO_2 Module abnormal	If the monitor shows the alarm [**CO2 Module abnormal**], the external device may have the alarm: CO_2 LINE BLK
Medium	AG Module abnormal	If the monitor shows the alarm [**AG Module abnormal**], the external device may have the following alarms: MIXED AGENT CO2 AGT ERR 2nd AGENT WATERTR.OLD?
Low	Low Technical Alarm	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: RS232COM ERR PRESS ERR WATER TRAP ? VENT TEMP HI VOL ERR FAN ERR N_2O PRESS HI O_2 CYL. ? VOLAT SUPPLY CO_2-LINE ? PWR SPLY ERR TIDAL VOL.? INSP VOL ERR N_2OCYL.SENS? AIRCYL.SENS? O_2 CYL.SENS? AIR CYL.? PMIN REACHED
Low	Low Technical Alarm	PRESS RELIEF ABSORB. OLD? ID-FUNC-INOP HOSE OLD?

3.3.3 Output Signals - Waveforms (For BeneVision N series Monitors)

Label	Units
Paw	cmH2O, mbar, hpa
Flow	L/min
CO2	mmHg, kPa, %
O2	%

3.4 Draeger Primus (for Passport M series)

3.4.1 Output Signals - Parameters

Monitor output: parameters from Draeger Primus anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	Yes
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes
Pplat	cmH2O, hPa, mbar	Plateau pressure	Yes
Pmean	cmH2O, hPa, mbar	Mean pressure	Yes
TVe	ml	Expiratory tidal volume	Yes
TVi	ml	Inspired tidal volume	Yes
MV	L/min	Minute volume	Yes
fspn	bpm	Spontaneous respiratory rate	Yes
Compl	ml/cmH2O,ml/hPa,ml/mbar	Compliance	Yes
$RRCO_2$	bpm	Respiratory rate of CO_2	Yes
$EtCO_2$	%,kPa,mmHg	End-tidal carbon dioxide	Yes
$FiCO_2$	%,kPa,mmHg	Fraction of inspired carbon dioxide	Yes
FiO_2	%,kPa,mmHg	Fractional concentration of O_2 in inspired gas	Yes
EtO_2	%,kPa,mmHg	End-tidal O_2	Yes

Monitor output: parameters from Draeger Primus anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
ΔO_2	%,kPa,mmHg	Difference between inspiratory and expiratory O_2	No
Apnea Tinsp	sec	Apnea time	No
FiN_2O	%	Inspired anesthetic agent	Yes
FiIso	%		Yes
FiDes	%		Yes
FiEnf	%		Yes
FiSev	%		Yes
FiHal	%		Yes
EtN_2O	%	End-tidal anesthetic agent	Yes
EtEnf	%		Yes
EtDes	%		Yes
EtIso	%		Yes
EtSev	%		Yes
EtHal	%		Yes
FiAA	%	Inspired anesthetic agent	Yes
EtAA	%	End-tidal anesthetic agent	Yes
FiAA 2nd	%	2nd Insp. Agent	Yes
EtAA 2nd	%	2nd Exp. Agent	Yes
Insp. MAC	\	Inspired minimum alveolar concentration	No
Exp. MAC	\	Expired minimum alveolar concentration	No
HALLev	ml	Anesthetic agent consupmtion	No
ENFLev	ml		
ISOLev	ml		
DESLev	ml		
SEVLev	ml		
VO_2	ml/min	Oxygen consumption	Yes

Monitor output: parameters from Draeger Primus anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
N_2O Flow	L/min	N_2O flow	Yes
Air Flow	L/min	Air flow	Yes
O_2 Flow	L/min	O_2 flow	Yes
SpO_2	%	Arterial oxygen saturation from pulse oximetry	Yes
PR	bpm	Pulse rate	Yes
FiO2%	%	Fractional concentration of O_2 in inspired gas	Yes
EtO2%	%	End-tidal O_2	Yes
ΔO_2 %	%	Difference between inspiratory and expiratory O_2	No
FiCO2%	%	Fraction of inspired carbon dioxide	Yes
EtCO2%	%	End-tidal carbon dioxide	Yes
Setting Parameters			
f	bpm	Breath rate	No
FreqMIN	bpm	Minimum breath frequency	No
TIP:TI	%	Percentage of inspiratory plateau time in inspiratory time	No
Tslope	sec	Time for the pressure to rise to target pressure	No
Tinsp	sec	Time of inspiration	No
Pinsp	cmH2O, hPa, mbar	Pressure control level of inspiration	No
△Psupp	cmH2O, hPa, mbar	Pressure support level	No
Pmax	cmH2O, hPa, mbar	Maximal breathing pressure	No
F-Trig	L/min	Inspiratory trigger level (flow trigger)	No
TVi	ml	Inspired tidal volume	No
FG	ml/min	Fresh gas flow	No

3.4.2 Output Signals - Alarms

Monitor output: alarms from Draeger Primus anesthesia machine		
Mindray Patient Monitor		**Draeger Primus Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	Apnea	APNEA/APNEA VENT
High	Volume Apnea > 2 min	APNEA VOL
High	Pressure Apnea	APNEA PRES
High	Paw High	PAW HIGH
High	Paw Low	PAW NEGATIVE
High	FiO_2 Low	%O2 LOW
High	CONT PRES	CONT PRES
High	CO_2 Apnea	APNEA CO2
High	No Pulse	NO SPO2 PULS
High	PR Low	SPO2 PULS LO
High	SPO_2 Low	SPO2 LOW
Medium	FiO_2 High	%O2 HIGH
Medium	TVe Low	VT LOW
Medium	MV High	MIN VOL HIGH
Medium	MV Low	MIN VOL LOW
Medium	PEEP High	PEEP HIGH
Medium	$EtCO_2$ High	ET CO2 HIGH
Medium	$EtCO_2$ Low	ET CO2 Low
Medium	$FiCO_2$ High	INSP CO2 HIGH
Medium	FiN_2O High	FI N2O HIGH
Medium	EtHal High	EXP. HAL HIGH
Medium	FiHal High	% HAL HIGH
Medium	FiHal Low	% HAL LOW
Medium	EtEnf High	EXP. ENF HIGH
Medium	FiEnf High	% ENF HIGH

Monitor output: alarms from Draeger Primus anesthesia machine		
Mindray Patient Monitor		**Draeger Primus Alarm**
Priority	**Label**	**Label**
Medium	FiEnf Low	% ENF LOW
Medium	EtIso High	EXP. ISO HIGH
Medium	FiIso High	% ISO HIGH
Medium	FiIso Low	% ISO LOW
Medium	EtSev High	EXP. SEV HIGH
Medium	FiSev High	% SEV HIGH
Medium	FiSev Low	% SEV LOW
Medium	EtDes High	EXP. DES HIGH
Medium	FiDes High	% DES HIGH
Medium	FiDes Low	% DES LOW
Medium	MAC Low	MAC LOW?
Medium	PR High	SPO2 PULS HI
Medium	SpO_2 High	SPO2 HIGH
Technical alarms		
High	O_2 Supply Failure	O2 SUPPLY ?
High	No Fresh Gas	NO FRESHGAS
High	Circuit Occluded	CIRCLE OCCL
High	VENT DISC	VENT DISC

Monitor output: alarms from Draeger Primus anesthesia machine		
Mindray Patient Monitor		**Draeger Primus Alarm**
Priority	**Label**	**Label**
High	High Technical alarms	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: VENT ERR INT.TMP.HIGH O_2CYL.DISCON CHK N_2O CYL NO N_2O DELIV NO O_2 DELIV. NO AIR DELIV FG X-OVER ? VENT.UNLOCKD AW-TEMP HIGH NO N_2O
Medium	Patient Circuit Leak	LEAKAGE
Medium	FRESH GAS?	FRESH GAS?
Medium	Medium Technical alarms	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the following alarms: POWER FAIL BATTERY LOW N_2O SUPPLY? PRESSURE LIM MIXER INOP P MAX SAFETY O_2 ON FG.FLOW LIM. LOSS OF DATA HOSES MIXED? WRONG HOSES? % O_2 ERR SET.CANCELED FG TOO HIGH FG ACTIVE FG AIR SENS?

Monitor output: alarms from Draeger Primus anesthesia machine		
Mindray Patient Monitor		**Draeger Primus Alarm**
Priority	**Label**	**Label**
Medium	Medium Technical alarms	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the following alarms: FG O_2 SENS? FG N_2O SENS? ABS. PRESENT?
Medium	AG Module abnormal	If the monitor shows the alarm [**AG Module abnormal**], the external device may have the following alarms: WATERTR. OLD? MIXED AGENT CO_2/AGT ERR N_2O ERR AGT ERR 2nd AGENT
Medium	CO2 Module abnormal	If the monitor shows the alarm [**CO2 Module abnormal**], the external device may have the following alarm: CO_2 LINE BLK
Low	NO AIR	NO AIR
Low	NO O_2 SUPPLY	NO O2 SUPPLY
Low	Low Technical alarms	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: FAN ERR PWR SPLY ERR PRESS ERR VOL ERR LO O_2 SUPPLY CHK O_2 CYL ID-FUNC-INOP HOSE OLD? HOSE MISSING COM VENT ERR

Monitor output: alarms from Draeger Primus anesthesia machine		
Mindray Patient Monitor		**Draeger Primus Alarm**
Priority	**Label**	**Label**
Low	Low Technical alarms	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: APOLLO COM1? APOLLO COM2? N_2OCYL.SENS? AIRCYL.SENS? O_2 CYL.SENS? AIR CYL.? PRESS RELIEF ABSORB. OLD? INSP VOL ERR
Low	SpO_2 Module abnormal	If the monitor shows the alarm [**SpO2 Module abnormal**], the external device may have the following alarms: SPO_2SEN DISC SPO_2 ALRM OF SPO_2 ERR

3.5 GE Aespire 7900&7100/ Aestiva 7900&7100

NOTE

- **Only the Benevision N sereis monitor supports integration with the GE Aespire 7900&7100 anesthesia machine.**

3.5.1 Output Signals - Parameters

Monitor output: parameters from GE Aespire 7900&7100/ Aestiva 7900&7100 anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
TVe	ml	Expiratory tidal volume	Yes
MVe	L/min	Expiratory minute volume	Yes
O_2%	%	Oxygen concentration	Yes
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes
Pplat	cmH2O, hPa, mbar	Plateau pressure	Yes
Pmean	cmH2O, hPa, mbar	Mean pressure	Yes
Pmin	cmH2O, hPa, mbar	Minimum airway pressure	No
ftotal	bpm	Total respiratory rate	Yes
Setting Parameters			
TV	ml	Tidal volume	No
f	bpm	Breath rate	No
I:E	/	Percentage of inspiratory plateau time in inspiratory time	No
TIP:TI	%	Percentage of inspiratory plateau time in inspiratory time	No
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	No
Plimit	cmH2O, hPa, mbar	Pressure limit level	No
Pinsp	cmH2O, hPa, mbar	Pressure control level of inspiration	No

3.5.2 Output Signals - Alarms

Monitor output: alarms from GE Aespire 7900&7100/Aestiva 7900&7100 anesthesia machine		
Mindray Patient Monitor		**Aespire 7900&7100/Aestiva 7900&7100 Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	FiO_2 Low	Low O2
High	Paw High	High Paw
High	Paw Low	Low Paw
High	High Paw Sustained	Sustained Paw (shutdown)
High	Volume Apnea > 2 min	Volume Apnea > 2 min
Medium	FiO_2 High	High O2
Medium	Sub-Atmospheric Paw	Sub-Atmospheric Paw
Medium	MV Low	Low VE
Medium	MV High	High VE
Medium	TVe Low	Low Vte
Medium	TVe High	High Vte
Medium	Volume Apnea	Volume Apnea
Low	Pressure limiting	Sustained Paw
Technical alarms		
High	No Fresh Gas	No Fresh Gas Flow
High	O_2 Supply Failure	No O2 Pressure
High	High Technical alarms	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: Pinspired Not Achieved Inspiration Stopped +15V SIB Out-of-Range +15V Manifold Out-of-Range Display Voltage Out-of-Range Vaux_ref Out-of-Range Vext_ref Out-of-Range

Monitor output: alarms from GE Aespire 7900&7100/Aestiva 7900&7100 anesthesia machine		
Mindray Patient Monitor		**Aespire 7900&7100/Aestiva 7900&7100 Alarm**
Priority	**Label**	**Label**
High	High Technical alarms	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: A/D Converter Failure CPU Failure Memory (EEPROM) Failure Memory (flash) Failure Memory (RAM) Failure Memory (video) Failure Bootup Memory Failure Software Watchdog Failure Hardware Watchdog Failure Internal Clock Too Fast Internal Clock Too Slow CPU Internal Error Control Settings Input Has Failed
Medium	Medium Technical alarms	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the following alarms: No Pressure Mode/PEEP Inspiratory Overshoot Manifold Pressure Sensor Failure High Pressure Limit Reached (min sys) Inspiratory Reverse Flow Expiratory Reverse Flow Check Flow Sensors Flow Valve Failure Gas Inlet Valve Failure Bootup Gas Inlet Valve Failure Memory (redundant storage) Fail No Battery Low Battery Charge Low VE Limit Set.
Low	Battery in Use	On Battery

Monitor output: alarms from GE Aespire 7900&7100/Aestiva 7900&7100 anesthesia machine		
Mindray Patient Monitor		**Aespire 7900&7100/Aestiva 7900&7100 Alarm**
Priority	**Label**	**Label**
Low	Low Technical alarms	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: Check O_2 Sensor O_2 Calibration Error PEEP Not Achieved Vt Not Achieved No Inspiratory Flow Sensor No Expiratory Flow Sensor Insp Vt/Vte Mismatch Vdel Mismatch Bellows Empty +Vanalog Failure -Vanalog Failure Flow Sensor Cal Data Corrupt Low Battery Low Battery (shutdown) Battery Voltage Out Of Range Battery Current Out Of Range Circuit Auxiliary Auxiliary Breathing Circuit Service Calibrations Due

3.5.3 Output Signals - Waveforms (For BeneVision N series Monitors)

Label	Units
Paw	cmH2O, mbar, hpa
Flow	L/min

3.6 GE AespireView (For BeneVision N series Monitors)

3.6.1 Output Signals - Parameters

Monitor output: parameters from GE AespireView anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
TVe	ml	Expiratory tidal volume	Yes
MVe	L/min	Expiratory minute volume	Yes
ftotal	bpm	Total respiratory rate	Yes
O_2%	%	Oxygen concentration	Yes
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes
Pplat	cmH2O, hPa, mbar	Plateau pressure	Yes
Pmean	cmH2O, hPa, mbar	Mean pressure	Yes
Pmin	L/min	Minimum airway pressure	No
MVspn	bpm	Spontaneous breathed minute volume	Yes
fspn	ml	Spontaneous respiratory rate	Yes
TVi	L/min	Inspired tidal volume	Yes
MVi	cmH2O, hPa, mbar	Inspiratory minute volume	Yes
PEEPtot	mmHg	Total PEEP	No
ATMP	L/min	Barometric pressure	No
O_2 Flow	L/min	O_2 flow	Yes
N_2O Flow	ml	N_2O flow	Yes
Air Flow	L/min	Air flow	Yes
Setting Parameters			
TV	ml	Tidal volume	No
f	bpm	Breath rate	No
I:E	\	Inspiratory time:Expiratory time ratio	No
TIP:TI	%	Percentage of inspiratory plateau time in inspiratory time	No

Monitor output: parameters from GE AespireView anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	No
Plimit	cmH2O, hPa, mbar	Pressure limit level	No
Pinsp	cmH2O, hPa, mbar	Pressure control level of inspiration	No
△Psupp	cmH2O, hPa, mbar	Pressure support level	No
F-Trig	L/min	Inspiratory trigger level (flow trigger)	No
Tinsp	sec	Time of inspiration	No

3.6.2 Output Signals - Alarms

Monitor output: alarms from GE AespireView anesthesia machine		
Mindray Patient Monitor		**GE AespireView Alarm**
Priority	**Label**	**Label**
High	Paw High	pPeak High
High	Paw Low	pPeak Low
High	Volume Apnea > 2 min	Volume Apnea > 2 min
Medium	Sub-Atmospheric Paw	Sub-Atmospheric Paw
Medium	MV Low	Low VE
Medium	MV High	High VE
Medium	TVe Low	Low Vte
Medium	TVe High	High Vte
Medium	Volume Apnea	Volume Apnea
Low	Pressure Limiting	Sustained Paw
Technical alarms		
High	No Fresh Gas	No Fresh Gas Flow
High	O_2 Supply Failure	No O2 Pressure

Monitor output: alarms from GE AespireView anesthesia machine		
Mindray Patient Monitor		**GE AespireView Alarm**
Priority	**Label**	**Label**
High	High Technical alarms	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: Other Priority Alarms Ventilator Has No Diver Gas Battery Charging Low Battery Voltage Manifold Pressure Sensor Failure Pressure Limit Switch Failure Flow Valve Failure Valve Power Failure No Insp flow sensor No Exp flow Sensor Replace exp flow Replace Insp Flow Sensor
Medium	Patient Circuit Leak	Patient Circuit Leak
Medium	Medium Technical alarms	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the following alarms: High Circuit O_2 Low Circuit O_2 No O_2 Cell Sensor No Pressure Cntrl/PEEP Inspiration Stopped Inspiratory Reverse Flow Expiratory Reverse Flow Check Flow Sensors No Air Pressure Battery Failure Battery Failure High Battery Current High ACGO On Increase Low MV Limit Display Failure Loss of Backup Audio
Low	Battery in Use	Running On Battery (No AC)

Monitor output: alarms from GE AespireView anesthesia machine		
Mindray Patient Monitor		**GE AespireView Alarm**
Priority	**Label**	**Label**
Low	Low Technical alarms	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: Replace O_2 Cell O_2 Cell Calibration Error Vt Not Achieved No Inspiratory Flow Sensor No Expiratory Flow Sensor Dry or Replace Sensors System Leak? Unable to drive bellows Memory (EEPROM) Failure

3.6.3 Output Signals - Waveforms (For BeneVision N series Monitors)

Label	Units
Paw	cmH2O, mbar, hpa
Flow	L/min
Vol	mL

3.6.4 Output Signals - Respiratory Loops (For BeneVision N series Monitors)

Label	Units
PV Loop	cmH2O/ml, hPa/ml, mbar/ml
FV Loop	L/min/ml
PF Loop	cmH2O/L/min, hPa/L/min, mbar/L/min

3.7 GE Aisys/Aisys CS2/Avance/Avance CS2

- **Only the Benevision N Series monitor supports integration with the GE Aisys CS2 /Avance CS2anesthesia machine.**

3.7.1 Output Signals - Parameters

Monitor output: parameters from GE Aisys/Aisys CS2/Avance/Avance CS2anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
TVe	ml	Expiratory tidal volume	Yes
MVe	L/min	Expiratory minute volume	Yes
ftotal	bpm	Total respiratory rate	Yes
O_2%	%	Oxygen concentration	Yes
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes
Pplat	cmH2O, hPa, mbar	Plateau pressure	Yes
Pmean	cmH2O, hPa, mbar	Mean pressure	Yes
Pmin	cmH2O, hPa, mbar	Minimum airway pressure	No
MVspn	L/min	Spontaneous breathed minute volume	Yes
fspn	bpm	Spontaneous respiratory rate	Yes
PEEPi	cmH2O, hPa, mbar	Intrinsic positive end-expiratory pressure	No
Compl	ml/cmH2O,ml/hPa,ml/mbar	Compliance	Yes
RAW	cmH2O/L/s,hPa/L/s,mbar/L/s	Airway resistance	Yes
TVi	ml	Inspired tidal volume	Yes
MVi	L/min	Inspiratory mimute volume	Yes
Paux Peak	cmH2O, hPa, mbar	Peak auxiliary pressure	No
Paux Mean	cmH2O, hPa, mbar	Mean auxiliary pressure	No
Paux Min	cmH2O, hPa, mbar	Minimum auxiliary pressure	No

Monitor output: parameters from GE Aisys/Aisys CS2/Avance/Avance CS2anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
PEEPe	cmH2O, hPa, mbar	Extrinsic positive end-expiratory pressure	No
PEEPtot	cmH2O, hPa, mbar	Total PEEP	No
PEEPi time	min	Intrinsic PEEP age (elapsed time since last maneuver)	No
P0.1	cmH2O, hPa, mbar	100 ms occlusion pressure	No
P0.1 time	min	P0.1 age (elapsed time since last maneuver)	No
ATMP	mmHg	Barometric pressure	No
FiO_2	%,kPa,mmHg	Fractional concentration of O_2 in inspired gas	Yes
EtO_2	%,kPa,mmHg	End-tidal O_2	Yes
ΔO2	%,kPa,mmHg	Difference between inspiratory and expiratory O_2	No
$FiCO_2$	%,kPa,mmHg	Fraction of inspired carbon dioxide	Yes
$EtCO_2$	%,kPa,mmHg	End-tidal carbon dioxide	Yes
$RRCO_2$	bpm	Respiratory rate of CO_2	Yes
FiAA	%	Inspired anesthetic agent	Yes
EtAA	%	End-tidal anesthetic agent	Yes
FiAA 2nd	%	2nd Insp. Agent	Yes
EtAA 2nd	%	2nd Exp. Agent	Yes
FiN_2O	%	Fraction of inspired nitrous oxide	Yes
EtN_2O	%	End-tidal N_2O	Yes
MAC	\	Minimum alveolar concentration	Yes
VO_2	ml/min	Oxygen consumption	Yes
VO_2/m^2	ml/min/m2	Oxygen consumption per body surface area	No
VO_2/kg	ml/min/kg	Oxygen consumption per body weight	No
VCO_2	ml/min	CO_2 production	No

Monitor output: parameters from GE Aisys/Aisys CS2/Avance/Avance CS2anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
EE	kcal/day	Energy expenditure	No
RQ	\	Respiratory quotient	No
PO_2	kPa	oxygen supply pressure	No
PN_2O	kPa	N_2O supply pressure	No
Pair	kPa	air supply pressure	No
O_2 cyl.	kPa	Oxygen cylinder pressure	No
O_2 cyl.2nd	kPa	Secondary oxygen cylinder pressure	No
N_2O cyl.	kPa	N_2O cylinder pressure	No
air cyl.	kPa	Air cylinder pressure	No
Des flow	ml/h	Anesthetic agent flow	No
Enf flow	ml/h		
Iso flow	ml/h		
Hal flow	ml/h		
Sev flow	ml/h		
O_2 Flow	L/min	O_2 flow	Yes
N_2O Flow	L/min	N_2O flow	Yes
Air Flow	L/min	Air flow	Yes
I:E	\	Inspiratory time:Expiratory time ratio	No
FRC	ml	Fractional residual capacity	No
FiO2%	%	Fractional concentration of O_2 in inspired gas	Yes
EtO2%	%	End-tidal O_2	Yes
ΔO_2 %	%	Difference between inspiratory and expiratory O_2	No
FiCO2%	%	Fraction of inspired carbon dioxide	Yes
EtCO2%	%	End-tidal carbon dioxide	Yes

Monitor output: parameters from GE Aisys/Aisys CS2/Avance/Avance CS2anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
FiHal	%	Inspired anesthetic agent	Yes
FiIso	%		
FiEnf	%		
FiDes	%		
FiSev	%		
EtSev	%	End-tidal anesthetic agent	Yes
EtHal	%		
EtIso	%		
EtEnf	%		
EtDes	%		
Setting Parameters			
TV	ml	Tidal volume	No
f	bpm	Breath rate	No
I:E	\	Inspiratory time:Expiratory time ratio	No
TIP:TI	%	Percentage of inspiratory plateau time in inspiratory time	No
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	No
Plimit	cmH2O, hPa, mbar	Pressure limit level	No
Pinsp	cmH2O, hPa, mbar	Pressure control level of inspiration	No
△Psupp	cmH2O, hPa, mbar	Pressure support level	No
Pmax	cmH2O, hPa, mbar	Maximal breathing pressure	No
IBW	kg	Ideal body weight	No
BSA	m2	Body surface area	No
Rise Time%	%	rise time%	No
F-Trig	L/min	Inspiratory trigger level (flow trigger)	No

Monitor output: parameters from GE Aisys/Aisys CS2/Avance/Avance CS2anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
P-Trig	cmH2O, hPa, mbar	Inspiratory trigger level(pressure trigger)	No
Tinsp	sec	Time of inspiration8	No
Tpause%	%	Pause Time%	No

3.7.2 Output Signals - Alarms

Monitor output: alarms from GE Aisys/Aisys CS2/Avance/Avance CS2anesthesia machine		
Mindray Patient Monitor		**Aisys/Aisys CS2/Avance/Avance CS2 Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	Paw High	High Paw
High	Paw Low	Low Paw
High	High Paw Sustained	High Paw Sustained
High	Volume Apnea > 2 min	Volume Apnea > 2 min
High	EtO_2 Low	Low etO2
High	EtO_2 High	High etO2
High	FiO_2 Low	Low FiO2
High	FiO_2 High	High FiO2
High	CO_2 Apnea	CO2 Apnea
Medium	Sub-Atmospheric Paw	Sub-Atmospheric Paw
Medium	MV Low	Low VE
Medium	MV High	High VE
Medium	TVe Low	Low Vte
Medium	TVe High	High Vte
Medium	Volume Apnea	Volume Apnea
Medium	RR High	High RR

Monitor output: alarms from GE Aisys/Aisys CS2/Avance/Avance CS2anesthesia machine		
Mindray Patient Monitor		**Aisys/Aisys CS2/Avance/Avance CS2 Alarm**
Priority	**Label**	**Label**
Medium	RR Low	Low RR
Medium	$EtCO_2$ Low	Low etCO2
Medium	$EtCO_2$ High	High etCO2
Medium	$FiCO_2$ High	High FiCO2
Medium	EtAA Low	Low etAA
Medium	EtAA High	High etAA
Medium	FiAA Low	Low FiAA
Medium	FiAA High	High FiAA
Low	PRESSURE LIM	Plimit Reached
Low	Pressure Limiting	Sustained Paw
Technical alarms		
High	No Fresh Gas	No Fresh Gas Flow
High	O_2 Supply Failure	No O2 Pressure
High	Circuit Occluded	Circuit Occluded
High	High Technical alarms	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: Pmax Reached Pinspired Not Achieved Other Priority Alarms (for high priority alarms not assigned a unique bit) No VO_2 High FiN_2O Low Drive Gas Pressure Low Battery Charge Low Battery (No AC) Control Settings Failure

Monitor output: alarms from GE Aisys/Aisys CS2/Avance/Avance CS2anesthesia machine		
Mindray Patient Monitor		**Aisys/Aisys CS2/Avance/Avance CS2 Alarm**
Priority	**Label**	**Label**
High	High Technical alarms	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: Therapy Computer Failure Monitoring Computer Failure Display Computer Failure System Error Mixer Failure Mixer Leak Mixer Control Failure Vent Failure Mechanical Ventilation Disabled Patient Detected (while in standby) High O_2 Supply Pressure High Air Supply Pressure
Medium	Patient Circuit Leak	Patient Circuit Leak
Medium	AG Module abnormal	If the monitor shows the alarm [**AG Module abnormal**], the external device may have the following alarms: MGAS ANE_WARMING_UP (5-minute warming up) MGAS WARMING_UP (2-minute warming up) No VO_2 FiO_2 > 85% Alternate O_2 ON Air Only Mode MGAS Failure Module Not Compatible Vaporizer Cassette Failure AA Delivery Disabled MGAS Outlet Occluded MGAS Filter Blocked MGAS Sample Line Blocked MGAS No Sample Line

Monitor output: alarms from GE Aisys/Aisys CS2/Avance/Avance CS2anesthesia machine		
Mindray Patient Monitor		**Aisys/Aisys CS2/Avance/Avance CS2 Alarm**
Priority	**Label**	**Label**
Medium	AG Module abnormal	If the monitor shows the alarm [**AG Module abnormal**], the external device may have the following alarms: MGAS Replace Water Trap Vaporizer Cassette Agent Level Low No Vaporizer Cassette Vaporizer Failure Vaporizer Leak AA Control Failure
Medium	Medium Technical alarms	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the following alarms: High Circuit O_2 Low Circuit O_2 No O_2 Cell Sensor No Pressure Cntrl/PEEP Inspiration Stopped Inspiratory Reverse Flow Expiratory Reverse Flow Check Flow Sensors No Air Pressure No VO_2 No VO_2, Artifact No VO2, High Bypass Flow No Battery Battery Failure Battery Charger Failure Non Circle Circuit Selected Expiratory Flow Sensed with Non Circle Circuit Verify Low VE Limit Fan Failure Heater Failure Power Supply Failure Display Failure Breathing System Failure

Monitor output: alarms from GE Aisys/Aisys CS2/Avance/Avance CS2anesthesia machine		
Mindray Patient Monitor		**Aisys/Aisys CS2/Avance/Avance CS2 Alarm**
Priority	**Label**	**Label**
Medium	Medium Technical alarms	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the following alarms: Sensor Interface Board Failure ACGO Failure SCGO Failure Primary Audio Failure Backup Audio Failure Nebulizer Failure No Nebulizer
Low	Battery in Use	Running On Battery (No AC)
Low	Low Technical alarms	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: ASR on Replace O_2 Cell O_2 Cell Calibration Error PEEP Not Achieved Vt Not Achieved No Inspiratory Flow Sensor No Expiratory Flow Sensor Insp Vt/Vte Mismatch (VTE > Insp VT) Vdel Mismatch (System Leak) Bellows Empty No N_2O Pressure Memory (EEPROM) Failure Flow Sensor Cal Data Corrupt Service Calibrations Due.

3.7.3 Output Signals - Waveforms (For BeneVision N series Monitors)

Label	Units
Paw	cmH2O, mbar, hpa

Label	Units
Flow	L/min
Vol	mL
CO2	mmHg, kPa, %
O2	%
AA	%
Hal	%
Des	%
Sev	%
Enf	%
Iso	%

3.8 HuL Leon (for Passport M series)

3.8.1 Output Signals - Parameters

Monitor output: parameters from Hul Leon anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
O_2%	%	Oxygen concentration	Yes
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	Yes
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes
Pplat	cmH2O, hPa, mbar	Plateau pressure	Yes
Pmean	cmH2O, hPa, mbar	Mean pressure	Yes
TVe	ml	Expiratory tidal volume	Yes
TVi	ml	Inspired tidal volume	Yes
MV	L/min	Minute volume	Yes
ftotal	bpm	Total respiratory rate	Yes
fspn	bpm	Spontaneous respiratory rate	Yes
Compl	ml/cmH2O,ml/hPa,ml/mbar	Compliance	Yes
RAW	cmH2O/L/s,hPa/L/s,mbar/L/s	Airway resistance	Yes
$EtCO_2$	%,kPa,mmHg	End-tidal carbon dioxide	Yes
$FiCO_2$	%,kPa,mmHg	Fraction of inspired carbon dioxide	Yes
FiO_2	%,kPa,mmHg	Fractional concentration of O_2 in inspired gas	Yes
EtO_2	%,kPa,mmHg	End-tidal O_2	Yes
FiN_2O	%	Inspired anesthetic agent	Yes
FiIso	%		
FiDes	%		
FiEnf	%		
FiSev	%		
FiHal	%		

Monitor output: parameters from Hul Leon anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
EtN_2O	%	End-tidal anesthetic agent	Yes
EtEnf	%		
EtDes	%		
EtIso	%		
EtSev	%		
EtHal	%		
MAC	\	Minimum alveolar concentration	Yes
FiO2%	%	Fractional concentration of O_2 in inspired gas	Yes
EtO2%	%	End-tidal O_2	Yes
EtCO2%	%	End-tidal carbon dioxide	Yes
FiCO2%	%	Fraction of inspired carbon dioxide	Yes
FiAA	%	Inspired anesthetic agent	Yes
FiAA_2nd	%	2nd Insp. Agent	Yes
EtAA	%	End-tidal anesthetic agent	Yes
EtAA_2nd	%	2nd Exp. Agent	Yes
Setting Parameters			
TV	ml	Tidal volume	No
TVi	ml	Inspired tidal volume	No
f	bpm	Breath rate	No
I:E	\	Inspiratory time:Expiratory time ratio	No
Insp Flow	L/min	Inspiration flow	No
Tinsp	sec	Time of inspiration	No
Pinsp	cmH2O, hPa, mbar	Pressure control level of inspiration	No
F-Trig	L/min	Inspiratory trigger level (flow trigger)	No

Monitor output: parameters from Hul Leon anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
Pmax	cmH2O, hPa, mbar	Maximal breathing pressure	No
Tpause	%	Pause Time%	No
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	No

3.8.2 Output Signals - Alarms

Monitor output: alarms from HuL Leon anesthesia machine		
Mindray Patient Monitor		**HuL Leon Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	Apnea	Apnea: Backup Breath was triggered /Apnea
High	CO_2 Apnea	Apnea CO2
High	High Paw Sustained	Patient pressure continuously too high
High	Paw High	Ppeak high
Medium	$EtCO_2$ High	Expiratory CO2 high
Medium	$EtCO_2$ Low	Expiratory CO2 low
Medium	FiEnf High	ENF insp. too high
Medium	$FiCO_2$ High	Inspiratory CO2 high
Medium	FiDes High	DES insp. too high
Medium	FiDes Low	DES insp. too low
Medium	FiEnf High	ENF insp. too low
Medium	FiHal High	HAL insp. too high
Medium	FiHal Low	HAL insp. too low
Medium	FiIso High	ISO insp. too high
Medium	FiIso Low	ISO insp. too low
Medium	FiO_2 High	Inspiratory O2 high
Medium	FiO_2 Low	Inspiratory O2 low
Medium	FiSev High	SEVO insp. too high

Monitor output: alarms from HuL Leon anesthesia machine		
Mindray Patient Monitor		**HuL Leon Alarm**
Priority	**Label**	**Label**
Medium	FiSev Low	SEVO insp. too low
Medium	MV High	MV high
Medium	MV Low	MV low
Medium	PRESS EXP High	No release of pressure during expiration
Medium	RR Low	FreqCO2 low
Medium	RR High	FreqCO2 high
Medium	TVe Low	Vte low
Low	PRESSURE LIM	PMax setting reached too early
Technical alarms		
High	Circuit Occluded	Gasmeasurement Occlusion (Artema AION)
High	Drive Gas Pressure Low	1. No driving gas. Mechanical ventilation stopped. Only Man/Spont possible. 2. Freshgas shortage
High	No Fresh Gas	O2 and Air supply failed. Dosing fresh gas stopped
High	O_2 Supply Failure	1. O2 cell fresh gas failed. Please change. Fresh gas is 100% O2 2.Deviation O2 Concentration fresh gas. Fresh gas is 100% O2 3.O2 cell of fresh gas not calibrated. Fresh gas is 100% O2
High	VENT DISC	Patient module unlocked. Ventilation stopped /Disconnection
High	High Technical Alarm	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: Battery empty. Mechanical ventilation stopped. Only Man/Spont possib Battery empty. Supply voltage Low Calib. needed: Remove O_2-Cell short-time. Checksum Error

Monitor output: alarms from HuL Leon anesthesia machine		
Mindray Patient Monitor		**HuL Leon Alarm**
Priority	**Label**	**Label**
High	High Technical Alarm	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: Checksum Fail PIC Conductor CFB Timeout Checksum Fail PIC Monitor CO_2 absorber removed. Circle system short-circuited Communication Fail CFB Communication Fail Conductor PIC Communication Fail Power PIC Communication Fail Monitor PIC (Busy Timeout) Communication Fail Monitor PIC (Read Timeout) Communication Fail Monitor PIC (Write Timeout) Controllerboard EEPROM checksum failed Controllerboard EEPROM not write protected Driving gas blender failed. Encoder without function Ext. fresh gas outlet active Expiratory flow measurement failed. No expiratory volume measurement. Failsafe Failure O_2 Measurement. Please calibrate O_2 Cell FiO_2 Cell badly calibrated Flowsensor contaminated. No measurement of expiratory flow. Flowsensor contaminated. No measurement of inspiratory flow. Flowsensor disconnected. No volume measurement. Fresh gas blender failed (flow High). Turn on emergency dosing Fresh gas blender failed (flow Low). Turn on emergency dosing!

Monitor output: alarms from HuL Leon anesthesia machine		
Mindray Patient Monitor		**HuL Leon Alarm**
Priority	**Label**	**Label**
High	High Technical Alarm	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: Fresh gas blender failed (N_2O). Turn on emergency dosing! Fresh gas blender failed (no flow measurement) Turn on emergency dosing! Fresh gas blender failed (O_2). Turn on emergency dosing! Fresh gas blender failed (valves). Fresh gas is 100% O_2 Gas Measurement failed (Artema AION) Systemtest skipped too many times Technical Failure CFB (see error log) Technical Failure NetDCU (see error log) Technical failure. Only Man/Spont possible Versions not compatible Zero flow. Flow sensor not calibrated
Medium	Patient Circuit Leak	Leak high
Medium	Medium Technical Alarm	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the following alarms: Battery almost empty Battery Check/Charge Fail Batteries deep discharged. Please calibrate Battery Fail Battery falsely connected or damaged Change Water Trap (Artema AION) Gas Measurement unreliable (Artema AION) Set pressure not reachable Set volume not reachable Broken loudspeaker. Audible alarming not possible Broken microphone. No checking of audible alarming
Low	Battery in Use	Device running on batteries

Monitor output: alarms from HuL Leon anesthesia machine		
Mindray Patient Monitor		**HuL Leon Alarm**
Priority	**Label**	**Label**
Low	NO AIR	Air supply failed, Fresh gas with 100% O2 /Air supply failed
Low	NO O_2 SUPPLY	O2 supply failed. Dosing fresh gas withair (=21% O2). /O2 supply failed /Piped O2 supply too low
Low	O_2 Sensor Unconnected	FiO2 cell failed. Please change.
Low	Low Technical Alarm	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: Air and N_2O supply failed, Fresh gas with 100% O_2 Air supply failed. Driving gas is O_2 Air supply pressure High Check external O_2 measurement CO_2 absorber removed. Circle system short-circuited Emergency dosing active Emergency dosing still active. Please turn off emergency dosing Exhalation Condition not reached Ext. fresh gas outlet active Failure during communication with VueLink Fan Fail HL7 server not available MemoryStick Fail No Primary Agent detected N_2O supply failed N_2O supply failed, Fresh gas with 100% O_2 N_2O supply from reserve O_2 ZGA supply failed. Driving gas is air Patient module open Piped N_2O supply pressure High Piped N_2O supply Low Piped O_2 supply pressure High VueLink not connected

3.9 HuL Leon Plus (for Passport M series)

3.9.1 Output Signals - Parameters

Monitor output: parameters from Hul Leon Plus anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
O_2%	%	Oxygen concentration	Yes
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	Yes
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes
Pplat	cmH2O, hPa, mbar	Plateau pressure	Yes
Pmean	cmH2O, hPa, mbar	Mean pressure	Yes
TVe	ml	Expiratory tidal volume	Yes
TVi	ml	Inspired tidal volume	Yes
MV	L/min	Minute volume	Yes
ftotal	bpm	Total respiratory rate	Yes
fspn	bpm	Spontaneous respiratory rate	Yes
Compl	ml/cmH2O,ml/hPa,ml/mbar	Compliance	Yes
RAW	cmH2O/L/s,hPa/L/s,mbar/L/s	Airway resistance	Yes
$FiCO_2$	%.kPa,mmHg	Fraction of inspired carbon dioxide	Yes
$EtCO_2$	%.kPa,mmHg	End-tidal carbon dioxide	Yes
FiO_2	%.kPa,mmHg	Fractional concentration of O_2 in inspired gas	Yes
EtO_2	%.kPa,mmHg	End-tidal O_2	Yes
FiN_2O	%	Inspired anesthetic agent	Yes
FiIso	%		
FiDes	%		
FiEnf	%		
FiSev	%		
FiHal	%		

Monitor output: parameters from Hul Leon Plus anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
EtN_2O	%	End-tidal anesthetic agent	Yes
EtEnf	%		
EtDes	%		
EtIso	%		
EtSev	%		
EtHal	%		
MAC	\	Minimum alveolar concentration	Yes
FiO2%	%	Fractional concentration of O_2 in inspired gas	Yes
EtO2%	%	End-tidal O_2	Yes
FiCO2%	%	Fraction of inspired carbon dioxide	Yes
EtCO2%	%	End-tidal carbon dioxide	Yes
FiAA	%	Inspired anesthetic agent	Yes
FiAA_2nd	%	2nd Insp. Agent	Yes
EtAA	%	End-tidal anesthetic agent	Yes
EtAA_2nd	%	2nd Exp. Agent	Yes
Setting Parameters			
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	No
TV	ml	Tidal volume	No
TVi	ml	Inspired tidal volume	No
f	bpm	Breath rate	No
Insp Flow	L/min	Inspiration flow	No
I:E	\	Inspiratory time:Expiratory time ratio	No
Tinsp	sec	Time of inspiration	No
Pinsp	cmH2O, hPa, mbar	Pressure control level of inspiration	No
Pmax	cmH2O, hPa, mbar	Maximal breathing pressure	No

Monitor output: parameters from Hul Leon Plus anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
F-Trig	L/min	Inspiratory trigger level (flow trigger)	No
Tpause	%	Pause Time%	No

3.9.2 Output Signals - Alarms

Monitor output: alarms from HuL Leon Plus anesthesia machine		
Mindray Patient Monitor		**HuL Leon Plus Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	Apnea	Apnea: Backup Breath was triggered /Apnea
High	CO_2 Apnea	Apnea CO2
High	FiO_2 Low	Inspiratory O2 low
High	Paw High	Ppeak high
High	High Paw Sustained	Patient pressure continuously too high
Medium	$EtCO_2$ High	Expiratory CO2 high
Medium	$EtCO_2$ Low	Expiratory CO2 low
Medium	$FiCO_2$ High	Inspiratory CO2 high
Medium	FiDes Low	DES insp. too low
Medium	FiDes High	DES insp. too high
Medium	FiEnf Low	ENF insp. too low
Medium	FiEnf High	ENF insp. too high
Medium	FiHal High	HAL insp. too high
Medium	FiHal Low	HAL insp. too low
Medium	FiIso High	ISO insp. too high
Medium	FiIso Low	ISO insp. too low
Medium	FiO_2 High	Inspiratory O2 high
Medium	FiSev High	SEVO insp. too high

Monitor output: alarms from HuL Leon Plus anesthesia machine		
Mindray Patient Monitor		**HuL Leon Plus Alarm**
Priority	**Label**	**Label**
Medium	FiSev Low	SEVO insp. too low
Medium	MV High	MV high
Medium	MV Low	MV low
Medium	PRESS EXP High	No release of pressure during expiration
Medium	RR Low	FreqCO2 low
Medium	RR High	FreqCO2 high
Medium	TVe Low	Vte low
Low	PRESSURE LIM	PMax setting reached too early
Technical alarms		
High	Circuit Occluded	Gasmeasurement Occlusion (Artema AION)
High	Drive Gas Pressure Low	No driving gas. Mechanical ventilation stopped.Only Man/Spont possible
High	No Fresh Gas	O2 and Air supply failed. Dosing fresh gas stopped.
High	O_2 Supply Failure	O2 cell fresh gas failed. Please change. Fresh gas is 100% O2
High	VENT DISC	Patient module unlocked. Ventilation stopped. Disconnection
High	High Technical Alarm	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: Battery empty. Mechanical ventilation stopped. Only Man/Spont possib Battery empty. Supply voltage too low Calib. needed: Remove O2-Cell short-time. CFB Timeout Checksum Error Checksum Fail PIC Conductor Checksum Fail PIC Monitor Communication Fail CFB Communication Fail Conductor PIC

Monitor output: alarms from HuL Leon Plus anesthesia machine		
Mindray Patient Monitor		**HuL Leon Plus Alarm**
Priority	**Label**	**Label**
High	High Technical Alarm	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: Communication Fail Monitor PIC (Busy Timeout) Communication Fail Monitor PIC (Read Timeout) Communication Fail Monitor PIC (Write Timeout) Communication Fail Power PIC Controllerboard EEPROM checksum failed Controllerboard EEPROM not write protected CO2 absorber removed. Circle system shortcircuited Driving gas blender failed. Encoder without function Ext. fresh gas outlet active Expiratory flow measurement failed. No expiratory volume measurement. Failsafe Failure O2 Measurement. Please calibrate O2 Cell FiO2 Cell badly calibrated Flowsensor contaminated. No measurement of expiratory flow. Flowsensor contaminated. No measurement of inspiratory flow. Flowsensor disconnected. No volume measurement. Fresh gas blender failed (flow too high). Turn on emergency dosing Fresh gas blender failed (flow too low). Turn on emergency dosing! Fresh gas blender failed (N2O). Turn on emergency dosing! Fresh gas blender failed (no flow measurement) Turn on emergency dosing! Fresh gas blender failed (O2). Turn on emergency dosing!

Monitor output: alarms from HuL Leon Plus anesthesia machine		
Mindray Patient Monitor		**HuL Leon Plus Alarm**
Priority	**Label**	**Label**
High	High Technical Alarm	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: Fresh gas blender failed (valves). Fresh gas is 100% O2 Gas Measurement failed (Artema AION) Inspiratory flow measurement failed. No inspiratory volume measurement. Mains Fail Conductor PIC Mains Fail Monitor PIC No water trap Read settings differ from written setting Security relay broken Sensor fail O2 measuremnet fresh gas. Switched to 100% O2 fresh gas flow Sensor Fail Patient Pressure System Fail Monitor Artema AION Systemtest skipped too many times Technical Failure CFB (see error log) Technical Failure NetDCU (see error log) Technical failure. Only Man/Spont possible Versions not compatible Zero flow. Flow sensor not calibrated
Medium	Patient Circuit Leak	
Medium	Medium Technical Alarm	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the following alarms: Battery almost empty Battery Check/Charge Fail Batteries deep discharged. Please calibrate Battery Fail Battery falsely connected or damaged Broken loudspeaker. Audible alarming not possible Change Water Trap (Artema AION) Gas Measurement unreliable (Artema AION)

Monitor output: alarms from HuL Leon Plus anesthesia machine		
Mindray Patient Monitor		**HuL Leon Plus Alarm**
Priority	**Label**	**Label**
Medium	Medium Technical Alarm	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the following alarms: Set pressure not reachable Set volume not reachable Broken microphone. No checking of audible alarming
Low	Battery in Use	
Low	NO AIR	
Low	NO O2 SUPPLY	
Low	O2 Sensor Unconnected	
Low	Low Technical Alarm	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: Air and N2O supply failed, Fresh gas with 100% O2 Air supply failed. Driving gas is O2 Air supply pressure too high Check external O2 measurement CO2 absorber removed. Circle system shortcircuited Emergency dosing active Emergency dosing still active. Please turn off emergency dosing Exhalation Condition not reached Ext. fresh gas outlet active Failure during communication with VueLink Fan Fail HL7 server not available MemoryStick Fail N2O supply failed N2O supply failed, Fresh gas with 100% O2 N2O supply from reserve No Primary Agent detected Patient module open

Monitor output: alarms from HuL Leon Plus anesthesia machine		
Mindray Patient Monitor		**HuL Leon Plus Alarm**
Priority	**Label**	**Label**
Low	Low Technical Alarm	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: Piped N2O supply pressure too high Piped N2O supply too low Piped O2 supply pressure too high O2 ZGA supply failed. Driving gas is air VueLink not connected

3.10 MAQUET FLOW-i

3.10.1 Output Signals - Parameters

Monitor output: parameters from MAQUET FLOW-i anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	Yes
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes
Pplat	cmH2O, hPa, mbar	Plateau pressure	Yes
Pmean	cmH2O, hPa, mbar	Mean pressure	Yes
TVi	ml	Inspired tidal volume	Yes
MVe	L/min	Expiratory minute volume	Yes
MVi	L/min	Inspiratory mimute volume	Yes
ftotal	bpm	Total respiratory rate	Yes
I:E	\	Inspiratory time:Expiratory time ratio	No
Exp Flow	L/min	Expiratory flow	No
Compl	ml/cmH2O,ml/hPa,ml/mbar	Compliance	Yes
$EtCO_2$	%,kPa,mmHg	End-tidal carbon dioxide	Yes

Monitor output: parameters from MAQUET FLOW-i anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
$FiCO_2$	%,kPa,mmHg	Fraction of inspired carbon dioxide	Yes
FiO_2	%,kPa,mmHg	Fractional concentration of O_2 in inspired gas	Yes
EtO_2	%,kPa,mmHg	End-tidal O_2	Yes
FiN_2O	%	Fraction of inspired nitrous oxide	Yes
EtN_2O	%	End-tidal N_2O	Yes
FiAA	%	Inspired anesthetic agent	Yes
EtAA	%	End-tidal anesthetic agent	Yes
FiAA 2nd	%	2nd Insp. Agent	Yes
EtAA 2nd	%	2nd Exp. Agent	Yes
MAC	\	Minimum alveolar concentration	Yes
PO_2	kPa	Oxygen supply pressure	No
PN_2O	kPa	N_2O supply pressure	No
Pair	kPa	Air supply pressure	No
Ti/Ttot	\	Duty cycle or ratio of inspiration time to total breathing cycle time (only during spontaneous breathing)	No
FiO_2%	%	Fractional concentration of O_2 in inspired gas	Yes
EtO_2%	%	End-tidal O_2	Yes
$FiCO_2$%	%	Fraction of inspired carbon dioxide	Yes
$EtCO_2$%	%	End-tidal carbon dioxide	Yes
TVe	ml	Expiratory tidal volume	Yes
Setting Parameters			
TV	ml	Tidal volume	No
MV	L/min	Minute volume	No
f	bpm	Breath rate	No

Monitor output: parameters from MAQUET FLOW-i anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
I:E	\	Inspiratory time:Expiratory time ratio	No
Tslope	sec	Time for the pressure to rise to target pressure	No
Tinsp	sec	Time of inspiration	No
PC above PEEP	cmH2O, hPa, mbar	PC above PEEP	No
PS above PEEP	cmH2O, hPa, mbar	PS above PEEP	No
P-Trig	cmH2O, hPa, mbar	Inspiratory trigger level(pressure trigger)	No
F-Trig	\	Inspiratory trigger level (flow trigger)	No
Insp Flow	L/min	Inspiratory flow	No
FG	ml/min	Fresh gas flow	No
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	No
Rise Time%	%	rise time%	No
Tpause	%	Pause Time%	No
Tinsp%	%	Time of inspiration	No
Tpause	sec	Pause Time	No

3.10.2 Output Signals - Alarms

Monitor output: alarms from MAQUET FLOW-i anesthesia machine		
Mindray Patient Monitor		**MAQUET FLOW-i Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	Apnea	Apnea
High	Paw High	Paw High
High	High Paw Sustained	High continuous pressure
High	EtO2 High	EtO2 High
High	EtO2 Low	EtO2 Low
High	FiO2 Low	FiO2 Low
Medium	MV High	MV too high
Medium	MV Low	MV too Low
Medium	PEEP High	PEEP High
Medium	PEEP Low	PEEP Low
Medium	$EtCO_2$ High	EtCO2 High
Medium	$EtCO_2$ Low	EtCO2 Low
Medium	$FiCO_2$ High	FiCO2 High
Medium	FiN_2O High	FiN2O High
Medium	EtIso High	EtISO High
Medium	EtIso Low	EtIso Low
Medium	FiIso High	FiIso High
Medium	FiIso Low	FiIso Low
Medium	EtSev High	EtSev High
Medium	EtSev Low	EtSev Low
Medium	FiSev High	FiSev High
Medium	FiSev Low	FiSev Low
Medium	EtDes High	EtDes High
Medium	EtDes Low	EtDes Low
Medium	FiDes High	FiDes High

Monitor output: alarms from MAQUET FLOW-i anesthesia machine		
Mindray Patient Monitor		**MAQUET FLOW-i Alarm**
Priority	**Label**	**Label**
Medium	FiDes Low	FiDes Low
Medium	FiO_2 High	FiO2 High
Low	RR High	frequency high
Low	RR Low	frequency low
Technical alarms		
High	Circuit Occluded	Gas sampling tube Occlusion
High	High Technical alarms	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: Mixture of Anesthesia agents Gas Supply Cross contamination of anesthesic Agents Vaporizer liquid level battery alarm patient Cassette remove patient Cassette exchange check tubing alarm
Medium	Medium Technical alarms	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the following alarms: Gas Analyzer water trap Gas Analyzer water trap missing internal communicaiton failture High continuous APL Pressure alarm Leakage alarm
Low	Battery in Use	Battery operation

3.10.3 Output Signals - Waveforms (For BeneVision N series Monitors)

Label	Units
Paw	cmH2O, mbar, hpa
Flow	L/min
Vol	mL
CO2	mmHg, kPa,%
O2	%
Des	%
Sev	%
Iso	%

3.10.4 Output Signals – Respiratory Loops (For BeneVision N series Monitors)

Label	Units
PV Loop	cmH2O/ml, hPa/ml, mbar/ml
FV Loop	L/min/ml
PF Loop	cmH2O/L/min, hPa/L/min, mbar/L/min

3.11 Mindray A9/A8/A7/A5/A4/A3

NOTE

- **Only the Benevision N Series monitor supports integration with the Mindray A9/A8/A4 anesthesia machine.**

3.11.1 Output Signals - Parameters

Monitor output: parameters from Mindray A9/A8/A7/A5/A4/A3 anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
I:E	/	Inspiratory time: Expiratory time ratio	No
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	Yes
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes
Pplat	cmH2O, hPa, mbar	Plateau pressure	Yes
Pmean	cmH2O, hPa, mbar	Mean pressure	Yes
MVe	L/min	Expiratory minute volume	Yes
TVe	ml	Expiratory tidal volume	Yes
RAW	cmH2O/L/s,hPa/L/s,mbar/L/s	Airway resistance	Yes
Compl	ml/cmH2O,ml/hPa,ml/mbar	Compliance	Yes
N_2O Flow	L/min	N_2O flow	Yes
Air Flow	L/min	Air flow	Yes
O_2 Flow	L/min	O_2 flow	Yes
$EtCO_2$	%,kPa,mmHg	End-tidal carbon dioxide	Yes
$FiCO_2$	%,kPa,mmHg	Fraction of inspired carbon dioxide	Yes
FiN_2O	%	Fraction of inspired nitrous oxide	Yes
EtN_2O	%	End-tidal N_2O	Yes

Monitor output: parameters from Mindray A9/A8/A7/A5/A4/A3 anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
EtDes	%	End-tidal anesthetic agent	Yes
EtSev	%		Yes
EtEnf	%		Yes
EtIso	%		Yes
EtHal	%		Yes
FiDes	%	Inspired anesthetic agent	Yes
FiSev	%		Yes
FiEnf	%		Yes
FiIso	%		Yes
FiHal	%		Yes
FiAA	%	Inspired anesthetic agent	Yes
EtAA	%	End-tidal anesthetic agent	Yes
MAC	\	Minimum alveolar concentration	Yes
BIS	\	Bispectral index	Yes
SQI	%	Signal quality index	Yes
SR	%	Suppression ratio	Yes
EMG	dB	Electromyograph	Yes
SEF	Hz	Spectral edge frequency	Yes
TP	dB	Total power	Yes
BC	/min	Burst count	Yes
HALLev	ml	Anesthetic agent consupmtion	No
ENFLev	ml		
ISOLev	ml		
DESLev	ml		
SEVLev	ml		
ftotal	bpm	Total breath rate	Yes
FiO_2	%,kPa,mmHg	Fractional concentration of O_2 in inspired gas	Yes

Monitor output: parameters from Mindray A9/A8/A7/A5/A4/A3 anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
EtO2	%,kPa,mmHg	End-tidal O_2	
FiO2%	%	Fractional concentration of O_2 in inspired gas	Yes
EtO2%	%	End-tidal O_2	Yes
MV Leak	L/min	Difference between the inspiratory and expiratory minute volume	No
Hal Speed	ml/h	Anesthetic agent consumption speed	No
Enf Speed			No
Iso Speed			No
Sev Speed			No
Des Speed			No
TOF Ratio	%	Train-of-four ratio	Yes
TOF Count	%	Train-of-four count	Yes
DBS Ratio	%	DBS Ratio	Yes
DBS Count	\	DBS Count	Yes
ST Ratio	%	ST Ratio	Yes
ST Count	\	ST Count	Yes
PTC	\	post tetanic count	Yes
T1	%	Size of twitch 1 in %	Yes
BIS L	\	Bispectral index of left brain	Yes
BIS R	\	Bispectral index of right brain	Yes
SBIS L	\	BIS variability index of the left brain	Yes
SBIS R	\	BIS variability index of the right brain	Yes
SQI L	%	Signal quality index of left brain	Yes
SQI R	%	Signal quality index of right brain	Yes
EMG L	dB	Electromyograph of left brain	Yes
EMG R	dB	Electromyograph of right brain	Yes

Monitor output: parameters from Mindray A9/A8/A7/A5/A4/A3 anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
SEMG L	dB	EMG variability index of the left brain	Yes
SEMG R	dB	EMG variability index of the right brain	Yes
SR L	%	Suppression ratio of left brain	Yes
SR R	%	Suppression ratio of right brain	Yes
SEF L	Hz	spectral edge frequency of left brain	Yes
SEF R	Hz	spectral edge frequency of right brain	Yes
TP L	dB	Total power of left brain	Yes
TP R	dB	Total power of right brain	Yes
BC L	/min	Burst count of left brain	Yes
BC R	/min	Burst count of right brain	Yes
ASYM	%	Asymmetry	Yes
Step	/	Step	No
△Vt	ml	△Vt	No
Total Flow(Aux)	L/min	Total Flow(Aux)	No
O2%(Aux)	%	O2%(Aux)	No
Total Flow(HFNC)	L/min	Total Flow(HFNC)	No
O2%(HFNC)	%	O2%(HFNC)	No
PtpI	CmH2O,hPa,mbar	PtpI	No
PtpE	CmH2O,hPa,mbar	PtpE	No
PesI	CmH2O,hPa,mbar	PesI	No
PesE	CmH2O,hPa,mbar	PesE	No
△Ptp	CmH2O,hPa,mbar	△Ptp	No
△Pes	CmH2O,hPa,mbar	△Pes	No
RRCO2	bpm	awRR	Yes

Monitor output: parameters from Mindray A9/A8/A7/A5/A4/A3 anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
Setting Parameters			
F-Trig	L/min	Inspiratory trigger level (flow trigger)	No
TV	ml	Tidal volume	No
f	bpm	Breath rate	No
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	No
Plimit	cmH2O, hPa, mbar	Pressure limit level	No
Pinsp	cmH2O, hPa, mbar	Pressure control level of inspiration	No
△Psupp	cmH2O, hPa, mbar	Pressure support level	No
Tinsp	sec	Time of inspiration	No
Tslope	sec	Time for the pressure to rise to target pressure	No
FreqMin	bpm	Minimum breath frequency	No
TIP:TI	%	Percentage of inspiratory plateau time in inspiratory time	No
P-Trig	cmH2O, hPa, mbar	Inspiratory trigger level(pressure trigger)	No
I:E	/	Inspiratory time:Expiratory time ratio	No
Exp%	%	Inspiration termination level	No
Trigger Window	%	Trigger Window	No
fsimv	bpm	Frequency of SIMV	No
Phigh	cmH2O,hPa,mbar	Upper pressure level	No
Plow	cmH2O,hPa,mbar	Lower pressure level	No
Thigh	sec	Time for the upper pressure level	No
Tlow	sec	Time for the lower pressure level	No
△Papnea	cmH2O,hPa,mbar	Apnea pressure	No
VtG	ml	VtG	No

Monitor output: parameters from Mindray A9/A8/A7/A5/A4/A3 anesthesia machine			
Labels	**Units**	**Description**	**Trend, record, print**
Apnea Ti	sec	Apnea inspiration time	No
O2 Flow	L/min	O_2 flow	No
N2O Flow	L/min	N_2O flow	No
AIR Flow	L/min	Air flow	No
Apnea I:E	/	Apnea Inspiratory time: Apnea Expiratory time ratio	No
RM DeltaP	L/min	RM △P	No
Breaths	/	Breaths	No
Pressure Hold	cmH2O,hPa,mbar	Pressure Hold	No
Hold Time	sec	Hold Time	No
PEEP upon exit	cmH2O,hPa,mbar	PEEP upon exit	No
MinFlow	L/min	MinFlow	No
FiO2%	%	Fractional concentration of O_2 in inspired gas	No
MV	L/min	Minute volume	No
FiIso	%	Inspired anesthetic agent	No
FiDes	%	Inspired anesthetic agent	No
FiSev	%	Inspired anesthetic agent	No
EtIso	%	End-tidal anesthetic agent	No
EtDes	%	End-tidal anesthetic agent	No
EtSev	%	End-tidal anesthetic agent	No
PC above PEEP	cmH2O, hPa,mbar	△ Pinsp	No
△ Pinsp	cmH2O, hPa, mbar	△ Pinsp	No

3.11.2 Output Signals - Alarms

Monitor output: alarms from Mindray A9/A8/A7/A5/A4/A3 anesthesia machine		
Mindray Patient Monitor		**Mindray A9/A8/A7/A5/A4/A3 Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	Apnea	Apnea Alarm
High	Volume Apnea>2min	Volume Apnea>2min
High	Paw High	Paw Too High
High	Paw Low	Paw Too Low
High	FiO_2 Low	FiO2 Too Low
High	EtO2 High	EtO2 Too High
High	EtO2 Low	EtO2 Too Low
High	High Paw Sustained	Sustained Airway Pressure too High
High	CO2 Apnea	Apnea CO2
Medium	MV High	MV Too High
Medium	MV Low	MV Too Low
Medium	BIS High	BIS Too High
Medium	BIS Low	BIS Too Low
Medium	BIS L High	BIS Too High
Medium	BIS L Low	BIS Too Low
Medium	BIS R High	BIS Too High
Medium	BIS R Low	BIS Too Low
Medium	$EtCO_2$ High	EtCO2 Too High
Medium	$EtCO_2$ Low	EtCO2 Too Low
Medium	$FiCO_2$ High	FiCO2 Too High
Medium	EtN_2O Low	EtN2O Too Low
Medium	EtN_2O High	EtN2O Too High
Medium	FiN_2O Low	FiN2O Too Low
Medium	FiN_2O High	FiN2O Too High
Medium	EtHal Low	EtHal Too Low

Monitor output: alarms from Mindray A9/A8/A7/A5/A4/A3 anesthesia machine		
Mindray Patient Monitor		**Mindray A9/A8/A7/A5/A4/A3 Alarm**
Priority	**Label**	**Label**
Medium	EtHal High	EtHal Too High
Medium	FiHal Low	FiHal Too Low
Medium	FiHal High	FiHal Too High
Medium	EtEnf Low	EtEnf Too Low
Medium	EtEnf High	EtEnf Too High
Medium	FiEnf Low	FiEnf Too Low
Medium	FiEnf High	FiEnf Too High
Medium	EtIso Low	EtIso Too Low
Medium	EtIso High	EtIso Too High
Medium	FiIso Low	FiIso Too Low
Medium	FiIso High	FiIso Too High
Medium	EtSev Low	EtSev Too Low
Medium	EtSev High	EtSev Too High
Medium	FiSev Low	FiSev Too Low
Medium	FiSev High	FiSev Too High
Medium	EtDes Low	EtDes Too Low
Medium	EtDes High	EtDes Too High
Medium	FiDes Low	FiDes Too Low
Medium	FiDes High	FiDes Too High
Medium	FiO_2 High	FiO2 Too High
Medium	$FiCO_2$ Low	FiCO2 Too Low
Low	Pressure limiting	Pressure Limiting
Technical alarms		
High	Drive Gas Pressure Low	Drive Gas Pressure Low
High	No Fresh Gas	No Fresh Gas
High	O_2 Supply Failure	O2 Supply Failure

Monitor output: alarms from Mindray A9/A8/A7/A5/A4/A3 anesthesia machine		
Mindray Patient Monitor		**Mindray A9/A8/A7/A5/A4/A3 Alarm**
Priority	**Label**	**Label**
High	High Technical alarms	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: Negative Pressure Check Flow Sensors O_2-N_2O Ratio Error Flowmeter Comm Stop Aux Control Module Comm Stop Power System Comm Stop System DOWN for battery depletion!Power Board High Temp Breathing Circuit Not MountedFlowmeter Cal. Data Error 01/02 Flowmeter Hardware Malfunction 01/02/03/04/05/06/07 Ventilator Hardware Malfunction 01/02/03/04/05/06/07/08/09/10/11/12 Aux Control Module Comm Error Power Supply Voltage Error Low Battery Voltage! Backup Flow Control Deployment Failure Flowmeter Comm ErrorAuxi Ctrl Module Hardware Error 01/02/03/04/05 Ventilator Comm Error Ventilator Selftest Error Power System Comm Error Keyboard Init Error RT Clock Need Reset RT Clock Not Exist Mechanical Ventilation Failure Paw < -10cmH2O Device Fault, Ventilate Manually

Monitor output: alarms from Mindray A9/A8/A7/A5/A4/A3 anesthesia machine		
Mindray Patient Monitor		**Mindray A9/A8/A7/A5/A4/A3 Alarm**
Priority	**Label**	**Label**
High	High Technical alarms	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: Incompatible AG Software Version BIS Module Error BISx Error Incompatible CO2 Software Version CO2 Module Error O2 Module Error Volume Exchanger not MountedVaporizer Dock FailureAuto/Manual Switching Failure Iso Vaporizer Lock Device Failure Sev Vaporizer Lock Device Failure Des Vaporizer Lock Device Failure Tube Disconnected? Battery Failure NMT Comm Abnormal NMT Comm Stop NMT Comm Error NMT Initialization Error NMT Self Test Error NMT Power Failure NMT Module Error Des Vaporizer Output Abnormal Sev Vaporizer Output Abnormal Iso Vaporizer Failure Sev Vaporizer Failure Des Vaporizer Failure Des Vaporizer Selftest Error Sev Vaporizer Selftest Error Iso Vaporizer Selftest Error Des Vaporizer Comm Stop Sev Vaporizer Comm Stop Iso Vaporizer Comm Stop Iso Vaporizer Output Abnormal

Monitor output: alarms from Mindray A9/A8/A7/A5/A4/A3 anesthesia machine		
Mindray Patient Monitor		**Mindray A9/A8/A7/A5/A4/A3 Alarm**
Priority	**Label**	**Label**
High	High Technical alarms	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: Vaporizer Dock Failure Auto Ventilation is Non-Functional Status Screen Comm Stop Aux O2/AIR Comm Stop HFNC Module Comm Stop O2 Supply Failure, Des Vaporizer Stopped O2 Supply Failure, Sev Vaporizer Stopped O2 Supply Failure, Iso Vaporizer Stopped Aux Control Module Voltage Error
Medium	Patient Circuit Leak	Patient Circuit Leak
Medium	Medium Technical alarms	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the following alarms: PEEP Valve Failure Insp Valve Failure ACGO 3-way Valve Failure Replace O_2 Sensor Battery Undetected IP Address Conflict Pressure Monitoring Channel Failure Ventilator Comm Stop CO2 Canister Not MountedElectronic Flow Control Error Backup Flow Control Retraction Failure Air Supply Failure N2O not detected Backup Flow Control Valves Open Total Flow Sensor Self Test Time Backup Flow Control Error PEEP Safety Valve Failure Insp Reverse Flow Exp Reverse Flow

Monitor output: alarms from Mindray A9/A8/A7/A5/A4/A3 anesthesia machine		
Mindray Patient Monitor		**Mindray A9/A8/A7/A5/A4/A3 Alarm**
Priority	**Label**	**Label**
Medium	Medium Technical alarms	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the following alarms: Out ACGO On TVe Below Control Range Key Error O_2 Flush Failure Auto Ventilation is Non-Functional - Leak Test Failed Esophageal Pressure Sensor Failure Des Vaporizer Almost Empty Iso Vaporizer Almost Empty Sev Vaporizer Almost Empty Des Vaporizer Liquid Level Sensor Failure Iso Vaporizer Liquid Level Sensor Failure Sev Vaporizer Liquid Level Sensor Failure Aux O2/AIR Failure Aux O2/AIR Selftest Error HFNC Module Failure HFNC Selftest Error Manual Only Manual Only - Leak Test Failed AGSS Failure

Monitor output: alarms from Mindray A9/A8/A7/A5/A4/A3 anesthesia machine		
Mindray Patient Monitor		**Mindray A9/A8/A7/A5/A4/A3 Alarm**
Priority	**Label**	**Label**
Medium	AG Module Abnormal	If the monitor shows the alarm [**AG Module Abnormal**], the external device may have the following alarms: AG Hardware Error O_2 Sensor Error External AG Self Test Error AG Hardware Malfunction AG Init Error AG No Watertrap AG Watertrap Type Wrong AG Change Watertrap AG Comm Stop AG Airway Occluded AG Comm Error AG Data Limit Error AG Zero Failed AG Cal. Failed AG Accuracy Error O_2/N_2O/CO_2/Enf/Iso/Sev/Hal/Des Accuracy Unspecified Mixed anesthetic gas and MAC < 3 Mixed anesthetic gas and MAC >=3 $EtCO_2$/$FiCO_2$/EtN_2O/FiN_2O/EtHal/FiHal/EtEnf/FiEnf/EtIso/FiIso/EtSev/FiSev/EtDes/FiDes/EtO_2/FiO_2 Over Range Internal AG Error 01 02 03 04 05 06 07 08 09 10 11 12

Monitor output: alarms from Mindray A9/A8/A7/A5/A4/A3 anesthesia machine		
Mindray Patient Monitor		**Mindray A9/A8/A7/A5/A4/A3 Alarm**
Priority	**Label**	**Label**
Medium	BIS Module abnormal	If the monitor shows the alarm [**BIS Module Abnormal**], the external device may have the following alarms: BIS Init Error BISx Disconnected BIS Comm Error BIS Over Range BIS High Imped. BIS Sensor Off BIS DSC Error BIS DSC Malf BIS No Cable BIS No Sensor BIS Wrong Sensor Type BIS SQI<50% BIS SQI<15% BIS Sensor Expired BIS Sensor Fault BIS Sensor Too Many Uses Disconnect/Reconnect BIS BIS Self Test Error BIS L Over Range BIS R Over Range BIS SQI L<15% BIS SQI L<50% BIS SQI R<15% BIS SQI R<50%
Low	Battery in Use	Battery in Use
Low	O_2 Sensor Unconnected	O2 Sensor Disconnected

Monitor output: alarms from Mindray A9/A8/A7/A5/A4/A3 anesthesia machine		
Mindray Patient Monitor		**Mindray A9/A8/A7/A5/A4/A3 Alarm**
Priority	**Label**	**Label**
Low	Low Technical alarms	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: Flow Sensor Failure Pinsp Not Achieved TV Not Achieved Calibrate O_2 Sensor Heating Module Failure Auto Vent UNUSEBIS Electrode Unconnected BIS Electrode 1/2/3/4 Lead Off BIS Electrode 1/2/3/4 High Imped. N2O Flow High O2 Flow High Air Flow High Flowmeter zero cal errACGO Not found Branch Flow Not Achieved Balance Gas Branch Flow Not Achieved Backup Flow Control is enabled Flowmeter Comm Stop Calibrate Flow Sensor Calibrate PEEP Valve TV Comp Disabled TVe > TVi N2O Sensor Error O2 Sensor Error Air Sensor Error 3-way Valve Failure Sensor Zero Failed TV Delivery High Flowmeter Zero Failed Ventilator Init Error

Monitor output: alarms from Mindray A9/A8/A7/A5/A4/A3 anesthesia machine		
Mindray Patient Monitor		**Mindray A9/A8/A7/A5/A4/A3 Alarm**
Priority	**Label**	**Label**
Low	Low Technical alarms	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: BIS Electrode G High BIS Electrode G Lead Off BIS Electrode C High BIS Electrode C Lead Off BIS Electrode LE High BIS Electrode LE Lead Off BIS Electrode LT High BIS Electrode LT Lead Off BIS Electrode RE High BIS Electrode RE Lead Off BIS Electrode RT High BIS Electrode RT Lead Off BIS Signal Quality Too Low BIS Low Signal Quality BIS L Signal Quality Too Low BIS L Low Signal Quality BIS R Signal Quality Too Low BIS R Low Signal Quality BIS Electrode Poor Contact BIS Electrode 1 Poor Contact BIS Electrode 2 Poor Contact BIS Electrode 3 Poor Contact BIS Electrode 4 Poor Contact BIS Electrode G Poor Contact BIS Electrode C Poor Contact BIS Electrode LE Poor Contact BIS Electrode LT Poor Contact BIS Electrode RE Poor Contact BIS Electrode RT Poor Contact

Monitor output: alarms from Mindray A9/A8/A7/A5/A4/A3 anesthesia machine		
Mindray Patient Monitor		**Mindray A9/A8/A7/A5/A4/A3 Alarm**
Priority	**Label**	**Label**
Low	Low Technical alarms	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: CO2 Change Watertrap Calibrate Esophageal Pressure Sensor AMV: Cannot Meet Target Calibrate Flow Sensor and Insp Valve Calibrate Pressure Sensor and PEEP Valve awRR Over Range NMT No Main Cable NMT No Sensor NMT Stimulation Electrode Off NMT Sensor Comm Error NMT Stimulation Current Over Limit ST-Ratio Overrange TOF-Ratio Overrange DBS-Ratio Overrange NMT Sensor Error Des Vaporizer Liquid Level Low Sev Vaporizer Liquid Level Low Iso Vaporizer Liquid Level Low Calibrate Aux O2/AIR Module Calibrate HFNC Module AGSS Scavenging Flow is Too High EtO2 Over Range FiO2 Over Range

3.11.3 Output Signals - Waveforms (For BeneVision N series Monitors)

Label	Units
Paw	cmH2O, mbar, hpa
Flow	L/min
Vol	mL
CO2	mmHg, kPa,%
O2	%
N2O	%
AA	%
Hal	%
Des	%
Sev	%
Enf	%
Iso	%

4 Integrating the Ventilator

4.1 AirLiquide ALMS Monnal T75 (for Passport M series)

4.1.1 Output Signals - Parameters

Monitor output: parameters from AirLiquide ALMS Monnal T75 ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	Yes
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes
Pplat	cmH2O, hPa, mbar	Plateau pressure	Yes
Pmean	cmH2O, hPa, mbar	Mean pressure	Yes
TVe	ml	Expiratory tidal volume	Yes
TVi	ml	Inspiratory tidal volume	Yes
MVe	L/min	Expiratory minute volume	Yes
ftotal	/min	Total respiratory rate	Yes
FiO_2	%,kPa,mmHg	Fractional concentration of O_2 in inspired gas	Yes
FiO2%	%	Fractional concentration of O_2 in inspired gas	Yes
$EtCO_2$	%,kPa,mmHg	End-tidal carbon dioxide	Yes
Setting Parameters			
TV	ml	Tidal volume	No
f	/min	Breath rate	No
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	No
I:E	\	Inspiratory time:Expiratory time ratio	No
△Psupp	cmH2O, hPa, mbar	Pressure support level	No
Tinsp	sec	Time of inspiration	No

4.1.2 Output Signals - Alarms

Monitor output: alarms from AirLiquide ALMS Monnal T75 ventilator		
Mindray Patient Monitor		**AirLiquide ALMS Monnal T75 Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	Apnea Ventilation	Apnea ventilation
High	TV Not Achieved	VT not reached
High	CO_2 Apnea	CO2 apnea
High	Apnea	Apnea
High	FiO_2 High	High FiO2
High	FiO_2 Low	Low FiO2
High	FiO2 Alarm	100% FiO2 during 2 min
High	MV High	High MVe
High	MV Low	Low MVe
High	Paw High	High pressure
High	Ppeak High	High Ppeak
High	Ppeak Low	Patient demand higher than set peak flow
Medium	$EtCO_2$ High	High etCO2
Medium	$EtCO_2$ Low	Low etCO2
Medium	$FiCO_2$ High	High FiCO2
Medium	PEEPe High	PEEP greater than set PEEP + 5 cmH2O
Medium	RR High	High RR
Medium	RR Low	Low RR
Medium	TVe High	High VTe
Medium	TVe Low	Low VTe
Low	Plimit Reached	Pl limit reached
Technical alarms		
High	Airway Obstructed?	Expiration blocked

Monitor output: alarms from AirLiquide ALMS Monnal T75 ventilator		
Mindray Patient Monitor		**AirLiquide ALMS Monnal T75 Alarm**
Priority	**Label**	**Label**
High	Check Flow Sensors	Expiratory flow sensor failure Inspiratory flow sensor failure
High	O_2 Supply Pressure Low	O2 supply failure
High	Patient Disconnected	Patient disconnection
High	High Technical Alarm	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: Internal battery low O_2 sensor failure Restart self-tests Technical failure detected Ventilator inoperative Minor failure detected Adjust ventilation parameters Nurse Call Internal battery failure Air supply failure N2O supply failure Xe supply failure N2O sensor failure Xe sensor failure AA sensor failure Gas analyzer failure Hypoxic mix PS limit reached Slow Inflation in progress Sustained exhalation in progress Maximum FiO2 during 2 min
High	High Technical Alarm	O2 flush in progress O2 monitoring disabled Expiratory monitoring disabled High AA Low AA Low FiCO2

Monitor output: alarms from AirLiquide ALMS Monnal T75 ventilator		
Mindray Patient Monitor		**AirLiquide ALMS Monnal T75 Alarm**
Priority	**Label**	**Label**
Medium	Medium Technical Alarm	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the following alarms: Internal battery discharged
Low	Airway Leak?	Important leak
Low	Battery in Use	Ventilator operates from external battery Ventilator operates from internal battery
Low	Low Technical Alarm	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: Maintenance required CO2 sensor failure

4.2 Carefusion Avea(VOXP) (for BeneVision N Series Patient Monitors)

4.2.1 Output Signals - Parameters

Monitor output: parameters from Carefusion Avea ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
C20/C	\	Compliance Ratio	Yes
Cdyn	ml/cmH2O,ml/hPa,ml/mbar	Dynamic compliance	Yes
Cstat	ml/cmH2O,ml/hPa,ml/mbar	Static compliance	Yes
O2%	%	Oxygen concentration	Yes
I:E	\	Inspiratory time: Expiratory time ratio	Yes
Leak Comp	%	Leak compensation	No

Monitor output: parameters from Carefusion Avea ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	Yes
Exp.Flow	L/min	Expiratory flow	No
Insp Flow	L/min	Inspiratory flow	No
Pmean	cmH2O, hPa, mbar	Mean pressure	Yes
PO2	kPa	Oxygen supply pressure	No
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes
Pplat	cmH2O, hPa, mbar	Plateau pressure	Yes
ftotal	/min	Total breath rate	Yes
fspn	/min	Spontaneous respiratory rate	Yes
Vdel	ml	Total volume of gas delivered	No
MVspn	L/min	Spontaneous breathed minute volume	Yes
WOB	J/L	Work of breathing	Yes
TVi	ml	Inspired tidal volume	Yes
TVe spn	ml	Spontaneous expiratory tidal volume	Yes
TVe/IBW	ml/kg	TVe/IBW	Yes
TVe Mand	ml	Mandatory Expiratory tidal volume	No
TVe	ml	Expiratory tidal volume	Yes
MVe	L/min	Expiratory minute volume	Yes
Tinsp	sec	Time of inspiration	Yes
Texp	sec	Expiratory time	Yes
Ri	cmH2O/L/s,hPa/L/s,mbar/L/s	Inspiratory resistance	Yes
RSBI	1/(min.L)	Rapid shallow breathing index	Yes
Pair	kPa	Air supply pressure	No
P0.1	cmH2O, hPa, mbar	100 ms occlusion pressure	No
PEEPi	cmH2O, hPa, mbar	Intrinsic positive end-expiratory pressure	Yes

Monitor output: parameters from Carefusion Avea ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
PEEPe	cmH2O, hPa, mbar	Extrinsic positive end-expiratory pressure	No
Re	cmH2O/L/s,hPa/L/s,mbar/L/s	Expiratory resistance	Yes
fmand	/min	Mandatory breathing frequency	Yes
NIF	cmH2O, hPa, mbar	Negative inspiratory force	No
Setting Parameters			
O2%	%	Fractional concentration of O2 in inspired gas	No
Base Flow	L/min	Base Flow	No
Exp%	%	Inspiration termination level	No
Peak Flow	L/min	Peak flow	No
Tpause	sec	Pause Time	No
Phigh	cmH2O, hPa, mbar	Upper pressure level	No
Plow	cmH2O, hPa, mbar	Lower pressure level	No
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	No
△Psupp	cmH2O, hPa, mbar	Pressure support level	No
f	/min	Breath rate	No
Tslope	sec	Rise time	No
Tinsp	sec	Time of inspiration	No
Tlow	sec	Time for the lower pressure level	No
F-Trig	L/min	Inspiratory trigger level (flow trigger)	No
P-Trig	cmH2O, hPa, mbar	Inspiratory trigger level (pressure trigger)	No
TV	ml	Tidal volume	No
Pinsp	cmH2O, hPa, mbar	Pressure control level of inspiration	No
Thigh	sec	Time for the upper pressure level	No
Ti Max	sec	Maximum inspiration time	No

4.2.2 Output Signals - Alarms

Monitor output: alarms from Carefusion Avea ventilator		
Mindray Patient Monitor		**Carefusion Avea Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	Ppeak High	HIGH Ppeak
High	PEEP Low	LOW PEEP
High	MV Low	LOW Ve
High	MV High	HIGH Ve
High	FiO2 Low	LOW FiO2
High	FiO2 High	HIGH FiO2
High	Ppeak Low	LOW Ppeak
Medium	RR High	HIGH RATE
Medium	TVe Low	LOW Vte
Medium	TVe High	HIGH Vte
Technical alarms		
High	High Technical alarms	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: Vent Inop Loss of Gas Circuit Disconnect Ext High Ppeak Safety Valve CIRCUIT OCCLUSION Apnea Interval Loss of O2 Loss of Air Loss of Heliox Low Battery Loss of A/C ILV Disconnect

Monitor output: alarms from Carefusion Avea ventilator		
Mindray Patient Monitor		**Carefusion Avea Alarm**
Priority	**Label**	**Label**
Medium	Medium Technical alarms	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the following alarms: Invalid Gas ID Fan Failure
Low	Low Technical alarms	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: Insp Time Limit I:E Limit Volume Limit

4.2.3 Output Signals - Waveforms (For BeneVision N series Monitors)

Label	Units
Paw	cmH2O, mbar, hpa
Flow	L/min
Vol	mL

4.3 Carefusion Vela

4.3.1 Output Signals - Parameters

Monitor output: parameters from Carefusion Vela ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	Yes
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes
Pmean	cmH2O, hPa, mbar	Mean pressure	Yes
TVe	ml	Expiratory tidal volume	Yes

Monitor output: parameters from Carefusion Vela ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
TVi	ml	Inspired tidal volume	Yes
TVe spn	ml	Spontaneous expiratory tidal volume	Yes
MVspn	L/min	Spontaneous breathed minute volume	Yes
MVe	L/min	Expiratory minute volume	Yes
ftotal	/min	Total breath rate	Yes
fspn	/min	Spontaneous respiratory rate	Yes
I:E	\	Inspiratory time:Expiratory time ratio	Yes
FiO2%	%	Fractional concentration of O_2 in inspired gas	Yes
FiO_2	%,kPa,mmHg	Fractional concentration of O_2 in inspired gas	Yes
Texp	sec	Expiratory time	Yes
PO_2	kPa	Oxygen supply pressure	No
$EtCO_2$	%,kPa,mmHg	End-tidal carbon dioxide	Yes
RSBI	1/(min.L)	Rapid shallow breathing index	Yes
Setting Parameters			
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	No
TV	ml	Tidal volume	No
f	/min	Breath rate	No
Base Flow	L/min	Base Flow	No
F-Trig	L/min	Inspiratory trigger level (flow trigger)	No
△Psupp	cmH2O, hPa, mbar	Pressure support level	No
Tinsp	sec	Time of inspiration	No
Pinsp	cmH2O, hPa, mbar	Pressure control level of inspiration	No
Phigh	cmH2O, hPa, mbar	Upper pressure level	No
Plow	cmH2O, hPa, mbar	Lower pressure level	No

Monitor output: parameters from Carefusion Vela ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Thigh	sec	Time for the upper pressure level	No
Tlow	sec	Time for the lower pressure level	No
Exp%	%	Inspiration termination level	No
Peak Flow	L/min	Peak flow	No
Ti max	sec	Maximum inspiration time	No
O2%	%	Oxygen concentration	No
Tpause	sec	Pause Time	No

4.3.2 Output Signals - Alarms

Monitor output: alarms from Carefusion Vela ventilator		
Mindray Patient Monitor		**Carefusion Vela Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	MV Low	Low Ve
High	Apnea	APNEA INTERVAL
High	PEEP High	HIGH PEEP
High	Ppeak High	HIGH PIP or HIGH PIP SUST
High	Ppeak Low	LOW PIP
High	FiO_2 Alarm	%O2 RANGE ERROR
Medium	$EtCO_2$ High	High EtCO2
Medium	$EtCO_2$ Low	Low EtCO2
Medium	RR High	HIGH RATE
Technical alarms		
High	O_2 cell cal. Needed	CHECK O2 CAL
High	O_2 Supply Pressure Low	O2 Inlet LOW
High	Circuit Disconnect	Circuit FAULT

Monitor output: alarms from Carefusion Vela ventilator		
Mindray Patient Monitor		**Carefusion Vela Alarm**
Priority	**Label**	**Label**
High	High Technical alarms	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: LOW BATTERY MOTOR FAULT VENT INOP H/W FAULT
Medium	Medium Technical alarms	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the following alarms: CHECK EVENTS LOW CLOCK BATTERY CO_2 COMMS ERROR CO_2 Out Of Range CO_2 Sensor Fault CO_2 Sensor Temp CO_2 Zero Reqd FAN FAILURE CO_2 Check Adapter DEFAULTS O_2 SENSOR FAILURE Invalid $EtCO_2$ O_2 INLET HIGH MED BATTERY XDCR FAULT
Low	Battery in Use	ON BATTERY POWER
Low	Low Technical alarms	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: INVALID SERIAL NUMBER NO CAL DATA

4.4 Draeger Babylog 8000 plus/Babylog 8000

4.4.1 Output Signals - Parameters

Monitor output: parameters from Draeger Babylog 8000 plus/Babylog 8000 ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
Cdyn	ml/cmH2O,ml/hPa,ml/mbar	Dynamic compliance	Yes
Rdyn	cmH2O/L/s,hPa/L/s,mbar/L/s	Dynamic lung resistance	Yes
Pmean	cmH2O, hPa, mbar	Mean pressure	Yes
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	Yes
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes
TVi	ml	Inspired tidal volume	Yes
Leak Comp	%	Leak compensation	No
MV	L/min	Minute volume	Yes
ftotal	/min	Total respiratory rate	Yes
FiO_2	%,kPa,mmHg	Fractional concentration of O_2 in inspired gas	Yes
FiO2%	%	Fractional concentration of O_2 in inspired gas	Yes
Setting Parameters			
O2%	%	Oxygen concentration	No
Tinsp	sec	Time of inspiration	No
fsimv	/min	Frequency of SIMV	No
PEEP/CPAP	cmH2O, hPa, mbar	PEEP/CPAP	No
Apnea Tinsp	sec	Apnea time	No
Pmax	cmH2O, hPa, mbar	Maximum airway pressure	No
f	/min	Breath rate	No
TV	ml	Tidal volume	No

Monitor output: parameters from Draeger Babylog 8000 plus/Babylog 8000 ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
I:E	\	Inspiratory time:Expiratory time ratio	No

4.4.2 Output Signals - Technical Alarms

Monitor output: alarms from Draeger Babylog 8000 plus/Babylog 8000 ventilator		
Mindray Patient Monitor		**Babylog 8000 plus/Babylog 8000 Alarm**
Priority	**Label**	**Label**
Medium	Medium Technical Alarm	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the following alarms: VOL ERR % O_2 ERR

4.5 Draeger Babylog VN500

4.5.1 Output Signals - Parameters

Monitor output: parameters from Draeger Babylog VN500 ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
Cdyn	ml/cmH2O,ml/hPa,ml/mbar	Dynamic compliance	Yes
Rdyn	cmH2O/L/s,hPa/L/s,mbar/L/s	Dynamic lung resistance	Yes
VCO2	ml/min	CO_2 production	No
Pmin	cmH2O, hPa, mbar	Minimum airway pressure	No
Pmean	cmH2O, hPa, mbar	Mean pressure	Yes
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	Yes
fmand	/min	Mandatory breathing frequency	Yes
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes

Monitor output: parameters from Draeger Babylog VN500 ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
TVe spn	ml	Spontaneous expiratory tidal volume	Yes
Mvleak	L/min	Leakage minute volume	Yes
Leak Comp	%	Leak compensation	No
fspn	/min	Spontaneous respiratory rate	Yes
MV	L/min	Minute volume	Yes
RSBI	1/(min.L)	Rapid shallow breathing index	Yes
ftotal	/min	Total respiratory rate	Yes
EtCO2%	%	End-tidal carbon dioxide	Yes
EtCO2	%,kPa,mmHg	End-tidal carbon dioxide	Yes
I:E	\	Inspiratory time: Expiratory time ratio	Yes
FiO2%	%	Fractional concentration of O_2 in inspired gas	Yes
FiO2	%,kPa,mmHg	Fractional concentration of O_2 in inspired gas	Yes
MVe	L/min	Expiratory minute volume	Yes
MVi	L/min	Inspiratory mimute volume	Yes
TVe	ml	Expiratory tidal volume	Yes
TVi	ml	Inspired tidal volume	Yes
TVe/IBW	ml/kg	TVe/IBW	Yes
Setting Parameters			
O2%	%	Fractional concentration of O_2 in inspired gas	Yes
Flow	L/min	Flow	No
Tinsp	sec	Time of inspiration	No
f	/min	Breath rate	No
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	No
△int.PEEP	cmH2O, hPa, mbar	Intermittent PEEP	No

Monitor output: parameters from Draeger Babylog VN500 ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Plow	cmH2O, hPa, mbar	Lower pressure level	No
Phigh	cmH2O, hPa, mbar	Upper pressure level	No
Tlow	sec	Time for the lower pressure level	No
Thigh	sec	Time for the upper pressure level	No
Apnea Tinsp	sec	Apnea Time	No
△Psupp	cmH2O, hPa, mbar	Pressure support level	No
Pmax	cmH2O, hPa, mbar	Maximal breathing pressure	No
F-Trig	L/min	Inspiratory trigger level (flow trigger)	No
Tslope	sec	Rise time	No
FlowAssist	cmH2O.s/L,hPa.s/L,mbar.s/L	Flow assist	No
Vol Assist	cmH2O/L,hPa/L,mbar/L	Volume assist	No
fapnea	/min	Breath rate for apnea ventilation	No
Pinsp	cmH2O, hPa, mbar	Pressure control level of inspiration	No
ATC	%	Automatic Tube Compensation	No
Tube ID	mm	Tube ID	No
Tdisconnect	sec	Delay time for "Airway pressure lower alarm limit"	No
Ti max	sec	Maximum inspiration time	No
Exp%	%	Inspiration termination level	No
TV	ml	Tidal volume	No
TVapnea	ml	Apnea tidal volume	No
I:E	\	Inspiratory time: Expiratory time ratio	No

4.5.2 Output Signals - Alarms

Monitor output: alarms from Draeger Babylog VN500 ventilator		
Mindray Patient Monitor		**Draeger Babylog VN500 Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	Paw High	Airway pressure high
High	Paw Low	Airway pressure low
High	MV High	MV high
High	MV Low	MV low
High	FiO_2 High	FiO2 high
High	FiO2 low	FiO2 low
High	PEEP High	PEEP high
High	PEEP Low	PEEP low
High	Apnea Ventilation	Apnea ventilation
High	Apnea	APNEA RESP
Medium	$EtCO_2$ High	etCO2 high
Medium	$EtCO_2$ Low	etCO2 low
Medium	TVe Low	Tidal volume low
Medium	RR High	High respiratory rate
Medium	VOL INCONST	VT not reached
Technical alarms		
High	Air Supply Pressure Low	Air supply down
High	O2 Supply Pressure Low	O2 supply down
High	CLEAN CO_2	Clean CO2 cuvette
High	Power Failure	Internal power supply failure
High	Check Flow Sensors	Exp Time Err
High	EXP-VALVE?	Expiratory valve malfunction
High	Negative Airway Pressure	Airway pressure negative
High	Neo Flow Sensor Error	Neo. flow sensor changed ?

Monitor output: alarms from Draeger Babylog VN500 ventilator		
Mindray Patient Monitor		**Draeger Babylog VN500 Alarm**
Priority	**Label**	**Label**
High	Circuit Disconnect	Disconnection Ventilator
High	No O2 Pressure	O2 supply down
High	Airway Obstructed?	Tube Obstruct
High	High Technical Alarms	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: CO_2 NOT CAL BATERY ERR SPEAKER FAIL VENT ERR VOL ERR AW TEMP INOP AIR PRESS HI HI O2 SUPPLY SYSTEM FAULT BATTER ERR x COOLING x CO2_NOT_CAL_X LOSS OF DATA HOSE ERR EJECTOR INOP MAP LOW O2 Err PRESS_ERR AW_TEM_SENS INT_TEMP_HI Evita Err CO2 SENSOR

Monitor output: alarms from Draeger Babylog VN500 ventilator		
Mindray Patient Monitor		**Draeger Babylog VN500 Alarm**
Priority	**Label**	**Label**
Medium	Medium Technical Alarms	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the following alarms: GAS FAILURE NO AIR AMB_PRESS BATT LOW CHECK_EVITA NEBULIZ OF VT LIMITED
Low	Battery In use	Internal battery activated
Low	Low Technical Alarms	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: CO2 ERR Plow>high limit Plow<low limit VOL CAL

4.6 Draeger Evita 2

4.6.1 Output Signals - Parameters

Monitor output: parameters from Draeger Evita 2 ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	Yes
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes
Pplat	cmH2O, hPa, mbar	Plateau pressure	Yes
Pmean	cmH2O, hPa, mbar	Mean pressure	Yes
TVe	ml	Expiratory tidal volume	Yes
MV	L/min	Minute volume	Yes

Monitor output: parameters from Draeger Evita 2 ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
MVspn	L/min	Spontaneous breathed minute volume	Yes
ftotal	/min	Total respiratory rate	Yes
fspn	/min	Spontaneous breathing frequency	Yes
FiO_2	%,kPa,mmHg	Fractional concentration of O_2 in inspired gas	Yes
Rdyn	cmH2O/L/s,hPa/L/s,mbar/L/s	Dynamic lung resistance	Yes
Cdyn	ml/cmH2O,ml/hPa,ml/mbar	Dynamic compliance	Yes
Pmin	cmH2O, hPa, mbar	Minimum airway pressure	No
Vtrap	ml	Trapped volume	No
T	ºC, ºF	Inspiratory breathing gas temperature	No
P0.1	cmH2O, hPa, mbar	100 ms occlusion pressure	No
PEEPi	cmH2O, hPa, mbar	Intrinsic positive end-expiratory pressure	Yes
$EtCO_2$	%,kPa,mmHg	End-tidal carbon dioxide	Yes
Vds	ml	Dead space	No
VCO_2	ml/min	CO_2 production	No
EtCO2%	%	End-tidal carbon dioxide	Yes
FiO2%	%	Fractional concentration of O_2 in inspired gas	Yes
Setting Parameters			
O2%	%	Oxygen concentration	No
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	No
TV		Tidal volume	No
fsimv	/min	Frequency of SIMV	No
I:E	\	Inspiratory time:Expiratory time ratio	No

Monitor output: parameters from Draeger Evita 2 ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
△int.PEEP	cmH2O, hPa, mbar	Intermittent PEEP	No
F-Trig	L/min	Inspiratory trigger level (flow trigger)	No
P-Trig	cmH2O, hPa, mbar	Inspiratory trigger level (pressure trigger)	No
Phigh	cmH2O, hPa, mbar	Upper pressure level	No
Plow	cmH2O, hPa, mbar	Lower pressure level	No
Thigh	sec	Time for the upper pressure level	No
Tlow	sec	Time for the lower pressure level	No
Pmax	cmH2O, hPa, mbar	Maximum airway pressure	No
Flow	L/min	Flow	No
Apnea Tinsp	sec	Apnea Time	No
ASB ramp	sec	ASB ramp	No
PASB	cmH2O, hPa, mbar	Assisted spontaneous breathing	No

4.6.2 Output Signals - Alarms

Monitor output: alarms from Draeger Evita 2 ventilator		
Mindray Patient Monitor		**Draeger Evita 2 Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	Paw High	PAW HIGH
High	Paw Low	PAW LOW
High	MV High	MIN VOL HIGH
High	MV Low	MIN VOL LOW
High	Apnea	APNEA EVITA
High	FiO_2 High	% O2 HIGH

Monitor output: alarms from Draeger Evita 2 ventilator		
Mindray Patient Monitor		**Draeger Evita 2 Alarm**
Priority	**Label**	**Label**
High	FiO_2 Low	% O2 LOW
High	AW-TEMP HIGH	AW-TEMP HIGH
High	PEEP High	PEEP HIGH
High	ASB>4s	ASB > 4 SEC
Medium	$EtCO_2$ High	ET CO2 HIGH
Medium	$EtCO_2$ Low	ET CO2 LOW
Medium	VOL INCONST	VOL INCONST
Medium	RR High	RESP RATE HI
Technical alarms		
High	Air Supply Pressure Low	AIR SUPPLY ?
High	Check Flow Sensors	FLOW SENSOR?
High	CLEAN CO_2	CLEAN CO2
High	EXP-VALVE?	EXP-VALVE?
High	O2 Supply Pressure Low	LO O2 SUPPLY
High	High Technical alarms	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: VOL ERR PRESS ERR AW-TEMP INOP AW-TEMP SENS CO_2 NOT CAL % O_2 ERR EVITA ERR COOLING INOP CYCLE FAILED COOLING INOP ADVISORY

Monitor output: alarms from Draeger Evita 2 ventilator		
Mindray Patient Monitor		**Draeger Evita 2 Alarm**
Priority	**Label**	**Label**
Low	Low Technical alarms	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: CO_2 ERR CO_2 SENS? MIXER INOP SYNCHRO INOP MIXER INOP ADV

4.7 Draeger Evita2 dura/Evita 4/Evita XL

4.7.1 Output Signals - Parameters

Monitor output: parameters from Draeger Evita2 dura/Evita 4/Evita XL ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	Yes
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes
Pplat	cmH2O, hPa, mbar	Plateau pressure	Yes
Pmean	cmH2O, hPa, mbar	Mean pressure	Yes
TVe	ml	Expiratory tidal volume	Yes
MV	L/min	Minute volume	Yes
MVspn	L/min	Spontaneous breathed minute volume	Yes
ftotal	/min	Total respiratory rate	Yes
fspn	/min	Spontaneous breathing frequency	Yes
FiO_2	%,kPa,mmHg	Fractional concentration of O_2 in inspired gas	Yes
Rdyn	cmH2O/L/s,hPa/L/s,mbar/L/s	Dynamic lung resistance	Yes
Cdyn	ml/cmH2O,ml/hPa,ml/mbar	Dynamic compliance	Yes
RSBI	1/(min.L)	Rapid shallow breathing index	Yes
Pmin	cmH2O, hPa, mbar	Minimum airway pressure	No
Vtrap	ml	Trapped Volume	No
T	°C, °F	Inspiratory breathing gas temperature	No
NIF	cmH2O, hPa, mbar	Negative inspiratory force	No
P0.1	cmH2O, hPa, mbar	100 ms occlusion pressure	No
PEEPi	cmH2O, hPa, mbar	Intrinsic positive end-expiratory pressure	Yes
$EtCO_2$	%,kPa,mmHg	End-tidal carbon dioxide	Yes

Monitor output: parameters from Draeger Evita2 dura/Evita 4/Evita XL ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Vds	ml	Dead space	No
VCO_2	ml/min	CO_2 production	No
PR	/min	Pulse rate	Yes
SpO_2	%	Arterial oxygen saturation from pulse oximetry	Yes
EtCO2%	%	End-tidal carbon dioxide	Yes
FiO2%	%	Fractional concentration of O_2 in inspired gas	Yes
Setting Parameters			
O_2%	%	Oxygen concentration	No
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	No
TV	ml	Tidal volume	No
f	/min	Breath rate	No
I:E	\	Inspiratory time: Expiratory time ratio	No
△int.PEEP	cmH2O, hPa, mbar	Intermittent PEEP	No
F-Trig	L/min	Inspiratory trigger level (flow trigger)	No
Phigh	cmH2O, hPa, mbar	Upper pressure level	No
Plow	cmH2O, hPa, mbar	Lower pressure level	No
Thigh	sec	Time for the upper pressure level	No
Tlow	sec	Time for the lower pressure level	No
Pmax	cmH2O, hPa, mbar	Maximum airway pressure	No
Tinsp	sec	Time of inspiration	No
Flow	L/min	Flow	No
Apnea Tinsp	sec	Apnea time	No
ASB ramp	sec	ASB ramp	No
PASB	cmH2O, hPa, mbar	Assisted spontaneous breathing	No

Monitor output: parameters from Draeger Evita2 dura/Evita 4/Evita XL ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
FlowAssist	cmH2O.s/L,hPa.s/L,mbar.s/L	Flow assist	No
Vol.Assist	cmH2O/L,hPa/L,mbar/L	Volume assist	No
Tdisconnect	sec	Delay time for "Airway pressure lower alarm limit"	No
Tube ID	mm	Tube ID	No
ATC	%	Automatic Tube Compensation	No
Pinsp	cmH2O, hPa, mbar	Pressure control level of inspiration	No
TVapnea	ml	Apnea tidal volume	No
Papnea	cmH2O, hPa, mbar	Apnea pressure	No
fapnea	/min	Breath rate for apnea ventilation	No

4.7.2 Output Signals - Alarms

Monitor output: alarms from Draeger Evita2 dura/Evita 4/Evita XL ventilator		
Mindray Patient Monitor		**Evita2 dura/Evita 4/Evita XL Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	Paw High	PAW HIGH
High	Paw Low	PAW LOW
High	MV High	MIN VOL HIGH
High	MV Low	MIN VOL LOW
High	Apnea	APNEA EVITA
High	FiO_2 High	% O2 HIGH
High	FiO_2 Low	% O2 LOW
High	AW-TEMP HIGH	AW-TEMP HI
High	PEEP High	PEEP HIGH
High	ASB>4s	ASB > 4 SEC

Monitor output: alarms from Draeger Evita2 dura/Evita 4/Evita XL ventilator		
Mindray Patient Monitor		**Evita2 dura/Evita 4/Evita XL Alarm**
Priority	**Label**	**Label**
High	No Pulse	NO SPO2 PULS
High	PR Low	SPO2 PULS LO
High	SpO_2 Low	SPO2 LOW
High	PR High	SPO2 PULS HI
High	SpO_2 High	SPO2 HIGH
Medium	TVe High	TIDVOL HI
Medium	$EtCO_2$ High	ET CO2 HIGH
Medium	$EtCO_2$ Low	ET CO2 LOW
Medium	VOL INCONST	VOL INCONST
Medium	RR High	RESP RATE HI
Low	ASB > 1.5s	ASB > 1,5 SEC
Low	PPS-TI > 1.5s	PPS-TI > 1,5S
Low	ASB > Tinsp	ASB > TINSP
Technical alarms		
High	Air Supply Pressure Low	AIR SUPPLY?
High	O_2 Supply Pressure Low	LO O2 SUPPLY
High	Airway Obstructed?	TUBE OBSTRUC
High	Check Flow Sensors	FLOW SENSOR?
High	CLEAN CO_2	CLEAN CO2
High	EXP-VALVE?	EXP-VALVE?

Monitor output: alarms from Draeger Evita2 dura/Evita 4/Evita XL ventilator		
Mindray Patient Monitor		**Evita2 dura/Evita 4/Evita XL Alarm**
Priority	**Label**	**Label**
High	High Technical alarms	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: VOL ERR PRESS ERR AW-TEMP INOP EVITA ERR CYCLE FAILED N-VOL ERR NEO FLOW? CO_2 ZERO CAL
High	High Technical alarms	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: SPO_2 SEN DISC SPO_2 ERR BATTERY ERR FAN ERR AIR PRESS HI HI O2 SUPPLY LOSS OF DATA REM.PAD-ERR PEEP V ERR CO2 NOT CAL
Medium	Medium Technical alarms	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the following alarms: BATT. < 2MIN CHECK EVITA EVITA STDBY AMB PRESS? NEBULIZ OFF ERR MULTIPCB
Low	Battery in Use	BATTERY ON

Monitor output: alarms from Draeger Evita2 dura/Evita 4/Evita XL ventilator		
Mindray Patient Monitor		**Evita2 dura/Evita 4/Evita XL Alarm**
Priority	**Label**	**Label**
Low	Low Technical alarms	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: CO_2 ERR CO_2 SENSOR ? MIXER INOP SYNCHRO INOP INSPHOLD END EXSPHOLD END

4.7.3 Output Signals - Waveforms (For BeneVision N series Monitors)

NOTE

- **The patient monitor does not output waveforms from the Draeger Evita XL ventilator.**

Label	Units
Paw	cmH2O, mbar, hpa
Flow	L/min
Vol	mL

4.8 Draeger Infinity V500

4.8.1 Output Signals - Parameters

Monitor output: parameters from Draeger Infinity V500 ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
Cdyn	ml/cmH2O,ml/ hPa,ml/mbar	Dynamic compliance	Yes

Monitor output: parameters from Draeger Infinity V500 ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Rdyn	cmH2O/L/s,hPa/L/s,mbar/L/s	Dynamic lung resistance	Yes
VCO_2	ml/min	CO_2 production	No
Pmin	cmH2O, hPa, mbar	Minimum airway pressure	No
P0.1	cmH2O, hPa, mbar	100 ms occlusion pressure	No
Pmean	cmH2O, hPa, mbar	Mean pressure	Yes
Pplat	cmH2O, hPa, mbar	Plateau pressure	Yes
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	Yes
PEEPi	cmH2O, hPa, mbar	Intrinsic positive end-expiratory pressure	Yes
fmand	/min	Mandatory breathing frequency	Yes
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes
Vtrap	ml	Volume trapped in the lung by intrinsic PEEP, and not exhaled during subsequent expiration	No
TVe spn	ml	Spontaneous expiratory tidal volume	Yes
Vds	ml	Dead space	No
NIF	cmH2O, hPa, mbar	Negative inspiratory force	No
Mvleak	L/min	Leakage minute volume	Yes
Leak Comp	%	Leak compensation	No
fspn	/min	Spontaneous respiratory rate	Yes
MV	L/min	Minute volume	Yes
RSBI	1/(min.L)	Rapid shallow breathing index	Yes
ftotal	/min	Total respiratory rate	Yes
$EtCO_2$	%,kPa,mmHg	End-tidal carbon dioxide	Yes
EtCO2%	%	End-tidal carbon dioxide	Yes
FiO_2	%,kPa,mmHg	Fractional concentration of O_2 in inspired gas	Yes
FiO2%	%	Fractional concentration of O_2 in inspired gas	Yes

Monitor output: parameters from Draeger Infinity V500 ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
TVe	ml	Expiratory tidal volume	Yes
TVi	ml	Inspired tidal volume	Yes
MVe	L/min	Expiratory minute volume	Yes
MVi	L/min	Inspiratory mimute volume	Yes
$VTCO_2$	ml	CO_2 tidal elimination	No
I:E	\	Inspiratory time:Expiratory time ratio	Yes
Cstat	ml/cmH2O,ml/ hPa,ml/mbar	Static compliance	Yes
TVe/IBW	ml/kg	TVe/IBW	Yes
MVspn%	%	Spontaneous breathing portion of minute volume	Yes
Setting Parameters			
O_2%	%	Oxygen concentration	No
Flow	sec	Flow	No
Tinsp	sec	Time of inspiration	No
I:E	\	Inspiratory time:Expiratory time ratio	No
f	/min	Breath rate	No
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	No
∆int PEEP	cmH2O, hPa, mbar	Intermittent PEEP	No
Plow	cmH2O, hPa, mbar	Lower pressure level	No
Phigh	cmH2O, hPa, mbar	Upper pressure level	No
Tlow	sec	Time for the lower pressure level	No
Thigh	sec	Time for the upper pressure level	No
Apnea Tinsp	sec	Apnea time	No
△Psupp	cmH2O, hPa, mbar	Pressure support level	No
Pmax	cmH2O, hPa, mbar	Maximum airway pressure	No

Monitor output: parameters from Draeger Infinity V500 ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
F-Trig	L/min	Inspiratory trigger level (flow trigger)	No
Tslope	sec	Rise time	No
Flow Assist	cmH2O.s/L,hPa.s/L,mbar.s/L	Flow assist	No
Vol Assist	cmH2O/L,hPa/L,mbar/L	Volume assist	No
TV	ml	Tidal volume	No
fapnea	/min	Breath rate for apnea ventilation	No
Pinsp	cmH2O, hPa, mbar	Pressure control level of inspiration	No
ATC	%	Automatic tube compensation	No
Tube ID	mm	Tube ID	No
Tdisconnect	sec	Delay time for "Airway pressure lower alarm limit"	No
Ti max	sec	Maximum inspiration time	No
TVapnea	ml	Apnea tidal volume	No
Trigger	%	Trigger	No
Exp%	%	Inspiration termination level	No

4.8.2 Output Signals - Alarms

Monitor output: alarms from Draeger Infinity V500 ventilator		
Mindray Patient Monitor		**Infinity V500 Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	FiO_2 Low	FiO2 low
High	Paw High	Airway pressure high
High	MV Low	MV low
High	MV High	MV high

Monitor output: alarms from Draeger Infinity V500 ventilator		
Mindray Patient Monitor		**Infinity V500 Alarm**
Priority	**Label**	**Label**
High	FiO_2 High	FiO2 high
High	Apnea	APNEA RESP
High	Paw Low	Airway pressure low
High	PEEP High	PEEP high
High	PEEP Low	PEEP low
High	Apnea ventilation	Apnea ventilation
Medium	$EtCO_2$ Low	etCO2 low
Medium	$EtCO_2$ High	etCO2 high
Medium	RR High	High respiratory rate
Medium	TVe High	Tidal volume high
Medium	TVe Low	Tidal volume low
Medium	VOL INCONST	VT not reached
Technical alarms		
High	Air Supply Pressure Low	Air supply down
High	O_2 Supply Pressure Low	O2 supply down
High	CLEAN CO_2	Clean CO2 cuvette
High	Power Failure	Internal power supply failure
High	Check Flow Sensors	Flow sensor failure
High	EXP-VALVE?	Expiratory valve malfunction
High	Negative Airway Pressure	Airway pressure negative
High	Neo Flow Sensor Error	Neo. flow sensor changed ?
High	Circuit Disconnect	Disconnection Ventilator
High	No O_2 Pressure	O2 supply down
High	AirWay Obstructed	Tube Obstruct

Monitor output: alarms from Draeger Infinity V500 ventilator		
Mindray Patient Monitor		**Infinity V500 Alarm**
Priority	**Label**	**Label**
High	High Technical Alarm	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: CO_2 NOT CAL BATERY ERR SPEAKER FAIL VENT ERR VOL ERR AW TEMP INOP AIR PRESS HI HI O2 SUPPLY SYSTEM FAULT BATTER ERR COOLING LOSS OF DATA HOSE ERR O2 Error Press Err AW TEMP Sens INT TEM HIGH Evita Err
Medium	Medium Technical Alarm	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the following alarms: Air supply down Nebulization finished Ambient pressure sensor? Device check incomplete GAS FAILURE BATT LOW
Low	Battery in Use	Internal battery activated

Monitor output: alarms from Draeger Infinity V500 ventilator		
Mindray Patient Monitor		**Infinity V500 Alarm**
Priority	**Label**	**Label**
Low	Low Technical Alarm	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: Exp. hold interrupted CO_2 measurement failed Plow>high limit Plow<low limit PMIN REACHED CO2 Err VOL CAL

4.8.3 Output Signals - Waveforms (For BeneVision N series Monitors)

Label	Units
Paw	cmH2O, mbar, hpa
Flow	L/min
Vol	mL
CO2	mmHg, kPa, %

4.9 Draeger Savina 300

4.9.1 Output Signals - Parameters

Monitor output: parameters from Draeger Savina 300 ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
Cdyn	ml/cmH2O,ml/hPa,ml/mbar	Dynamic compliance	Yes
Rdyn	cmH2O/L/s,hPa/L/s,mbar/L/s	Dynamic lung resistance	Yes

Monitor output: parameters from Draeger Savina 300 ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Pmean	cmH2O, hPa, mbar	Mean pressure	Yes
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	Yes
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes
TVe	ml	Expiratory tidal volume	Yes
TVi	ml	Inspired tidal volume	Yes
MV	L/min	Minute volume	Yes
ftotal	/min	Total respiratory rate	Yes
MVspn	L/min	Spontaneous breathed minute volume	Yes
fspn	/min	Spontaneous respiratory rate	Yes
FiO_2	%,kPa,mmHg	Fractional concentration of O_2 in inspired gas	Yes
T	ºC, ºF	Inspiratory breathing gas temperature	No
$EtCO_2$	%,kPa,mmHg	End-tidal carbon dioxide	Yes
RSBI	1/(min.L)	Rapid shallow breathing index	Yes
Pplat	cmH2O, hPa, mbar	Plateau pressure	Yes
I:E	\	Inspiratory time: Expiratory time ratio	Yes
EtCO2%	%	End-tidal carbon dioxide	Yes
FiO2%	%	Fractional concentration of O_2 in inspired gas	Yes
Setting Parameters			
O_2%	%	Oxygen concentration	No
TV	ml	Tidal volume	No
TVapnea	ml	Apnea tidal volume	No
fapnea	/min	Breath rate for apnea ventilation	No
f	/min	Breath rate	No
I:E	\	Inspiratory time: Expiratory time ratio	No

Monitor output: parameters from Draeger Savina 300 ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
△int.PEEP	cmH2O, hPa, mbar	Intermittent PEEP	No
F-Trig	L/min	Inspiratory trigger level (flow trigger)	No
Apnea Tinsp	sec	Apnea Time	No
PASB	cmH2O, hPa, mbar	Assisted spontaneous breathing	No
Pinsp	cmH2O, hPa, mbar	Pressure control level of inspiration	No
Pmax	cmH2O, hPa, mbar	Maximum airway pressure	No
Tdisconnect	sec	Delay time for "Airway pressure lower alarm limit"	No
FlowACC	cmH2O/s,hPa/s,mbar/s	Flow acceleration	No
Plow	cmH2O, hPa, mbar	Lower pressure level	No
Phigh	cmH2O, hPa, mbar	Upper pressure level	No
Thigh	sec	Time for the upper pressure level	No
Tlow	sec	Time for the lower pressure level	No
Tinsp	sec	Time of inspiration	No
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	No

4.9.2 Output Signals - Alarms

Monitor output: alarms from Draeger Savina 300 ventilator		
Mindray Patient Monitor		**Savina 300 Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	Paw High	Air pressure high
High	Paw Low	Air pressure low
High	MV High	MV high

Monitor output: alarms from Draeger Savina 300 ventilator		
Mindray Patient Monitor		**Savina 300 Alarm**
Priority	**Label**	**Label**
High	MV Low	MV low
High	FiO_2 High	O2 HIGH
High	FiO_2 Low	O2 low
High	PEEP High	PEEP HIGH
High	ASB>4s	Assist Spontaneous Breathing>4s
High	Apnea Ventilation	Apnea ventilation
High	Apnea	APNEA SAVINA
High	AW-TEMP HIGH	Airway temperature high
Medium	TVe High	Tidal volume high
Medium	TVe Low	Tidal volume low
Medium	RR High	RESP RATE HI
Medium	$EtCO_2$ Low	EtCO2 low
Medium	$EtCO_2$ High	EtCO2 high
Technical alarms		
High	O_2 Supply Pressure Low	O2 supply pressure low
High	Check Flow Sensors	Check flow sensor
High	EXP-VALVE?	Check expiratory valve?

Monitor output: alarms from Draeger Savina 300 ventilator		
Mindray Patient Monitor		**Savina 300 Alarm**
Priority	**Label**	**Label**
High	High Technical Alarm	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: High O_2 supply pressure insp.O_2 measurement in operation Failen to cycle Problem with fan Problem with PEEP control volume measurement inoperable Pressure measurement inoperable CO_2 not calibrated COOLING SAVINA ERR BATTERY ERR AW TEMP INOP
Medium	Medium Technical Alarm	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the following alarms: Check cooling CHECK SAVINA 300 NO nubelizer SAVINA STDBY BATTERY LOW MICROFILTER
Low	Low Technical Alarm	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: Insp hold aborted CO_2 device failure CO_2 sensor disconnected Expiration hold aborted

4.10 GE Carescape R860

4.10.1 Output Signals - Parameters

Monitor output: parameters from GE Carescape R860 ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes
Pplat	cmH2O, hPa, mbar	Plateau pressure	Yes
Pmean	cmH2O, hPa, mbar	Mean pressure	Yes
TVe	ml	Expiratory tidal volume	Yes
TVi	ml	Inspired tidal volume	Yes
TVe/IBW	ml/kg	TVe/IBW	Yes
TVe spn	ml	Spontaneous expiratory tidal volume	Yes
MVspn	L/min	Spontaneous breathed minute volume	Yes
MVe	L/min	Expiratory minute volume	Yes
MVi	L/min	Inspiratory mimute volume	Yes
fmand	/min	Mandatory breathing frequency	Yes
fspn	/min	Spontaneous respiratory rate	Yes
I:E	\	Inspiratory time:Expiratory time ratio	Yes
FiO_2	%,kPa,mmHg	Fractional concentration of O_2 in inspired gas	Yes
EtO_2	%,kPa,mmHg	End-tidal O_2	Yes
ΔO_2	%,kPa,mmHg	Difference between inspiratory and expiratory O_2	No
Rdyn	cmH2O/L/s,hPa/L/s,mbar/L/s	Dynamic lung resistance	Yes
Cstat	ml/cmH2O,ml/hPa,ml/mbar	Static compliance	Yes
Cdyn	ml/cmH2O,ml/hPa,ml/mbar	Dynamic compliance	Yes

Monitor output: parameters from GE Carescape R860 ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
RSBI	1/(min.L)	Rapid shallow breathing index	Yes
Texp	sec	Expiratory time	Yes
Paux Peak	cmH2O, hPa, mbar	Peak auxiliary pressure	No
Paux Mean	cmH2O, hPa, mbar	Mean auxiliary pressure	No
Paux Min	cmH2O, hPa, mbar	Minimum auxiliary pressure	No
PO_2	kPa	oxygen supply pressure	No
Pair	kPa	air supply pressure	No
PEEPi	cmH2O, hPa, mbar	Intrinsic positive end-expiratory pressure	Yes
PEEPe	cmH2O, hPa, mbar	Extrinsic positive end-expiratory pressure	No
PEEPtot	cmH2O, hPa, mbar	Total PEEP	Yes
$EtCO_2$	%,kPa,mmHg	End-tidal carbon dioxide	Yes
$RRCO_2$	bpm	Respiratory rate of CO_2	Yes
EE	kcal/day	Energy expenditure	No
RQ	\	Respiratory quotient	No
VO_2	ml/min	Oxygen consumption	Yes
VCO_2	ml/min	CO_2 production	No
VO_2/m^2	ml/min/m2	Oxygen consumption per body surface area	No
VCO_2/ m^2	ml/min/m2	CO_2 consumption per body surface area	No
VO_2/kg	ml/min/kg	Oxygen consumption per body weight	No
VCO_2/kg	ml/min/kg	CO_2 consumption per body weight	No
ftotal	/min	Total respiratory rate	Yes
FiO2%	%	Fractional concentration of O_2 in inspired gas	Yes
EtO2%	%,	End-tidal O_2	Yes

Monitor output: parameters from GE Carescape R860 ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
EtCO2%	%	End-tidal carbon dioxide	Yes
ΔO_2%	%	Difference between inspiratory and expiratory O_2	No
Setting Parameters			
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	No
TV	ml	Tidal volume	No
Base Flow	L/min	Base Flow	No
Tsupp	sec	Support time	No
F-Trig	L/min	Inspiratory trigger level (flow trigger)	No
P-Trig	cmH2O, hPa, mbar	Inspiratory trigger level (pressure trigger)	No
△Psupp	cmH2O, hPa, mbar	Pressure support level	No
Plimit	cmH2O, hPa, mbar	Pressure limit level	No
Tinsp	sec	Time of inspiration	No
Pinsp	cmH2O, hPa, mbar	Pressure control level of inspiration	No
Tslope	sec	Rise time	No
Tpause	sec	Pause Time	No
Phigh	cmH2O, hPa, mbar	Upper pressure level	No
Plow	cmH2O, hPa, mbar	Lower pressure level	No
Thigh	sec	Time for the upper pressure level	No
Tlow	sec	Time for the lower pressure level	No
Pmax	cmH2O, hPa, mbar	Maximum airway pressure	No
Flow	L/min	Flow	No
Apnea Tinsp	sec	Apnea Time	No
Tdisconnect	sec	Delay time for "Airway pressure lower alarm limit"	No
Tube ID	mm	Tube ID	No

Monitor output: parameters from GE Carescape R860 ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
O_2%	%	Oxygen concentration	No
I:E	\	Inspiratory time:Expiratory time ratio	No

4.10.2 Output Signals - Alarms

Monitor output: alarms from GE Carescape R860 ventilator		
Mindray Patient Monitor		**Carescape R860 Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	Apnea	Apnea
High	AW-TEMP HIGH	Air Temp High
High	FiO_2 High	FiO2 high
High	FiO_2 Low	FiO2 low
High	MV High	MVexp high
High	MV Low	MVexp low
High	Ppeak High	Ppeak High
High	Ppeak Low	Ppeak Low
High	Pressure Sustained	Sustained Paw
High	TV Not Achieved	Tidal volume not delivered(VT Not Achieved)
Medium	$EtCO_2$ High	EtCO2 High
Medium	$EtCO_2$ Low	EtCO2 Low
Medium	EtO_2 High	EtO2 High
Medium	EtO_2 Low	EtO2 Low
Medium	Paux High	Paux High
Medium	PEEPe High	PEEPe High
Medium	PEEPe Low	PEEPe Low
Medium	PEEPi High	PEEPi High

Monitor output: alarms from GE Carescape R860 ventilator		
Mindray Patient Monitor		**Carescape R860 Alarm**
Priority	**Label**	**Label**
Medium	RR High	RR High
Medium	RR Low	RR Low
Medium	TVe High	VTexp high
Medium	TVe Low	VTexp Low
Low	Plimit Reached	Plimit Reached
Technical alarms		
High	Air Supply Pressure Low	Air Supply Pressure Low
High	Airway Obstructed?	Breathing Circuit Occlusion
High	Circuit Leak	Circuit Leak
High	Check Flow Sensors	Expiratory Flow Sensor Error Exp Flow Sensor Failure
High	Negative Airway Pressure	Negative Airway Pressure
High	Neo Flow Sensor Error	Neo Flow Sensor Error
High	No Gas Supply Pressure	No Gas Supply Pressure
High	O_2 Supply Pressure Low	O2 Supply Pressure Low
High	Patient Connection Leak	Patient Connection Leak
High	Patient Connected?	Patient detected (Patient Connected?)
High	Patient Disconnected	Patient Disconnected
High	Power Failure	Power Supply Fail

Monitor output: alarms from GE Carescape R860 ventilator		
Mindray Patient Monitor		**Carescape R860 Alarm**
Priority	**Label**	**Label**
High	High Technical Alarm	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: Air Supply Pressure High Air Temp Sensor Error Clean Neo Flow Sensor FiO_2 Control Error Relief Valve Opened Low Internal Battery 1 Min Low Internal Battery 5 Min Low Internal Battery 10 Min Mixed Gas Temp Sensor Error Neo Flow Sensor Reversed Neo Flow Sensor Off No D-Lite Sensor? No Expiratory Flow Sensor No Neo Flow Sensor O_2 Supply Pressure High O_2 Temp Sensor ErrorPressure Sensor Failure Primary Audio Failure Relief Valve Failure Replace Neo Flow Sensor Temp High Shutdown Possible Total Flow Sensor Communication Failure Volume Delivery Error
Medium	FiO_2 Sensor Disconnected	O2 Sensor Failure

Monitor output: alarms from GE Carescape R860 ventilator		
Mindray Patient Monitor		**Carescape R860 Alarm**
Priority	**Label**	**Label**
Medium	Medium Technical Alarm	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the following alarms: Backup Ventilation on Check D-fend Check Sample Gas Out Circuit Leak Alarm Off Fans Require Service Low Internal Battery 20 Min Module Fail No CO_2, O_2 Data No Battery Backup Replace D-fend Sample Flow Deviation Sample Line Blocked SBT Ended No Battery Backup Backup Audio Failure
Low	Battery in Use	Battery in use
Low	Low Technical Alarm	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: Air Supply Pressure Sensor Out of Range Alarm Light Failure Alarms Silenced Apnea Alarm Off Cannot Calculate FRC Carrier Board Overheat Case Fan Speed Fail Connect Nebulizer Controls Frozen Need Service CPU Fan Speed Fail CPU Overheat Missed Scheduled FRC Module Not Compatible

Monitor output: alarms from GE Carescape R860 ventilator		
Mindray Patient Monitor		**Carescape R860 Alarm**
Priority	**Label**	**Label**
Low	Low Technical Alarm	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: Module Warming Up 2 Min Module Warming Up 5 Min Air Supply Pressure No Patient Effort MVexp Low Alarm Off O_2 Supply Pressure Sensor Out of Range Pinsp Sensor Out of Range Pexp Sensor Out of Range Paux Sensor Out of Range SBT Completed successfully Touchscreen Failure

4.10.3 Output Signals - Waveforms (For BeneVision N series Monitors)

Label	Units
Paw	cmH2O, mbar, hpa
Flow	L/min
Vol	mL
CO2	%,kPa,mmHg

4.10.4 Output Signals - Respiratory Loops (For BeneVision N series Monitors)

Label	Units
PV Loop	cmH2O/ml, hPa/ml, mbar/ml
FV Loop	L/min/ml
PF Loop	cmH2O/L/min, hPa/L/min, mbar/L/min

4.11 GE Engström Carestation

4.11.1 Output Signals - Parameters

Monitor output: parameters from GE Engström Carestation ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes
Pplat	cmH2O, hPa, mbar	Plateau pressure	Yes
Pmean	cmH2O, hPa, mbar	Mean pressure	Yes
TVe	ml	Expiratory tidal volume	Yes
TVi	ml	Inspired tidal volume	Yes
TVe/IBW	ml/kg	TVe/IBW	Yes
TVe spn	ml	Spontaneous expiratory tidal volume	Yes
MVspn	L/min	Spontaneous breathed minute volume	Yes
MVe	L/min	Expiratory minute volume	Yes
MVi	L/min	Inspiratory mimute volume	Yes
ftotal	/min	Total respiratory rate	Yes
fmand	/min	Mandatory breathing frequency	No
fspn	/min	Spontaneous breathing frequency	Yes
I:E	\	Inspiratory time: Expiratory time ratio	Yes
FiO_2	%,kPa,mmHg	Fractional concentration of O_2 in inspired gas	Yes
EtO_2	%,kPa,mmHg	End-tidal O_2	Yes
ΔO_2	%,kPa,mmHg	Difference between inspiratory and expiratory O_2	No
Rdyn	cmH2O/L/s,hPa/L/s,mbar/L/s	Dynamic lung resistance	Yes
Cstat	ml/cmH2O,ml/hPa,ml/mbar	Static compliance	Yes

Monitor output: parameters from GE Engström Carestation ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Cdyn	ml/cmH2O,ml/hPa,ml/mbar	Dynamic compliance	Yes
RSBI	1/(min.L)	Rapid shallow breathing index	Yes
Texp	sec	Expiratory time	Yes
Paux Peak	cmH2O, hPa, mbar	Peak auxiliary pressure	No
Paux Mean	cmH2O, hPa, mbar	Mean auxiliary pressure	No
Paux Min	cmH2O, hPa, mbar	Minimum auxiliary pressure	No
PO_2	kPa	oxygen supply pressure	No
Pair	kPa	air supply pressure	No
PEEPi	cmH2O, hPa, mbar	Intrinsic positive end-expiratory pressure	Yes
PEEPe	cmH2O, hPa, mbar	Extrinsic positive end-expiratory pressure	No
PEEPtot	cmH2O, hPa, mbar	Total PEEP	Yes
$EtCO_2$	%,kPa,mmHg	End-tidal carbon dioxide	Yes
$RRCO_2$	bpm	Respiratory rate of CO_2	Yes
EE	kcal/day	Energy expenditure	No
RQ	\	Respiratory quotient	No
VO_2	ml/min	Oxygen consumption	Yes
VCO_2	ml/min	CO_2 production	No
VO_2/m^2	ml/min/m2	Oxygen consumption per body surface area	No
VCO_2/m^2	ml/min/m2	CO_2 consumption per body surface area	No
VO_2/kg	ml/min/kg	Oxygen consumption per body weight	No
VCO_2/kg	ml/min/kg	CO_2 consumption per body weight	No
FiO2%	%	Fractional concentration of O_2 in inspired gas	Yes

Monitor output: parameters from GE Engström Carestation ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
EtO2%	%	End-tidal O_2	Yes
EtCO2%	%	End-tidal carbon dioxide	Yes
ΔO_2 %	%	Difference between inspiratory and expiratory O_2	No
Setting Parameters			
O_2%	%	Oxygen concentration	No
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	No
TV	ml	Tidal volume	No
Base Flow	L/min	Base Flow	No
Tsupp	sec	Support time	No
F-Trig	L/min	Inspiratory trigger level (flow trigger)	No
Trigger	%	Trigger	No
P-Trig	cmH2O, hPa, mbar	Inspiratory trigger level (pressure trigger)	No
△Psupp	cmH2O, hPa, mbar	Pressure support level	No
Plimit	cmH2O, hPa, mbar	Pressure limit level	No
Tinsp	sec	Time of inspiration	No
Pinsp	cmH2O, hPa, mbar	Pressure control level of inspiration	No
Tslope	sec	Rise time	No
Phigh	cmH2O, hPa, mbar	Upper pressure level	No
Plow	cmH2O, hPa, mbar	Lower pressure level	No
Thigh	sec	Time for the upper pressure level	No
Tlow	sec	Time for the lower pressure level	No
Pmax	cmH2O, hPa, mbar	Maximum airway pressure	No
Flow	L/min	Flow	No
Apnea Tinsp	sec	Apnea time	No

Monitor output: parameters from GE Engström Carestation ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Tdisconnect	sec	Delay time for "Airway pressure lower alarm limit"	No
Tube ID	mm	Tube ID	No
Tpause	sec	Pause Time	No
I:E	\	Inspiratory time: Expiratory time ratio	

4.11.2 Output Signals - Alarms

Monitor output: alarms from GE Engström Carestation ventilator		
Mindray Patient Monitor		**Engström Carestation Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	MV High	MVexp High
High	MV Low	MVexp Low
High	Apnea	Apnea
High	FiO_2 High	FiO2 High
High	FiO_2 Low	FiO2 Low
High	Pressure Sustained	Sustained Paw
High	TV not Achieved	TV Not Achieved
High	AW TEMP High	Air Temp High
High	Ppeak High	Ppeak High
High	Ppeak Low	Ppeak Low
Medium	TVe Low	TVexp Low
Medium	RR Low	RR Low
Medium	$EtCO_2$ High	EtCO2 High
Medium	$EtCO_2$ Low	EtCO2 Low
Medium	RR High	RR High

Monitor output: alarms from GE Engström Carestation ventilator		
Mindray Patient Monitor		**Engström Carestation Alarm**
Priority	**Label**	**Label**
Medium	EtO_2 High	EtO2 High
Medium	EtO_2 Low	EtO2 Low
Medium	PEEPe High	PEEPe High
Medium	PEEPe Low	PEEPe Low
Medium	PEEPi High	PEEPi High
Medium	TVe High	TVexp High
Medium	Paux High	Paux High
Low	Plimit Reached	Plimit Reached
Low	Base Flow High	Base Flow High
Technical alarms		
High	Air Supply Pressure Low	Air Supply Pressure Low
High	O_2 Supply Pressure Low	O2 Supply Pressure Low
High	No Gas Supply Pressure	No Gas Supply Pressure
High	Airway Obstructed?	Breathing Circuit Occlusion
High	Check Flow Sensors	Exp Flow Sensor Error
High	Neo Flow Sensor Error	Neo Flow Sensor Error
High	Patient Connected?	Patient Connected?
High	Negative Airway Pressure	Negative Airway Pressure
High	Circuit Leak	Circuit Leak
High	Patient Connection Leak	Patient Connection Leak
High	Patient Disconnected	Patient Disconnected

Monitor output: alarms from GE Engström Carestation ventilator		
Mindray Patient Monitor		**Engström Carestation Alarm**
Priority	**Label**	**Label**
High	High Technical Alarm	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: temp high shutdown possible primary audio failure Neo Flow Sendor Reversed Clean Neo Flow Sensor Replace Neo Flow Sensor Neo Flow Sensor Off No Expiratory Flow Sensor No Neo Flow Sensor Air Supply Pressure High O_2 Supply Pressure High FiO_2 Control Error Volume Delivery Error Air Temp Sensor Error O_2 Temp Sensor Error Mixed Gas Temp Sensor Error Total Flow Sensor Communication Failure No D-Lite Sensor? Pressure Sensor Failure Low Internal Battery 20 Min Low Internal Battery 10 Min Low Internal Battery 5 Min Low Internal Battery 1 Min Relief Valve Failure No Patient Effort
Medium	FiO_2 Sensor Disconnected	O2 Sensor Failure

Monitor output: alarms from GE Engström Carestation ventilator		
Mindray Patient Monitor		**Engström Carestation Alarm**
Priority	**Label**	**Label**
Medium	Medium Technical Alarm	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the following alarms: Check Sample Gas Out Replace D-fend Sample Line Blocked Check D-fend Sample Flow Deviation Module Fail No CO_2, O_2 Data No Battery Backup Fans Require Service Backup Mode Active Backup audio failure Display Fans Fail
Low	Battery in Use	On Battery
Low	Low Technical Alarm	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: Air Supply Pressure Sensor Out of Range O_2 Supply Pressure Sensor Out of Range Pinsp Sensor Out of Range Pexp Sensor Out of Range Paux Sensor Out of Range Module Not Compatible Controls Frozen Need Service Connect Nebulizer SBT Ends < 2 Minutes SBT Completed SBT Ended Cannot Calculate FRC Missed Scheduled FRC FRC Series Stopped Relief Valve Opened

Monitor output: alarms from GE Engström Carestation ventilator		
Mindray Patient Monitor		**Engström Carestation Alarm**
Priority	**Label**	**Label**
Low	Low Technical Alarm	Circuit Leak Alarm Off Apnea Alarm Off MVexp Low Alarm Off Unable to Deliver TV $VO_2/VCO_2/CO_2/O_2$ Out of Range No VO_2 FiO_2 > 85% Artifact Module Warming Up 2 Min Module Warming Up 5 Min Alarms Silenced.

4.12 Hamilton C1/C2/C3/T1(Polling Protocol)

NOTE

- **Only the Benevision N Series monitor supports integration with the Hamilton C1/T1 ventilator.**

4.12.1 Output Signals - Parameters

Monitor output: parameters from Hamilton C1/C2/C3/T1 ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
O_2%	%	Oxygen concentration	Yes
MV	L/min	Minute volume	Yes
I: E	\	Inspiratory time:Expiratory time ratio	Yes
$EtCO_2$	%,kPa,mmHg	End-tidal carbon dioxide	Yes
TVi	ml	Inspired tidal volume	Yes
TVe	ml	Expiratory tidal volume	Yes
ftotal	/min	Total respiratory rate	Yes

Monitor output: parameters from Hamilton C1/C2/C3/T1 ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
fspn	/min	Spontaneous respiratory rate	Yes
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes
Pmean	cmH2O, hPa, mbar	Mean pressure	Yes
Pplat	cmH2O, hPa, mbar	Plateau pressure	Yes
Texp	sec	Expiratory time	Yes
Ri	cmH2O/L/s,hPa/L/s,mbar/L/s	Inspiratory resistance	Yes
Cstat	ml/cmH2O,ml/hPa,ml/mbar	Static compliance	Yes
Insp Flow	L/min	Inspiration flow	No
TVe spn	ml	Spontaneous expiratory tidal volume	Yes
PEEPi	cmH2O, hPa, mbar	Intrinsic positive end-expiratory pressure	Yes
P0.1	cmH2O, hPa, mbar	100 ms occlusion pressure	No
Exp Flow	L/min	Expiratory flow	No
RCexp	sec	Expiratory time constant	Yes
PTP	cmH2O.s,hPa.s,mbar.s	Pressure time product	No
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	Yes
Setting Parameters			
fCMV	/min	CMV frequency	No
fsimv	/min	Frequency of SIMV	No
TV	ml	Tidal volume	No
PEEP/CPAP	cmH2O, hPa, mbar	PEEP/CPAP	No
△Psupp	cmH2O, hPa, mbar	Pressure support level	No
O2%	%	Oxygen concentration	No
MV	L/min	Minute volume	No
Phigh	cmH2O, hPa, mbar	Upper pressure level	No

Monitor output: parameters from Hamilton C1/C2/C3/T1 ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
I: E	\	Inspiratory time:Expiratory time ratio	No
Exp%	%	Inspiration termination level	No
Ramp	msec	Ramp	No
IBW	kg	Ideal body weight	No
%MinVol	%	Percentage of minute volume to be delivered	No

4.12.2 Output Signals - Alarms

Monitor output: alarms from Hamilton C1/C2/C3/T1 ventilator		
Mindray Patient Monitor		**C1/C2/C3/T1 Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	Paw High	High Pressue
High	Apnea	Apnea
High	Loss of PEEP	Loss of PEEP
High	MV Low	Low Min Vol
High	MV High	High Min Vol
Medium	RR High	High Rate
Technical alarms		
High	Disconnection ventilator side	Disconnection Ventilator
High	Patient Disconnected	Disconnection Patient
High	High Technical alarms	If the monitor shows the alarm [**High Technical alarms**], the external device may have the alarm: Oxygen Concentration.

Monitor output: alarms from Hamilton C1/C2/C3/T1 ventilator		
Mindray Patient Monitor		**C1/C2/C3/T1 Alarm**
Priority	**Label**	**Label**
Medium	Medium Technical alarms	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the alarm: Gas Supply Spez Alarm
Low	Low Technical alarms	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: Operator General Alarm

4.13 Hamilton G5 (Block Protocol)

4.13.1 Output Signals - Parameters

Monitor output: parameters from Hamilton G5 ventilator (Block protocol)			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
MV	L/min	Minute volume	Yes
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes
Pplat	cmH2O, hPa, mbar	Plateau pressure	Yes
Pmean	cmH2O, hPa, mbar	Mean pressure	Yes
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	Yes
Pmin	cmH2O, hPa, mbar	Minimum airway pressure	No
PEEPi	cmH2O, hPa, mbar	Intrinsic positive end-expiratory pressure	Yes
P0.1	cmH2O, hPa, mbar	100 ms occlusion pressure	No
PTP	cmH2O.s,hPa.s,mba.s	Pressure time product	No
Insp Flow	L/min	Inspiration flow	No
Exp Flow	L/min	Expiratory flow	No

Monitor output: parameters from Hamilton G5 ventilator (Block protocol)			
Labels	**Units**	**Description**	**Trend, record, print**
TVi	ml	Inspired tidal volume	Yes
TVe	ml	Expiratory tidal volume	Yes
TVe spn	ml	Spontaneous expiratory tidal volume	Yes
MVspn	L/min	Spontaneous breathed minute volume	Yes
ftotal	/min	Total respiratory rate	Yes
fspn	/min	Spontaneous respiratory rate	Yes
Texp	sec	Expiratory time	Yes
I:E	\	Inspiratory time:Expiratory time ratio	Yes
Ri	cmH2O/L/s,hPa/L/s,mbar/L/s	Inspiratory resistance	Yes
Re	cmH2O/L/s,hPa/L/s,mbar/L/s	Expiratory resistance	Yes
Cstat	ml/cmH2O,ml/hPa,ml/mbar	Static compliance	Yes
RCexp	sec	Expiratory time constant	Yes
RCinsp	sec	Inspiratory time constant	No
RSBI	1/(min.L)	Rapid shallow breathing index	Yes
$O_2\%$	%	Oxygen concentration	Yes
WOB	J/L	Work of breathing	Yes
$EtCO_2$	%,kPa,mmHg	End-tidal carbon dioxide	Yes
VCO_2	ml/min	CO_2 production	No
PR	/min	Pulse rate	Yes
SpO_2	%	Arterial oxygen saturation from pulse oximetry	Yes
TVe/IBW	ml/kg	TVe/IBW	Yes
Setting Parameters			
f	/min	Breath rate	No
TV	ml	Tidal volume	No

Monitor output: parameters from Hamilton G5 ventilator (Block protocol)			
Labels	**Units**	**Description**	**Trend, record, print**
TPause	%	Pause Time%	No
P-Trig	cmH2O, hPa, mbar	Inspiratory trigger level(pressure trigger)	No
PEEP/ CPAP	cmH2O, hPa, mbar	PEEP/CPAP	No
Plow	cmH2O, hPa, mbar	Lower pressure level	No
△Psupp	cmH2O, hPa, mbar	Pressure support level	No
MV	L/min	Minute volume	No
Plimit	cmH2O, hPa, mbar	Pressure limit level	No
Pinsp	cmH2O, hPa, mbar	Pressure control level of inspiration	No
Phigh	cmH2O, hPa, mbar	Upper pressure level	No
F-Trig	L/min	Inspiratory trigger level (flow trigger)	No
I:E	\	Inspiratory time:Expiratory time ratio	No
Peak Flow	L/min	Peak flow	No
Exp%	%	Inspiration termination level	No
Ramp	msec	Ramp	No
IBW	kg	Ideal body weight	No
%MinVol	%	Percentage of minute volume to be delivered	No
Tlow	sec	Time for the lower pressure level	No
Thigh	sec	Time for the upper pressure level	No
Ti max	sec	Maximum inspiration time	No
Tip	sec	Inspiratory pause time	No
Tube ID	mm	Tube ID	No
Base flow	L/min	Base Flow	No
O_2%	%	Oxygen concentration	No

4.13.2 Output Signals - Alarms

Monitor output: alarms from Hamilton G5 ventilator (Block protocol)		
Mindray Patient Monitor		**Hamilton G5 Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	Paw High	High pressure
High	Paw Low	Low pressure
High	FiO_2 High	High oxygen
High	FiO_2 Low	Low oxygen
High	Apnea	Apnea
High	Apnea Ventilation	Apnea ventilation
High	SpO_2 Low	SpO2 too low
High	SpO_2 High	SpO2 too high
High	MV Low	Low minute volume
High	MV High	High minute volume
High	Loss of PEEP	Loss of PEEP
Medium	RR High	High frequency
Medium	RR Low	Low frequency
Medium	$EtCO_2$ High	High PetCO2
Medium	$EtCO_2$ Low	Low PetCO2
Technical alarms		
High	Patient Disconnected	Disconnection Patient Disconnection on patient side
High	Air Supply Pressure Low	Air supply failed
High	O_2 Supply Pressure Low	Oxygen supply failed
High	O_2 cell disconnect	O2 cell missing
High	O_2 cell cal. Needed	O2 cell calibration needed
High	Power Failure	Loss of mains power
High	Check Flow Sensors	Check Flow Sensor type
High	No Gas Supply Pressure	All gas supplies failed

Monitor output: alarms from Hamilton G5 ventilator (Block protocol)		
Mindray Patient Monitor		**Hamilton G5 Alarm**
Priority	**Label**	**Label**
High	Disconnection ventilator side	Disconnection Ventilator Disconnection on ventilator side
High	High Technical alarms	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: Wrong Flow Sensor type O_2 cell defective Disconncetion Low internal pressure High pressure during sigh Pressure not released Exhalation obstructed TF5514:Check loudspeaker Internal battery empty Ventilator unit connection lost Check internal battery
Medium	O_2 and air supply	Oxygen + air supplies failed
Medium	O_2 and heliox supply	Oxygen + heliox supplies failed
Medium	Medium Technical alarms	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the following alarms: High leak Low tidal volume High tidal volume Turn the Flow Sensor APV init failed Internal battery low Panel connection lost Heliox supply failed SpO_2: sensor error(left slot) SpO_2: sensor error(right slot) SpO_2: no sensor (left slot) SpO_2: no sensor (right slot) SpO_2: patient disconnected (left slot) SpO_2: patient disconnected (right slot)

Monitor output: alarms from Hamilton G5 ventilator (Block protocol)		
Mindray Patient Monitor		**Hamilton G5 Alarm**
Priority	**Label**	**Label**
Medium	Medium Technical alarms	SpO_2: light interference (left slot) SpO_2: light interference (right slot) SpO_2: poor signal (left slot) SpO_2: poor signal (right slot) Large change in FiO_2 Recruitment maneuver in process Brightness test alarm AERONEB disconnected Cuff disconnection Air + heliox supplies failed Oxygenation adjustment OFF (no SpO_2) Ventilation adjustment OFF (no $PetCO_2$) No hemodynamic status available High HLI MV oszillation FiO_2 oszillation PEEP oszillation Cuff high pressure FiO_2 set to 100% due to low saturation Check P ramp
Low	Low Technical alarms	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: Volume Low for nebulizer ASV: Check high pressure limit APV: Check high pressure limit Pressure low limit reached Check %MinVol Check Body Wt ASV: Cannot meet target Check PEEP/high pressure limit Check PEEP/Pcontrol Check PEEP/Psupport Check trigger Check %TI

Monitor output: alarms from Hamilton G5 ventilator (Block protocol)		
Mindray Patient Monitor		**Hamilton G5 Alarm**
Priority	**Label**	**Label**
Low	Low Technical alarms	Check trigger Check %TI Check pause Check I:E Check Vt Check rate Check peak flow Check TI Check Flow Pattern Flow sensor calibration needed Expiratory valve calibration needed Apnea ventilation ended Maximum leak compensation Low ExpMinVol alarm off CO_2 sensor calibration needed Check CO_2 airway adapter CO_2 sensor disconnected CO_2 sensor over temperature CO_2 sensor faulty External battery empty Sensor simulation active IRV Cuff leak IntelliCuff not found Check VThigh limit AERONEB module disconnected Oxygenation adjustment OFF (no SpO_2) Ventilation adjustment OFF (no $PetCO_2$) Check CO_2 sampling line Check INTELLiVENT PEEP limit setting Set low limit of ExpMinVol alarm Recruitment in Progress Oxygenation Controller on Limit Ventilation Controller on Limit SBT conditions fulfilled SBT in progress

4.13.3 Output Signals - Waveforms (For BeneVision N series Monitors)

Label	Units
Paw	cmH2O, mbar, hpa
Flow	L/min
Vol	mL
CO2	mmHg, kPa, %

4.14 Hamilton G5 (Polling Protocol)

4.14.1 Output Signals - Parameters

Monitor output: parameters from Hamilton G5 ventilator (polling protocol)			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
O_2%	%	Oxygen concentration	Yes
MV	L/min	Minute volume	Yes
I: E	\	Inspiratory time:Expiratory time ratio	Yes
$EtCO_2$	%,mmHg,kPa	End-tidal carbon dioxide	Yes
SpO_2	%	Arterial oxygen saturation from pulse oximetry	Yes
PR	/min	Pulse rate	Yes
TVi	ml	Inspired tidal volume	Yes
TVe	ml	Expiratory tidal volume	Yes
ftotal	/min	Total respiratory rate	Yes
fspn	/min	Spontaneous respiratory rate	Yes
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes
Pmean	cmH2O, hPa, mbar	Mean pressure	Yes
Pplat	cmH2O, hPa, mbar	Plateau pressure	Yes
Texp	sec	Expiratory time	Yes

Monitor output: parameters from Hamilton G5 ventilator (polling protocol)			
Labels	**Units**	**Description**	**Trend, record, print**
Ri	cmH2O/L/s,hPa/L/s,mbar/L/s	Inspiratory resistance	Yes
Re	cmH2O/L/s,hPa/L/s,mbar/L/s	Expiratory resistance	Yes
Cstat	ml/cmH2O,ml/hPa,ml/mbar	Static compliance	Yes
Insp Flow	L/min	Inspiration flow	No
TVe spn	ml	Spontaneous expiratory tidal volume	Yes
PEEPi	cmH2O, hPa, mbar	Intrinsic positive end-expiratory pressure	No
Pmin	cnH2O,hPa,mbar	Minimum airway pressure	No
P0.1	cmH2O, hPa, mbar	100 ms occlusion pressure	No
Exp Flow	L/min	Expiratory flow	No
RCexp	sec	Expiratory time constant	Yes
RCinsp	sec	Inspiratory time constant	No
WOB	J/L	Work of breathing	Yes
PTP	cmH2O.s,hPa.s,mbar.s	Pressure time product	No
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	Yes
Setting Parameters			
Phigh	cmH2O,hPa,mba	Upper pressure level	No
fCMV	/min	CMV frequency	No
fsimv	/min	Frequency of SIMV	No
TV	ml	Tidal volume	No
Tpause	%	Pause Time%	No
P-Trig	cmH2O,hPa,mba	Inspiratory trigger level(pressure trigger)	No
PEEP/CPAP	cmH2O, hPa, mbar	PEEP/CPAP	No
△Psupp	cmH2O, hPa, mbar	Pressure support level	No

Monitor output: parameters from Hamilton G5 ventilator (polling protocol)			
Labels	**Units**	**Description**	**Trend, record, print**
O2%	%	Oxygen concentration	No
MV	L/min	Minute volume	No
I: E	\	Inspiratory time:Expiratory time ratio	No
Peak Flow	L/min	Peak flow	No
Exp%	%	Inspiration termination level	No
Ramp	msec	Ramp	No
IBW	kg	Ideal body weight	No
%MinVol	%	Percentage of minute volume to be delivered	No

4.14.2 Output Signals - Alarms

Monitor output: alarms from Hamilton G5 ventilator (polling protocol)		
Mindray Patient Monitor		**Hamilton G5 Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	Paw High	High pressure
High	Apnea	Apnea
High	Loss of PEEP	Loss of PEEP
High	MV Low	Low minute volume
High	MV High	High minute volume
Medium	RR High	High frequency
Technical alarms		
High	Disconnection ventilator side	Disconnection Ventilator or, Disconnection on ventilator side
High	Patient Disconnected	Disconnection Patient or, Disconnection on patient side

Monitor output: alarms from Hamilton G5 ventilator (polling protocol)		
Mindray Patient Monitor		**Hamilton G5 Alarm**
Priority	**Label**	**Label**
High	High Technical alarms	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: OXYGEN CONCENTRATION.
Medium	Medium Technical alarms	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the following alarms: Gas Supply SPEZ ALARM
Low	Low Technical alarms	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: Operator General Alarm

4.15 Hamilton Galileo (Polling Protocol)

4.15.1 Output Signals - Parameters

Monitor output: parameters from Hamilton Galileo ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
O_2%	%	Oxygen concentration	Yes
MV	L/min	Minute volume	Yes
I: E	\	Inspiratory time:Expiratory time ratio	Yes
TVi	ml	Inspired tidal volume	Yes
TVe	ml	Expiratory tidal volume	Yes
ftotal	/min	Total respiratory rate	Yes
fspn	/min	Spontaneous respiratory rate	Yes
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes

Monitor output: parameters from Hamilton Galileo ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Pmean	cmH2O, hPa, mbar	Mean pressure	Yes
Pplat	cmH2O, hPa, mbar	Plateau pressure	Yes
Texp	sec	Expiratory time	Yes
Ri	cmH2O/L/s,hPa/L/s,mbar/L/s	Inspiratory resistance	Yes
Re	cmH2O/L/s,hPa/L/s,mbar/L/s	Expiratory resistance	Yes
Cstat	ml/cmH2O,ml/hPa,ml/mbar	Static compliance	Yes
Insp Flow	L/min	Inspiration flow	No
PEEPi	cmH2O, hPa, mbar	Intrinsic positive end-expiratory pressure	Yes
Pmin	cmH2O, hPa, mbar	Minimum airway pressure	No
P0.1	cmH2O, hPa, mbar	100 ms occlusion pressure	No
Exp Flow	L/min	Expiratory flow	No
RCexp	sec	Expiratory time constant	Yes
RCinsp	sec	Inspiratory time constant	No
WOB	J/L	Work of breathing	Yes
PTP	cmH2O.s,hPa.s,mbar.s	Pressure time product	No
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	Yes
Setting Parameters			
fCMV	/min	CMV frequency	No
fsimv	/min	Frequency of SIMV	No
TV	ml	Tidal volume	No
Tpause	%	Pause Time%	No
P-Trig	cmH2O, hPa, mbar	Inspiratory trigger level(pressure trigger)	No
PEEP/CPAP	cmH2O, hPa, mbar	PEEP/CPAP	No
△Psupp	cmH2O, hPa, mbar	Pressure support level	No

Monitor output: parameters from Hamilton Galileo ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
O_2%	%	Oxygen concentration	No
Phigh	cmH2O, hPa, mbar	Upper pressure level	No
I: E	\	Inspiratory time:Expiratory time ratio	No
Peak Flow	L/min	Peak flow	No
Exp%	%	Inspiration termination level	No
Ramp	msec	Ramp	No
IBW	kg	Ideal body weight	No
%MinVol	%	Percentage of minute volume to be delivered	No

4.15.2 Output Signals - Alarms

Monitor output: alarms from Hamilton Galileo ventilator		
Mindray Patient Monitor		**Hamilton Galileo Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	Paw High	High Pressue
High	Apnea	Apnea
High	Loss of PEEP	Loss of PEEP
High	MV Low	Low Min Vol
High	MV High	High Min Vol
Medium	RR High	High Rate
Technical alarms		
High	Disconnection ventilator side	Disconnection Ventilator
High	Patient Disconnected	Disconnection Patient

Monitor output: alarms from Hamilton Galileo ventilator		
Mindray Patient Monitor		**Hamilton Galileo Alarm**
Priority	**Label**	**Label**
High	High Technical alarms	If the monitor shows the alarm [**High Technical alarms**], the external device may have the alarm: Oxygen Concentration
Medium	Medium Technical alarms	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the alarm: Gas Supply
Low	Low Technical alarms	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: Operator General Alarm

4.16 HuL Leoni Plus (for Passport M series)

4.16.1 Output Signals - Parameters

Monitor output: parameters from HuL Leoni Plus ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	Yes
FiO2	%.kPa,mmHg	Fractional concentration of O_2 in inspired gas	Yes
FiO2%	%	Fractional concentration of O_2 in inspired gas	Yes
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes
Pmean	cmH2O, hPa, mbar	Mean pressure	Yes
TVe	ml	Expiratory tidal volume	Yes
TVi	ml	Inspiratory tidal volume	Yes
MV	L/min	Minute volume	Yes
ftotal	/min	Total respiratory rate	Yes
fspn	/min	Spontaneous respiratory rate	Yes
Rstat	ml/cmH2O,ml/ hPa,ml/mbar	Static lung resistance	Yes
Cdyn	ml/cmH2O,ml/ hPa,ml/mbar	Dynamic compliance	Yes
SpO_2	%	Arterial oxygen saturation from pulse oximetry	Yes
Setting Parameters			
O_2%	%	Oxygen concentration	No
TV	ml	Tidal volume	No
fapnea	/min	Breath rate for apnea ventilation	No
f	/min	Breath rate	No
I:E	\	Inspiratory time: Expiratory time ratio	No
F-Trig	L/min	Inspiratory trigger level (flow trigger)	No

Monitor output: parameters from HuL Leoni Plus ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Trigger	%	Trigger	No
Tinsp	sec	Time of inspiration	No
Pinsp	cmH2O, hPa, mbar	Pressure control level of inspiration	No
Pmax	cmH2O, hPa, mbar	Maximum airway pressure	No
Flow	L/min	Flow	No
Apnea Tinsp	sec	Apnea time	No
△Psupp	cmH2O, hPa, mbar	Pressure support level	No
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	No

4.16.2 Output Signals - Alarms

Monitor output: alarms from HuL Leoni Plus ventilator		
Mindray Patient Monitor		**HuL Leoni Plus Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	Apnea	Apnea
High	FiO_2 High	O2 high
High	FiO_2 Low	P: O2 too low
High	MV High	MV high
High	MV Low	MV low
High	PEEP Not Achieved	PEEP pressure not reached
High	PEEP High	PEEP too high
High	Pinsp Not Achieved	Set pressure not reachable
High	Ppeak High	Ppeak high
High	Ppeak Low	Ppeak low
High	SpO_2 High	SpO2 too high
High	SpO_2 Low	SpO2 too low

Monitor output: alarms from HuL Leoni Plus ventilator		
Mindray Patient Monitor		**HuL Leoni Plus Alarm**
Priority	**Label**	**Label**
High	TV Not Achieved	Volume not reached
Medium	RR High	Frequency too high
Medium	TVe High	VTe too high
Medium	TVe Low	Vte too low
Technical alarms		
High	Airway Obstructed?	
High	No O2 Pressure	
High	Patient Disconnected	
High	Check Flow Sensors	If the monitor shows the alarm [**Check Flow Sensors**], the external device mayhave the following alarms: Flow sensor broken Flowsensor fail Calibrate Flowsensor Flowsensor contaminated.

Monitor output: alarms from HuL Leoni Plus ventilator		
Mindray Patient Monitor		**HuL Leoni Plus Alarm**
Priority	**Label**	**Label**
High	High Technical Alarm	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: Air supply Air supply failed. Freshgas is O2 Battery empty. Mechanical ventilation stopped. Battery empty. Supply voltage too low Excess pressure Exsp-Tube Excess pressure Insp-Tube O2 and Air supply failed. Dosing fresh gas stopped. O2 supply Deviation pressure sensors Technical Failure Current consumption too high 3.3V supply on NetDCU too high 3.3V supply on NetDCU too low 5V supply on NetDCU too high 5V supply on NetDCU too low 12V supply on NetDCU too high 12V supply on NetDCU too low 24V supply on NetDCU too high 24V supply on NetDCU too low Versions not compatible Failsafe Controllerboard EEPROM checksum failed Patient safe: Reboot the device Sensor Fail Patient Pressure Driving gas blender failed. Checksum error Encoder without function
Medium	FiO2 Sensor Disconnected	
Medium	Patient Connection Leak	

Monitor output: alarms from HuL Leoni Plus ventilator		
Mindray Patient Monitor		**HuL Leoni Plus Alarm**
Priority	**Label**	**Label**
Medium	Medium Technical Alarm	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the following alarms: Battery Fail Battery not connected Broken loudspeaker. Audible alarming not possible. Batteries deep discharged. Please change. O2 Calibration failure Broken microphone. No checking of audible alarming Battery almost empty Check O2 concentration Oximetry cable not connected SpO2: Sensor not connected SpO2: communication error SpO2: Sensor failure Oximetry cable failure O2 control aborted Low Perfusion SpO2: Sensor off patient SpO2: No cable connected SpO2: No adhesive sensor connected
Low	Battery in Use	
Low	Low Technical Alarm	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: Fan Fail Observe battery runtime Controllerboard EEPROM not write protected

4.17 MAQUET SERVO-i/SERVO-s

4.17.1 Output Signals - Parameters

Monitor output: parameters from MAQUET SERVO-i/SERVO-s ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
O_2%	%	Oxygen concentration	Yes
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	Yes
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes
Pplat	cmH2O, hPa, mbar	Plateau pressure	Yes
Pmean	cmH2O, hPa, mbar	Mean pressure	Yes
TVe	ml	Expiratory tidal volume	Yes
TVi	ml	Inspired tidal volume	Yes
MVspn	L/min	Spontaneous breathed minute volume	Yes
MVe	L/min	Expiratory minute volume	Yes
MVi	L/min	Inspiratory mimute volume	Yes
ftotal	/min	Total respiratory rate	Yes
fspn	/min	Spontaneous respiratory rate	Yes
I:E	\	Inspiratory time:Expiratory time ratio	Yes
Leak Comp	%	Leak compensation	No
Cstat	ml/cmH2O,ml/hPa,ml/mbar	Static compliance	Yes
Cdyn	ml/cmH2O,ml/hPa,ml/mbar	Dynamic compliance	Yes
RSBI	1/(min.L)	Rapid shallow breathing index	Yes
WOB	J/L	Work of breathing	Yes
Exp Flow	L/min	Expiratory flow	No
Ri	cmH2O/L/s,hPa/L/s,mbar/L/s	Inspiratory resistance	Yes

Monitor output: parameters from MAQUET SERVO-i/SERVO-s ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Re	cmH2O/L/s,hPa/L/s,mbar/L/s	Expiratory resistance	Yes
PO_2	kPa	oxygen supply pressure	No
Pair	kPa	air supply pressure	No
P0.1	cmH2O, hPa, mbar	100 ms occlusion pressure	No
PEEPtot	cmH2O, hPa, mbar	Total PEEP	Yes
$EtCO_2$	%,kPa,mmHg	End-tidal carbon dioxide	Yes
$EtCO_2$%	%	End-tidal carbon dioxide	Yes
VCO_2	ml/min	CO_2 production	No
$VTCO_2$	ml	CO_2 tidal elimination	No
TI/TTOT	\	Duty cycle or ratio of inspiration time to total breathing cycle time (only during spontaneous breathing)	Yes
Setting Parameters			
TV	ml	Tidal volume	No
MV	L/min	Minute volume	No
fCMV	/min	CMV frequency	No
fsimv	/min	Frequency of SIMV	No
I:E	\	Inspiratory time:Expiratory time ratio	No
F-Trig	\	Inspiratory trigger level (flow trigger)	No
P-Trig	cmH2O, hPa, mbar	Inspiratory trigger level (pressure trigger)	No
Tinsp	sec	Time of inspiration	No
Tpause	%	Pause Time%	No
Rise Time%	%	rise time%	No
Phigh	cmH2O, hPa, mbar	Upper pressure level	No

Monitor output: parameters from MAQUET SERVO-i/SERVO-s ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Thigh	sec	Time for the upper pressure level	No
Tpeep	sec	Time at PEEP level in Bi-Vent	No
PC above PEEP	cmH2O, hPa, mbar	PC above PEEP	No
PS above PEEP	cmH2O, hPa, mbar	PS above PEEP	No
PEEP/ CPAP	cmH2O, hPa, mbar	PEEP/CPAP	No
Plimit	cmH2O, hPa, mbar	Pressure limit level	No
fapnea	/min	Breath rate for apnea ventilation	No
Tpause	sec	Pause Time	No
Tslope	sec	Rise time	No
Apnea Tinsp	sec	Apnea time	No
TVapnea	ml	Apnea tidal volume	No
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	No
O_2%	%	Oxygen concentration	No

4.17.2 Output Signals - Alarms

Monitor output: alarms from MAQUET SERVO-i/SERVO-s ventilator		
Mindray Patient Monitor		**MAQUET SERVO-i/SERVO-s Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	Paw High	Airway pressure alarm Upper pressure limit exceeded
High	MV High	Exp.Minute volume too high
High	MV Low	Exp.Minute volume too low
High	Apnea	Apnea alarm
High	FiO_2 High	O2 conc.too high
High	FiO_2 Low	O2 conc.too low
High	PEEP High	PEEP High
High	PEEP Low	PEEP Low
Medium	$EtCO_2$ High	EtCO2 conc.too high
Medium	$EtCO_2$ Low	EtCO2 conc.too low
Medium	RR Low	Breath frequency Low
Medium	RR High	Breath frequency High
Technical alarms		
High	No Gas Supply Pressure	Gas supply alarm
High	O_2 cell disconnect	O2 cell disconnect

Monitor output: alarms from MAQUET SERVO-i/SERVO-s ventilator		
Mindray Patient Monitor		**MAQUET SERVO-i/SERVO-s Alarm**
Priority	**Label**	**Label**
High	High Technical alarms	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: Breathing system uP Module error Inspiratory control uP Module error Monitoring System uP Module error Battery alarm Power Failure Mains Failure O_2 potentiometer error CMV potentiometer error Range Switch error Mode Switch error Barometer error High continuous pressure Overrange Computer Interface Emulator hardware error NIV,Leakage out of range NIV,Time in waiting position exceeds 2 min regulation pressure limited NIV,No patient effort detected Unreliable Edi signal Check catheterposition/Edi invalid No consistent patient effort Check catheter position/RR and HR coupling
Medium	Medium Technical alarms	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the following alarms: Panel Interface uP Module error Exp.flow &CO_2 linearization uP Module error Alarm buff CI Battery Voltage Pneumatic-Edi out of synch Edi activity low No Edi signal detected Unsuccessful manual gas change alarm Check Heliox adapter

Monitor output: alarms from MAQUET SERVO-i/SERVO-s ventilator		
Mindray Patient Monitor		**MAQUET SERVO-i/SERVO-s Alarm**
Priority	**Label**	**Label**
Low	Check tubing	Check tubing
Low	Low Technical alarms	Leakage fraction too high

4.17.3 Output Signals - Waveforms (For BeneVision N series Monitors)

Label	Units
Paw	cmH2O, mbar, hpa
Flow	L/min
Vol	mL
CO2	%,kPa,mmHg

4.17.4 Output Signals - Respiratory Loops (For BeneVision N series Monitors)

Label	Units
PV Loop	cmH2O/ml, hPa/ml, mbar/ml
FV Loop	L/min/ml
PF Loop	cmH2O/L/min, hPa/L/min, mbar/L/min

4.18 MAQUET SERVO-U/SERVO-N

NOTE

- **Only the Benevision N Series monitor supports integration with the MAQUET SERVO-N ventilator.**

4.18.1 Output Signals - Parameters

Monitor output: parameters from MAQUET SERVO-U/SERVO-N ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
O_2%	%	Oxygen concentration	Yes
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	Yes
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes
Pplat	cmH2O, hPa, mbar	Plateau pressure	Yes
Pmean	cmH2O, hPa, mbar	Mean pressure	Yes
TVe	ml	Expiratory tidal volume	Yes
TVi	ml	Inspired tidal volume	Yes
TVe/IBW	ml/kg	TVe/IBW	Yes
MVe	L/min	Expiratory minute volume	Yes
MVi	L/min	Inspiratory mimute volume	Yes
MVspn	L/min	Spontaneous breathed minute volume	Yes
ftotal	/min	Total respiratory rate	Yes
fspn	/min	Spontaneous respiratory rate	Yes
I:E	\	Inspiratory time:Expiratory time ratio	Yes
TI/TTOT	\	Duty cycle or ratio of inspiration time to total breathing cycle time (only during spontaneous breathing)	Yes
Leak Comp	%	Leak compensation	No

Monitor output: parameters from MAQUET SERVO-U/SERVO-N ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Cstat	ml/cmH2O,ml/hPa,ml/mbar	Static compliance	Yes
Cdyn	ml/cmH2O,ml/hPa,ml/mbar	Dynamic compliance	Yes
RSBI	1/(min.L)	Rapid shallow breathing index	Yes
WOB	J/L	Work of breathing	Yes
Exp Flow	L/min	Expiratory flow	No
Ri	cmH2O/L/s,hPa/L/s,mbar/L/s	Inspiratory resistance	Yes
Re	cmH2O/L/s,hPa/L/s,mbar/L/s	Expiratory resistance	Yes
PO_2	kPa	oxygen supply pressure	No
Pair	kPa	air supply pressure	No
P0.1	cmH2O, hPa, mbar	100 ms occlusion pressure	No
PEEPtot	cmH2O, hPa, mbar	Total PEEP	Yes
$EtCO_2$	%,kPa,mmHg	End-tidal carbon dioxide	Yes
VCO_2	ml/min	CO_2 production	No
$VTCO_2$	ml	CO_2 tidal elimination	No
EtCO2%	%	End-tidal carbon dioxide	Yes
Setting Parameters			
TV	ml	Tidal volume	No
TVapnea	ml	Apnea tidal volume	No
MV	L/min	Minute volume	No
fapnea	/min	Breath rate for apnea ventilation	No
f	/min	Breath rate	No
fsimv	/min	Frequency of SIMV	No
I:E	\	Inspiratory time: Expiratory time ratio	No
F-Trig	L/min	Inspiratory trigger level (flow trigger)	No

Monitor output: parameters from MAQUET SERVO-U/SERVO-N ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
P-Trig	cmH2O, hPa, mbar	Inspiratory trigger level (pressure trigger)	No
Plimit	cmH2O, hPa, mbar	Pressure limit level	No
Tinsp	sec	Time of inspiration	No
Tpause	%	Pause Time%	No
Tslope	sec	Rise time	No
Rise Time%	%	rise time%	No
Phigh	cmH2O, hPa, mbar	Upper pressure level	No
Thigh	sec	Time for the upper pressure level	No
Tpeep	sec	Time at PEEP level in Bi-Vent	No
PC above PEEP	cmH2O, hPa, mbar	PC above PEEP	No
PS above PEEP	cmH2O, hPa, mbar	PS above PEEP	No
PEEP/ CPAP	cmH2O, hPa, mbar	PEEP/CPAP	No
Flow	L/min	Flow	No
Apnea Tinsp	sec	Apnea time	No
O_2%	%	Oxygen concentration	No
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	No

4.18.2 Output Signals - Alarms

Monitor output: alarms from MAQUET SERVO-U/SERVO-N ventilator		
Mindray Patient Monitor		**SERVO-U/SERVO-N Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	Apnea	Apnea
High	FiO_2 High	O2 concentration high
High	FiO_2 Low	O2 concentration low
High	High Paw Sustained	Airway pressure continuously high
High	MV High	Expiratory minute volume high
High	MV Low	Expiratory minute volume low
High	Paw High	Airway pressure high
High	PEEP High	PEEP high
High	PEEP Low	PEEP low
Medium	$EtCO_2$ High	EtCO2 high
Medium	$EtCO_2$ Low	EtCO2 low
Medium	RR High	Respiratory rate High
Medium	RR Low	Respiratory rate low
Technical alarms		
High	Patient Disconnected	Patient_Disconnected
High	O2 cell disconnect	O2_cell_disconnect
High	No Gas Supply Pressure	No_Gas_Supply_Pressure
High	High Technical alarms	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: Battery alarm Overrange alarm Time in waiting position > 2 min Patient disconnected > 1 min Leakage too high

Monitor output: alarms from MAQUET SERVO-U/SERVO-N ventilator		
Mindray Patient Monitor		**SERVO-U/SERVO-N Alarm**
Priority	**Label**	**Label**
Medium	Medium Technical alarms	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the following alarms: The nebulizer cannot be run on one battery No consistent patient effort No patient effort CPAP high CPAP low Expiratory cassette disconnected Edi signal invalid Edi signal interference from ECG
Low	Battery in Use	Battery_in_Use
Low	Low Technical alarms	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: Inconsistent Edi signal Volume delivery restricted Low Edi signal No Edi signal detected Expiratory cassette replaced

4.18.3 Output Signals - Waveforms (For BeneVision N series Monitors)

Label	Units
Paw	cmH2O, mbar, hpa
Flow	L/min
Vol	mL
CO2	%,kPa,mmHg

4.18.4 Output Signals - Respiratory Loops (For BeneVision N series Monitors)

Label	Units
PV Loop	cmH2O/ml, hPa/ml, mbar/ml
FV Loop	L/min/ml
PF Loop	cmH2O/L/min, hPa/L/min, mbar/L/min

4.19 Newport E360

4.19.1 Output Signals - Parameters

Monitor output: parameters from Newport E360 ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	Yes
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes
Pmean	cmH2O, hPa, mbar	Mean pressure	Yes
TVe	ml	Expiratory tidal volume	Yes
TVi	ml	Inspired tidal volume	Yes
MVspn	L/min	Spontaneous breathed minute volume	Yes
MVe	L/min	Expiratory minute volume	Yes
MVi	L/min	Inspiratory mimute volume	Yes
ftotal	/min	Total respiratory rate	Yes
fspn	/min	Spontaneous respiratory rate	Yes
I:E	\	Inspiratory time: Expiratory time ratio	Yes
FiO_2	%,kPa,mmHg	Fractional concentration of O_2 in inspired gas	Yes
FiO_2%	%	Fractional concentration of O_2 in inspired gas	Yes

Monitor output: parameters from Newport E360 ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Insp Flow	L/min	Inspiration flow	Yes
Exp Flow	L/min	Expiratory flow	No
PEEPtot	cmH2O, hPa, mbar	Total PEEP	Yes
Setting Parameters			
TV	ml	Tidal volume	No
f	/min	Breath rate	No
F-Trig	L/min	Inspiratory trigger level (flow trigger)	No
P-Trig	cmH2O, hPa, mbar	Inspiratory trigger level (pressure trigger)	No
△Psupp	cmH2O, hPa, mbar	Pressure support level	No
Plimit	cmH2O, hPa, mbar	Pressure limit level	No
Tinsp	sec	Time of inspiration	No
PEEP/ CPAP	cmH2O, hPa, mbar	PEEP/CPAP	No

4.19.2 Output Signals - Alarms

Monitor output: alarms from Newport E360 ventilator		
Mindray Patient Monitor		**Newport E360 Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	Paw High	High Paw
High	Paw Low	Low Paw
High	MV High	High Exhale Mv
High	MV Low	Low Exhale Mv
High	Apnea	Apnea Alarm
High	FiO_2 High	FiO2 High
High	FiO_2 Low	FiO2 Low

Monitor output: alarms from Newport E360 ventilator		
Mindray Patient Monitor		**Newport E360 Alarm**
Priority	**Label**	**Label**
High	TV Not Achieved	Volume Target Not Met
High	High Baseline	High Baseline
High	Low Baseline	Low Baseline
High	Sustained Hbline	Sustained Hbline
Medium	RR High	Resp. Rate Alarm
Technical alarms		
High	Air Supply Pressure Low	Air Supply Loss
High	O_2 Supply Pressure Low	O2 Supply Loss
High	Check Flow Sensors	Flow Sensor Error
High	Power Failure	Power Failure
High	Tinsp too Short	Insp Time too Short
High	Patient Disconnected	Patient Disconnected

Monitor output: alarms from Newport E360 ventilator		
Mindray Patient Monitor		**Newport E360 Alarm**
Priority	**Label**	**Label**
High	High Technical alarms	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: Device Alert No O_2 Power-Up Control EEPROM Failure Low Battery Transducer Error Mon Internal System Failed Ctrol Internal System Failed Air Servo Valve Leak O_2 Servo Valve Leak Control RAM Failed Control ROM Failed Control CPU Failed Monitor RAM Failed Monitor ROM Failed Monitor CPU Failed Dual RAM Failed Monitor Tasks Failed Control Processor Failed Control Tasks Failed Monitor Processor Failed Fan Failure Air Flow Sensor EEPROM Failure O2 Flow Sensor EEPROM Failure
Medium	O_2 and air supply	Air & O2 Supply Loss
Medium	FiO2 Sensor Disconnected	FiO2 Sensor Disconnected

Monitor output: alarms from Newport E360 ventilator		
Mindray Patient Monitor		**Newport E360 Alarm**
Priority	**Label**	**Label**
Medium	Medium Technical alarms	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the following alarms: Flow Sensor Cal Failed FiO_2 Sensor Bad O_2 Sensor Cal Failed External Battery Check Flow Sensor Board NO TEST
Low	Low Technical alarms	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: I:E Ratio Inverse violation Plimit<Pbase Psupport+Pbase>60cmH_2O Pbase>Low Paw Tidal Volume Out of Range Flow Out of Range Ti Out of Range Rate Out of Range Psupport Out of Range Plimit Out of Range PEEP/CPAP Out of Range Flow Trigger Out of Range CPM Blinking EXH. VALVE CAL. Failed: Prox < 1 EXH. VALVE CAL. Failed: Prox > 0.5 EXH. VALVE CAL. Failed: Prox Low EXH. VALVE CAL. Failed: Flow < 1 Leak Test Failed
Low	Tinsp too Long	Insp Time too Long
Low	Battery in Use	Battery in Use

4.20 Philips Respironics V60 (SNDA Protocol)

4.20.1 Output Signals - Parameters

Monitor output: parameters from Philips Respironics V60 (SNDA protocol) ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
ftotal	/min	Total breath rate	Yes
TVe	ml	Expiratory tidal volume	Yes
MV	L/min	Minute volume	Yes
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes
Setting Parameters			
f	/min	Breath rate	No
O_2%	%	Oxygen concentration	Yes
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	No
△Psupp	cmH2O, hPa, mbar	Pressure support level	No
Pinsp	cmH2O, hPa, mbar	Pressure control level of inspiration	No
Tinsp	sec	Time of inspiration	No

4.20.2 Output Signals - Alarms

Monitor output: alarms from Philips Respironics V60 (SNDA protocol) ventilator		
Mindray Patient Monitor		**Respironics V60 (SNDA protocol) Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	Paw High	High inhalation pressure
High	Paw Low	Low inhalation pressure Low inspiratory pressure
High	MV Low	Low exhaled minute volume Low minute volume
Medium	RR High	High respiratory rate

Monitor output: alarms from Philips Respironics V60 (SNDA protocol) ventilator		
Mindray Patient Monitor		**Respironics V60 (SNDA protocol) Alarm**
Priority	**Label**	**Label**
Medium	TVe Low	Low exhaled mandatory spontaneous tidal volume
Technical alarms		
High	O_2 Supply Pressure Low	Low oxygen supply pressure
High	Patient Disconnect	Occlusion or I-time too long
High	High Technical alarms	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: Low battery

4.21 Philips Respironics V60 (VRPT Protocol)

4.21.1 Output Signals - Parameters

Monitor output: parameters from Philips Respironics V60 (VRPT protocol) ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
ftotal	/min	Total breath rate	Yes
TVe	ml	Expiratory tidal volume	Yes
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes
MVe	L/min	Expiratory minute volume	Yes
Mvleak	L/min	Leakage minute volume	Yes
TI/TTOT	\	Oxygen concentration	Yes
Setting Parameters			
f	/min	Breath rate	No
O_2%	%	Oxygen concentration	No
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	No
Pinsp	cmH2O, hPa, mbar	Pressure control level of inspiration	No

Monitor output: parameters from Philips Respironics V60 (VRPT protocol) ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Tinsp	sec	Time of inspiration	No

4.21.2 Output Signals - Alarms

Monitor output: alarms from Philips Respironics V60 (VRPT protocol) ventilator		
Mindray Patient Monitor		**Respironics V60 Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	Paw Low	Low inhalation pressure, Low inspiratory pressure
High	Paw High	High inhalation pressure
High	MV Low	Low exhaled minute volume Low minute volume
High	PEEP Low	Low PEEP
Medium	RR High	High respiratory rate
Medium	RR Low	Apnea
Medium	TVe Low	Low exhaled mandatory spontaneous tidal volume
Technical alarms		
High	O_2 Supply Pressure Low	Low O2 supply
High	High Technical alarms	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: Low internal battery alarm status Primary alarm failure Air source fault alarm status O2 valve stuck closed alarm status
High	Airway Obstructed?	Occlusion
High	EXP-VALVE?	Safety valve

Monitor output: alarms from Philips Respironics V60 (VRPT protocol) ventilator		
Mindray Patient Monitor		**Respironics V60 Alarm**
Priority	**Label**	**Label**
Medium	Medium Technical alarms	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the alarm: High enclosure temperature.
Low	Airway Leak?	High leak
Low	Low Technical alarms	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the alarm: Nonvolatile memory failure.

4.22 Puritan Bennett PB840/PB980 (SNDF Protocol)

4.22.1 Output Signals - Parameters

Monitor output: parameters from Puritan Bennett PB840/PB980 (SNDF protocol) ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
O_2%	%	Oxygen concentration	Yes
EtCO2	%, mmHg, kPa	End-tidal carbon dioxide	Yes
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	Yes
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes
Pplat	cmH2O, hPa, mbar	Plateau pressure	Yes
Pmean	cmH2O, hPa, mbar	Mean pressure	Yes
TVe	ml	Expiratory tidal volume	Yes
TVi	ml	Inspired tidal volume	Yes
TVe spn	ml	Spontaneous expiratory tidal volume	Yes
MVspn	L/min	Spontaneous breathed minute volume	Yes

Monitor output: parameters from Puritan Bennett PB840/PB980 (SNDF protocol) ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
MVe	L/min	Expiratory minute volume	Yes
ftotal	/min	Total respiratory rate	Yes
I:E	\	Inspiratory time: Expiratory time ratio	Yes
Mvleak	L/min	Leakage minute volume	Yes
Leak Comp	%	Leak compensation	No
Rstat	cmH2O/L/s,hPa/L/s,mbar/L/s	Static lung resistance	Yes
Rdyn	cmH2O/L/s,hPa/L/s,mbar/L/s	Dynamic lung resistance	Yes
Cstat	ml/cmH2O,ml/hPa,ml/mbar	Static compliance	Yes
Cdyn	ml/cmH2O,ml/hPa,ml/mbar	Dynamic compliance	Yes
RSBI	1/(min.L)	Rapid shallow breathing index	Yes
WOB	J/L	Work of breathing	Yes
NIF	cmH2O, hPa, mbar	Negative inspiratory force	No
P0.1	cmH2O, hPa, mbar	100 ms occlusion pressure	No
PEEPi	cmH2O, hPa, mbar	Intrinsic positive end-expiratory pressure	Yes
PEEPtot	cmH2O, hPa, mbar	Total PEEP	Yes
Setting Parameters			
TV	ml	Tidal volume	No
TVapnea	ml	Apnea tidal volume	No
PeakFlow	L/min	Peak flow	No
Apnea Tinsp	sec	Apnea interval	No
IBW	kg	Ideal body weight	No
Ti max	sec	Maximum inspirationtime	No
Tube ID	mm	Tube ID	No

Monitor output: parameters from Puritan Bennett PB840/PB980 (SNDF protocol) ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Phigh	cmH2O, hPa, mbar	Upper pressure level	No
Plow	cmH2O, hPa, mbar	Lower pressure level	No
Thigh	sec	Time for the upperpressure level	No
Tlow	sec	Time for the lowerpressure level	No
fapnea	/min	Breath rate for apnea ventilation	No
f	/min	Breath rate	No
I:E	\	Inspiratory time: Expiratory time ratio	No
Base Flow	L/min	Base Flow	No
F-Trig	L/min	Inspiratory triggerlevel (flow trigger)	No
P-Trig	cmH2O, hPa, mbar	Inspiratory trigger level (pressure trigger)	No
△Psupp	cmH2O, hPa, mbar	Pressure support level	No
Tplat	sec	Plateau time	No
Rise Time%	%	Rise time%	No
PEEP/ CPAP	cmH2O, hPa, mbar	PEEP/CPAP	No

4.22.2 Output Signals - Alarms

Monitor output: alarms from Puritan Bennett PB840/PB980 (SNDF protocol) ventilator		
Mindray Patient Monitor		**PB840/PB980 (SNDF protocol) Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	MV High	High Exhaled minute Volume
High	MV Low	Low Exhaled Minute Volume
High	Apnea	Apnea

Monitor output: alarms from Puritan Bennett PB840/PB980 (SNDF protocol) ventilator		
Mindray Patient Monitor		**PB840/PB980 (SNDF protocol) Alarm**
Priority	**Label**	**Label**
High	FiO_2 Low	Low O2 %
High	Ppeak High	High Ppeak
High	Ppeak Low	Low Ppeak
Medium	TVe High	High Exhaled Tidal Volume
Medium	RR High	High ftotal
Medium	TVe Low	Low Exhaled Mandatory Tidal Volume Alarm
Medium	EtO_2 High	High O2 Percent
Technical alarms		
High	Air Supply Pressure Low	No Air Supply
High	O_2 Supply Pressure Low	No O2 Supply
High	Airway Obstructed?	Severe Occlusion
High	Circuit Disconnect	Circuit Disconnect
High	Power Failure	Loss of Power
High	High Technical alarms	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: Compressor Inoperative Compliance Limited VT Procedure Error PAV Startup Too Long PAV R& C Not Assessed Volume Not Delivered(VC+) Volume Not Delivered(VS)
Low	Low Technical alarms	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: Inoperative Battery Low Battery Ac Power Loss
Low	Tinsp too Long	Inspiration Too Long

4.23 Puritan Bennett PB840/PB980 (SNDA Protocol)

4.23.1 Output Signals - Parameters

Monitor output: parameters from Puritan Bennett PB840/PB980 (SNDA protocol) ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
Ppeak	cmH2O, hPa, mbar	Peak pressure	Yes
Pplat	cmH2O, hPa, mbar	Plateau pressure	Yes
Pmean	cmH2O, hPa, mbar	Mean pressure	Yes
TVe	ml	Expiratory tidal volume	Yes
MVspn	L/min	Spontaneous breathed minute volume	Yes
MVe	L/min	Expiratory minute volume	Yes
ftotal	/min	Total respiratory rate	Yes
I:E	\	Inspiratory time: Expiratory time ratio	Yes
Rstat	cmH2O/L/s,hPa/L/s,mbar/L/s	Static lung resistance	Yes
Rdyn	cmH2O/L/s,hPa/L/s,mbar/L/s	Dynamic lung resistance	Yes
Cstat	ml/cmH2O,ml/hPa,ml/mbar	Static compliance	Yes
Cdyn	ml/cmH2O,ml/hPa,ml/mbar	Dynamic compliance	Yes
NIF	cmH2O, hPa, mbar	Negative inspiratory force	No
PR	/min	Pulse rate	Yes
SpO2	%	Arterial oxygen saturation from pulse oximetry	Yes
Setting Parameters			
TV	ml	Tidal volume	No
TVapnea	ml	Apnea tidal volume	No
fapnea	/min	Breath rate for apnea ventilation	No

Monitor output: parameters from Puritan Bennett PB840/PB980 (SNDA protocol) ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
f	/min	Breath rate	No
I:E	\	Inspiratory time: Expiratory time ratio	No
Base Flow	L/min	Base Flow	No
F-Trig	L/min	Inspiratory trigger level (flow trigger)	No
P-Trig	cmH2O, hPa, mbar	Inspiratory trigger level (pressure trigger)	No
△Psupp	cmH2O, hPa, mbar	Pressure support level	No
Tplat	sec	Plateau time	No
PEEP/ CPAP	cmH2O, hPa, mbar	PEEP/CPAP	No
Peak Flow	L/min	Peak flow	No
Apnea Tinsp	sec	Apnea interval	No
Phigh	cmH2O, hPa, mbar	Upper pressure level	No
Plow	cmH2O, hPa, mbar	Lower pressure level	No
Cycles Sigh	/min	Sigh Rate	No
VTsigh	ml	Sigh Tidal Volume	No

4.23.2 Output Signals - Alarms

Monitor output: alarms from Puritan Bennett PB840/PB980 (SNDA protocol) ventilator		
Mindray Patient Monitor		**PB840/PB980 (SNDA protocol) Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	SpO2 Low	Low Saturation Alarm
High	SpO2 High	High Saturation Alarm

Monitor output: alarms from Puritan Bennett PB840/PB980 (SNDA protocol) ventilator		
Mindray Patient Monitor		**PB840/PB980 (SNDA protocol) Alarm**
Priority	**Label**	**Label**
High	MV Low	Low Exhaled minute Volume
High	Apnea	Apnea
High	PR Low	Low Pulse Rate Alarm
High	PR High	High Pulse Rate Alarm
High	Ppeak Low	Low Ppeak
High	Ppeak High	High Ppeak
Medium	TVe Low	Low Exhaled Mandatory Tidal Volume Alarm
Medium	RR High	High ftotal
Technical alarms		
High	Air Supply Pressure Low	No Air Supply
High	O_2 Supply Pressure Low	No O2 Supply
High	EXP-VALVE?	Exhalation Valve Leak
High	Circuit Disconnect	Circuit Disconnect
Low	Low Technical alarms	If the monitor shows the alarm [**Low Technical alarms**], the external device may have the following alarms: Low Battery

4.24 ResMed VSIII (For Passport M Series)

4.24.1 Output Signals - Parameters

Monitor output: parameters from ResMed VSIII ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
Monitoring Parameters			
ftotal	/min	Total respiratory rate	Yes
Mvleak	L/min	Leakage minute volume	Yes
Setting Parameters			
PEEP	cmH2O, hPa, mbar	Positive end-expiratory pressure	No

Monitor output: parameters from ResMed VSIII ventilator			
Labels	**Units**	**Description**	**Trend, record, print**
TV	ml	Tidal volume	No
f	/min	Breath rate	No
F-Trig	L/min	Inspiratory trigger level (flow trigger)	No
Tinsp	sec	Time of inspiration	No
Pinsp	cmH2O, hPa, mbar	Pressure control level of inspiration	No
Exp%	%	Inspiration termination level	No
Ti max	sec	Maximum inspiration time	No

4.24.2 Output Signals - Alarms

Monitor output: alarms from ResMed VSIII ventilator		
Mindray Patient Monitor		**VSIII Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	Paw High	High pressure
High	Paw Low	Low Pressure
High	Apnea	Apnea alarm
Medium	RR High	High Frequency alarm
Technical alarms		
High	Power Failure	Main disconnect
High	Tube Disconnected?	Turbine alarm
High	O_2 cell cal.Needed	FiO2 Cell Defective
High	O_2 cell disconnect	Fi O2 Cell Missing

Monitor output: alarms from ResMed VSIII ventilator		
Mindray Patient Monitor		**VSIII Alarm**
Priority	**Label**	**Label**
High	High Technical Alarm	If the monitor shows the alarm [**High Technical alarms**], the external device may have the following alarms: No power supply Without external DC power supply Technical Alarm Internal battery temperature out of range
Medium	Patient Circuit Leak	Patient circuit disconnected
Medium	Medium Technical Alarm	If the monitor shows the alarm [**Medium Technical alarms**], the external device may have the following alarms: With power supply With mains power No power supply

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5 Integrating the tcGas Monitoring Device

5.1 RADIOMETER TCM40 (for BeneVision N Series Patient Monitors)

5.1.1 Output Signals - Parameters

Monitor output: parameters from RADIOMETER TCM40 tcGas Monitoring Device			
Labels	**Units**	**Description**	**Trend, record, print**
$tcpCO_2$	mmHg,kPa	Transcutaneous carbon dioxide partial pressures	Yes
$tcpO_2$	mmHg,kPa	Transcutaneous oxygen partial pressures	Yes
Power	mW	Sensor heating power	Yes
Tsensor	℃,℉	Sensor temperature	Yes
PR	bpm	Pulse rate	Yes
SpO_2	%	Arterial oxygen saturation from pulse oximetry	Yes

5.1.2 Output Signals - Alarms

Monitor output: alarms from RADIOMETER TCM40 tcGas Monitoring Device		
Mindray Patient Monitor		**RADIOMETER TCM40 Alarm**
Priority	**Label**	**Label**
Physiological alarms		
Medium	SpO_2 Alarm	SpO2 Alarm high/low
Medium	$tcpCO_2$ Alarm	tcpCO2 Alarm high/low
Medium	$tcpO_2$ Alarm	tcpO2 Alarm high/low
Medium	PR Alarm	Pulse Alarm high/low
Technical alarms		
High	tcGas Battery Depleted	Battery level critically low
High	TCM Temperature High	Monitor temperature too high
Medium	tcGas Low Battery	Battery level low
Low	TCM Alert	TCM Alert

5.2 RADIOMETER TCM4/TCM CombiM

NOTE

- **Only the BeneVision N series monitor supports integration with the TCM 4 monitor.**
- **Only the Passport M series monitor supports integration with the TCM CombiM monitor.**

5.2.1 Output Signals - Parameters

Monitor output: parameters from RADIOMETER TCM4/TCM CombiM tcGas Monitoring Device			
Labels	**Units**	**Description**	**Trend, record, print**
$tcpCO_2$	mmHg,kPa	Transcutaneous carbon dioxide partial pressures	Yes
$tcpO_2$	mmHg,kPa	Transcutaneous oxygen partial pressures	Yes

Monitor output: parameters from RADIOMETER TCM4/TCM CombiM tcGas Monitoring Device			
Labels	**Units**	**Description**	**Trend, record, print**
Power	mW	Sensor heating power	Yes
Tsensor	℃,℉	Sensor temperature	Yes

5.2.2 Output Signals - Alarms

Monitor output: alarms from RADIOMETER TCM4/TCM CombiM tcGas Monitoring Device		
Mindray Patient Monitor		**RADIOMETER TCM4/TCM 5/TCM CombiM Alarm**
Priority	**Label**	**Label**
Physiological alarms		
Medium	$tcpCO_2$ Alarm	pCO2 alarm high/low
Medium	$tcpO_2$ Alarm	pO2 alarm high/low
Technical alarms		
High	tcGas Battery Depleted	Battery level critically low
High	TCM Temperature High	Monitor temperature too high
Medium	tcGas Low Battery	Battery level low
Low	TCM Alert	TCM Alert

5.3 RADIOMETER TCM Tosca (for Passport M Series Patient Monitors)

5.3.1 Output Signals - Parameters

Monitor output: parameters from RADIOMETER TCM Tosca tcGas Monitoring Device			
Labels	**Units**	**Description**	**Trend, record, print**
$tcpCO_2$	mmHg,kPa	Transcutaneous carbon dioxide partial pressures	Yes
Power	mW	Sensor heating power	Yes

Monitor output: parameters from RADIOMETER TCM Tosca tcGas Monitoring Device			
Labels	**Units**	**Description**	**Trend, record, print**
Tsensor	℃,℉	Sensor temperature	Yes
PR	bpm	Pulse rate	Yes
SpO_2	%	Arterial oxygen saturation from pulse oximetry	Yes

5.3.2 Output Signals - Alarms

Monitor output: alarms from RADIOMETER TCM Tosca tcGas Monitoring Device		
Mindray Patient Monitor		**RADIOMETER TCM Tosca Alarm**
Priority	**Label**	**Label**
Physiological alarms		
Medium	SpO_2 Alarm	SpO2 Alarm high/low
	$tcpCO_2$ Alarm	pCO2 Alarm high/low
	PR Alarm	Pulse Alarm high/low
Technical alarms		
High	tcGas Battery Depleted	Battery level critically low
	TCM Temperature High	Monitor temperature too high
Medium	tcGas Low Battery	Battery level low
Low	TCM Alert	TCM Alert

5.4 SenTec Digital Monitor

5.4.1 Output Signals - Parameters

Monitor output: parameters from SenTec Digital Monitor			
Labels	**Units**	**Description**	**Trend, record, print**
$tcpCO_2$	mmHg,kPa	Transcutaneous carbon dioxide partial pressures	Yes

Monitor output: parameters from SenTec Digital Monitor			
Labels	**Units**	**Description**	**Trend, record, print**
$tcpO_2$	mmHg,kPa	Transcutaneous oxygen partial pressures	Yes
Power	mW	Sensor heating power	Yes
Tsensor	℃,℉	Sensor temperature	Yes
PR	bpm	Pulse rate	Yes
SpO_2	%	Arterial oxygen saturation from pulse oximetry	Yes

5.4.2 Output Signals - Alarms

Monitor output: alarms from SenTec Digital Monitor		
Mindray Patient Monitor		**SenTec Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	SpO_2 Alarm	SpO2 Alarm high/low
Medium	$tcpCO_2$ Alarm	tcpCO2 Alarm high/low
	tcpO2 Alarm	tcpO2 Alarm high/low
	PR Alarm	Pulse Alarm high/low
Technical alarms		
High	tcGas Battery Depleted	SDMS Battery Critical
Medium	tcGas Low Battery	SDMS Battery Low

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6 Integrating Infusion System

You can connect the infusion systems to the four network connectors of the BeneLink module at the same time. Up to 24 pumps can be connected.

6.1 B.Braun Perfusor Space Pumps (For BeneVision N series Monitors)

6.1.1 Output Signals - Parameters

Monitor output: parameters from B.Braun Perfusor Space Pumps			
Labels	**Units**	**Description**	**Trend, record, print**
Rate	ml/hr	Flow Rate	No
V-infused	ml	Infused Volume	No
T-Remain	h:m	Time Remain	No
T-infused	h:m	Time Infused	No
Drug Name	\	Drug Name	No
Status	\	Infused Status	No
Mode	\	Infused Mode	No

6.1.2 Output Signals - Technical Alarms

Monitor output: alarms from B.Braun Perfusor Space Pumps		
Mindray Patient Monitor		**Perfusor Space Alarm**
Priority	**Label**	**Label**
High	Low Battery	Battery alarm
High	Syringe Empty	Syringe empty
High	Occlusion	Pressure too high

Monitor output: alarms from B.Braun Perfusor Space Pumps		
Mindray Patient Monitor		**Perfusor Space Alarm**
Priority	**Label**	**Label**
High	End of infusion	Volume infused Infusion time expired x hour limit is reached. Only for PCA operation
High	Door Open	Syringe holder open
High	Drop alarm	Drop alarm, summary of all drop alarms Drop alarm: no drops
High	Air bubble	Air alarm, summary of all air alarms Air alarm: Air bubble too large > 0.3 ml Air alarm: Air rate exceeded > 4 ml/h Air alarm: sensor test faulty
High	Syringe Near Empty	syringe empty pre-alarm

6.2 Fresenius Agilia Injectomat Series Infusion Pumps (For BeneVision N series Monitors)

6.2.1 Output Signals - Parameters

Monitor output: parameters from Fresenius Agilia Injectomat series Infusion Pumps			
Labels	**Units**	**Description**	**Trend, record, print**
Rate	ml/hr	Flow Rate	No
V-infused	ml	Infused Volume	No
Drug Name	\	Drug Name	No
VTBI	ml	Left Volume	No

6.2.2 Output Signals - Technical Alarms

Monitor output: alarms from Fresenius Agilia Injectomat series Infusion Pumps		
Mindray Patient Monitor		**Agilia Injectomat Alarm**
Priority	**Label**	**Label**
High	Low Battery	Battery/Pre-Alarm Battery
High	End of infusion	end of limit volume end of volume/time end of infusion
High	Occlusion	occlusion rise of pressure
High	Mechanical Abnormal	syringe clamp flange plunger head
High	Syringe disengagement	disengagment
High	Drop too less	infusion flow rate low
High	Drop too many	infusion flow rate high
High	Syringe Empty	syringe empty
Medium	Pre-Occlusion	occlusion(pre-alarm)
Medium	System Abnormal	power disconnection
Low	Infusion Near Done	end of limit volume (pre-alarm) end of volume/time(pre-alarm) end of infusion (pre-alarm)

6.3 Fresenius Agilia Volumat Series Infusion Pumps (For BeneVision N series Monitors)

6.3.1 Output Signals - Parameters

Monitor output: parameters from Fresenius Agilia Volumat series Infusion Pumps			
Labels	**Units**	**Description**	**Trend, record, print**
Rate	ml/hr	Flow Rate	No
V-infused	ml	Infused Volume	No
Drug Name	\	Drug Name	No
VTBI	ml	Left Volume	No

6.3.2 Output Signals - Technical Alarms

Monitor output: alarms from Fresenius Agilia Volumat series Infusion Pumps		
Mindray Patient Monitor		**Agilia Volumat Alarm**
Priority	**Label**	**Label**
High	Low Battery	battery alarm battery pre-alarm
High	end of infusion	end of infusion alarm end of secondary infusion alarm
High	Occlusion	downstream occlusion alarm upstream occlusion alarm occlusion detected by drop sensor occlusion check system failed pressure increase
High	Mechanical Abnormal	clamp missing
High	Syringe disengagement	Disengagement
High	Sensor alarm	absence of drop sensor presence of drop sensor
High	Drop too less	under flow alarm detected by drop sensor low flow rate or low dose
High	Drop too many	over flow alarm detected by drop sensor high flow rate or high dose

Monitor output: alarms from Fresenius Agilia Volumat series Infusion Pumps		
Mindray Patient Monitor		**Agilia Volumat Alarm**
Priority	**Label**	**Label**
High	Syringe Empty	Syringe empty
High	Door Open	door opened alarm
High	Drop alarm	uncontrolled flow alarm
High	Air bubble	Air alarm (air presence or air detection failure) Air alarm (air volume exceeded limit)
Medium	Pre-Occlusion	downstream occlusion pre-alarm
Medium	System Abnormal	set not detected by upstream pressure sensor set not detected by downstream pressure sensor set not installed correctly main disconnection
Low	Infusion Near Done	end of infusion pre-alarm

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7 Integrating Other Devices

7.1 Masimo Radical 7 Pulse CO-Oximeter (For BeneVision N Series Monitors)

7.1.1 Output Signals – Parameters

Monitor output: parameters from Masimo Radical 7 Pulse CO-Oximeter			
Labels	**Units**	**Description**	**Trend, record, print**
SpO2	%	Arterial oxygen saturation from pulse oximetry	Yes
PR	bmp	Pulse rate	Yes
PI	/	Perfusion index	Yes
SpCO	%	Carboxyhemoglobin	Yes
SpMET	%	Methemoglobin	Yes
SpHb	g/l	Total hemoglobin	Yes
SpOC	ml/dl	Oxygen content	Yes
PVI	/	Pleth variability index	Yes
RRp	rpm	Respiration rate through the plethysmograph waveform	Yes
RRa	bpm	Respiration rate through either the novel acoustic sensor	Yes

7.1.2 Output Signals – Alarms

Monitor output: alarms from Masimo Radical 7 Pulse CO-Oximeter		
Mindray Patient Monitor		**Radical 7 Pulse Alarm**
Priority	**Label**	**Label**
Physiological alarms		
High	Respiratory Pause	Respiratory Pause
High	SpO2 High	SpO2 High
High	SpO2 Low	SpO2 Low
High	PR High	PR High
High	PR Low	PR Low
High	SpCO High	SpCO High
High	SpCO Low	SpCO Low
High	SpMET High	SpMET High
High	SpMET Low	SpMET Low
High	SpHb High	SpHb High
High	SpHb Low	SpHb Low
High	SpOC High	SpOC High
High	SpOC Low	SpOC Low
High	RR High	RR High
High	RR Low	RR Low
High	ORI High	ORI High
High	ORI Low	ORI Low
Medium	PI High	PI High
Medium	PI Low	PI Low
Medium	PI Delta High	PI Delta High
Medium	PI Delta low	PI Delta low
Medium	PVI High	PVI High
Medium	PVI Low	PVI Low
Medium	Desat Index	Desat Index

Monitor output: alarms from Masimo Radical 7 Pulse CO-Oximeter		
Mindray Patient Monitor		**Radical 7 Pulse Alarm**
Priority	**Label**	**Label**
Technical alarms		
High	No Cable Connected	No Cable Connected
High	No Sensor Connected	No Sensor Connected
High	No Tape	No Tape
High	Sensor Off Patient	Sensor Off Patient
High	Low Battery	Low Battery
Medium	Incompatible Cable	Incompatible Cable
Medium	Unrecognized Cable	Unrecognized Cable
Medium	Defective Cable	Defective Cable
Medium	Incompatible Sensor	Incompatible Sensor
Medium	Unrecognized Sensor	Unrecognized Sensor
Medium	Defective Sensor	Defective Sensor
Medium	Incompatible Tape	Incompatible Tape
Medium	Unrecognized Tape	Unrecognized Tape
Medium	Defective Tape	Defective Tape
Low	Cable Life Expired	Cable Life Expired
Low	Cable Life Near Expiration	Cable Life Near Expiration
Low	Sensor Life Expired	Sensor Life Expired
Low	Emitter Temp Out of Range	Emitter Temp Out of Range
Low	Sensor Current Limit Exceeded	Sensor Current Limit Exceeded
Low	Sensor Life Near Expiration	Sensor Life Near Expiration
Low	Tape Life Expired	Tape Life Expired
Low	Tape Life Near Expiration	Tape Life Near Expiration

7.2 Organon TOF-Watch SX NMT Monitoring Device

7.2.1 Output Signals - Parameters

Monitor output: parameters from Organon TOF-Watch SX NMT Monitoring Device			
Labels	**Units**	**Description**	**Trend, record, print**
TOF-Ratio	%	Train-of-four ratio	Yes
TOF-Count	/	Train-of-four count	Yes
PTC	/	post tetanic count	Yes
Single	/	Single twitch stimulation	Yes
Tskin	℃, ℉	Skin temperature	No
T1	%	Size of twitch 1 in %/	No
T2	%	Size of twitch 2 in %/	No
T3	%	Size of twitch 3 in %	No
T4	%	Size of twitch 4 in %	No

7.2.2 Output Signals - Alarms

Monitor output: alarms from Organon TOF-Watch SX NMT Monitoring Device		
Mindray Patient Monitor		**TOF-Watch SX Alarm**
Priority	**Label**	**Label**
Physiological alarms		
Medium	TOF Alarm	TOF Alarm Enabled
Technical alarms		
High	TWSX Battery Depleted	Battery empty
Medium	TWSX Low Battery	Battery Low
Low	TWSX No Acceleration Sensor	AccelleCable Not Mounted
Low	TWSX No Temp Sensor	TempCable Not Mounted
Low	TWSX No Stimulation Cable	SurfaceCable Not Mounted

Monitor output: alarms from Organon TOF-Watch SX NMT Monitoring Device		
Mindray Patient Monitor		**TOF-Watch SX Alarm**
Priority	**Label**	**Label**
Low	TWSX Technical Alarm	SkinResist Too high Calibration Error BadAccSignal BadTempSignal StimMissing AccMissing BadElectrode Internal Error
Prompt	TWSX Not Cal	Cal not calib

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8 BeneLink Function Test

8.1 Preparing the Tools

Prepare the tools for the function test according to the type of the external device you install. Please see the Instructions for Use of the corresponding external device for guidance. For the function test of ventilator and anesthesia machine, at least the following tools are needed:

- BeneVision patient monitor with BeneLink module properly installed
- Anesthesia machine or ventilator
- Gas source (tube or gas cylinder), including air or O_2 at least, and with N_2O or other anesthesia gases as options
- Tube that connects the or test lung
- Test lung and a matching Y-pipe, or other accessories

CAUTION

- **The Function tests should only be conducted by Mindray authorized personnel.**
- **Function tests should not be performed while in use with a patient.**

8.2 Checking the Function

To check the function of the BeneLink module, follow this procedure:

1. Connect the BeneLink module to the ventilator or the anesthesia machine. See ***2.7 Connecting External Devices*** for more details.
2. Connect the gas supply and test lungs to the ventilator or anesthesia machine, turn on the device, and configure as follows:
   - Set the serial port of the external device by referring to ***8.3 Setting the Serial Ports***.
   - Set the pressure control mode and check if the ventilator or anesthesia machine works normally.
3. Make sure the ID adapter is correctly configured, and the green indicator of corresponding port on the BeneLink module illuminates constantly.
4. Access the **Integrated Devices** screen on the patient monitor. Check that the device type (ventilator or anesthesia machine) and ventilation mode are correctly displayed.

5. Select parameters PEEP, Pmean, TVe, MV, I:E, and f(RR) respectively on the patient monitor and check if the parameter values displayed on the patient monitor are consistent with those displayed on the ventilator or anesthesia machine.
6. Re-configure the above parameters on the ventilator or the anesthesia machine and check if the parameter values displayed on the patient monitor change accordingly.
7. Trigger alarms **MV Low**, **Airway Pressure Too High**, **PAW High**, **Peak High** and **No Gas Supply** (no Air or O2) on the ventilator or the anesthesia machine. Check whether these alarm messages are correctly recorded in the alarm list of the patient monitor.
8. Switch the ventilator or anesthesia machine to volume control ventilation mode. Check if the ventilation mode displayed on the patient monitor changes accordingly, and if the parameter values of PEEP, Pmean, TVe, MV, I:E, and f(RR) are correctly displayed.

8.3 Setting the Serial Ports

8.3.1 Setting the Serial Ports of the Anesthesia Machines

Brand	Model	Protocol	Baud Rate	Data Bits	Stop Bits	Parity	Remark
Draeger	Apollo	Medibus	9600	8	1	Even	Push knob/Switch screen/power together → System Service Screen → Serial Port
Draeger	Fabius GS/Fabius GS Premium	Medibus	9600	7	1	Even	Push knob/Switch screen/power together → System Service Screen → Serial Port
Draeger	Fabius Tiro	Medibus	9600	7	1	Even	1. In the standby mode, push knob/Switch screen/power together → System Service Screen → Serial Port 2. Select Serial Port → Parameters → Enter the Service Port Parameters Screen → Make the following Setting: •Baud Rate: 9600 •Parity: EVEN •Stop Bits: 1 •Data Bits: 7 •Protocol: MEDIBUS 3. The Setting take effect after shutdown and reboot.
Draeger	Perseus A500	Medibus	9600	8	1	Even	System Setup → System → interface
Draeger	Primus	Medibus	9600	8	1	Even	Push knob/Switch screen/power together → System Service Screen → Serial Port
GE	Aespire 7900/7100	/	19200	7	1	Odd	No need to set
GE	AespireView	/	19200	7	1	Odd	No need to set
GE	Aestiva 7900/7100	/	19200	7	1	Odd	No need to set
GE	Aisys/Aisys CS2	/	19200	7	1	Odd	No need to set
GE	Avance/ Avance CS2	/	19200	7	1	Odd	No need to set

Brand	Model	Protocol	Baud Rate	Data Bits	Stop Bits	Parity	Remark
Hul	Leon	/	19200	8	1	None	Standby → switch screen → Login → Service Engineer (password:0002) → Configuration → Page 2 → Serial Protocol: On, Mode: request driven
Hul	Leon Plus	/	19200	8	1	None	Standby → switch screen → Login → Service Engineer (password:0002) → Configuration → Page 2 → Serial Protocol: On, Mode: request driven
MAQUET	FLOW-i	/	38400	8	1	Even	No need to set
Mindray	A9/A8/A7/A5/A4/A3	WATO	/	/	/	/	1. Enter the Standby mode. 2. Select Setup to enter the System Setup menu (password is 1234). 3. Select Network → Serial → Protocol: MR-WATO.

8.3.2 Setting the Serial Ports of the Ventilator

Brand	Model	Protocol	Baud Rate	Data Bits	Stop Bits	Parity	Remark
AirLiquide	ALMS T75	/	38400	8	1	None	No need to set
Carefusion	Avea(VOXP)/ Vela	/	115200	8	1	None	/
Draeger	Babylog 8000/ 8000plus	/	9600	/	1	None	Cal. Config → config → com→ Start bit: 1
Draeger	Evita 2	Medibus	19200	/	1	Even	• Channel A: No need to set • Channel B: Menu Mode → Other
Draeger	Evita 2 Dura	Medibus	19200	/	1	Even	Cal. Conf. → Device → Interface
Draeger	Evita 4	Medibus	19200	/	1	Even	Configuration → Ventilation → System Defaults → Interface
Draeger	Evita XL	Medibus	19200	/	1	Even	/

Brand	Model	Protocol	Baud Rate	Data Bits	Stop Bits	Parity	Remark
Draeger	Infinity V500/ Babylog VN500	Medibus Medibus.X	19200	/	1	Even	System setup → system → interface → COM →Start bit: 1
Draeger	Savina 300	Medibus Medibus.X	19200	/	1	Even	System Setup → Interface
GE	Carescape R860	/	19200	7	1	Odd	No need to set
GE	Engström Carestation	/	19200	7	1	Odd	No need to set
Hamilton	C1/C2/C3/T1	Polling	9600	7	2	Even	System → General → More → RS232 Protocol: GALILEO compatible. **NOTE:** an adapting cable (P/N: 161545) is required for the Hamilton C1/T1. This cable is provided by Hamilton.
Hamilton	G5	Block	38400	8	1	None	Enter the Configuration menu.
Hamilton	G5	Polling	9600	7	2	Even	1. Enter the Standby mode. 2. Press and hold hard keys "O2 ICON" and "Lung ICON", "Lock/Unlock ICON" and "On/Off ICON". 3. Select Configuration → Interface. 4. Set com1/2 to Hamilton C5/Polling.
Hamilton	Galileo	Polling	9600	7	2	Even	Enter the Configuration menu.
Hul	Leon i Plus	/	19200	8	1	None	1. Select Standby → switch screen → Login → Service Engineer (password:0002) → "Connections. 2. Set as follows: Serial Protocol: On; Mode: request driven.
MAQUET	SERVO-i/ SERVO-s	/	9600	8	1	Even	No need to set
MAQUET	SERVO-U/ SERVO-N	/	38400	8	1	Even	No need to set
Newport	E360	Newport	38400	8	1	None	Setup & Calibration → Technical → Comm. Protocol: Newport

Brand	Model	Protocol	Baud Rate	Data Bits	Stop Bits	Parity	Remark
Philips	Respironics V60	SNDA VRPT	19200	/	/	/	Turn off machine → Hold confirm button and then push power button → Enter Diagnosis mode **Note: An extra 25-pin to 9-pin adapter is required.**
Puritan Bennett	PB840	SNDF SNDA	38400	8	/	None	Ventilator Setting → Other Screens → Communications Setup
Puritan Bennett	PB980	SNDF SNDA	/	/	/	/	COM1: 840 DCI
ResMed	VSIII	/	9600	8	1	/	No need to set

8.3.3 Setting the Serial Ports of the TcGas Monitoring Devices

Brand	Model	Protocol	Baud Rate	Data Bits	Stop Bits	Parity	Remark
RADIOMETER	TCM Tosca/ CombiM /TCM4/ TCM40	MonLink	9600	8	1	Even	Setup(password: 19100) → Tech.settings → Continuous data output: MonLink You need also the serial interface adapter with cable from RADIOMETER. (SN: 636-649)
SenTec	SenTec Digital Monitor)	SenTecLink	115200	/	/	/	Interfaces → Serial Interface → Protocol: SenTecLink

8.3.4 Setting the Serial Ports of the Infusion Systems

Brand	Model	Protocol	Baud Rate	Data Bits	Stop Bits	Parity	Remark
B.Braun	Perfusor Space	/	57600	8	1	None	1. Use the Type F cable to connect the spaceCom connector of the SpaceStation (if cascading is needed, refer to the official documents on how to cascade several SpaceStation). 2. Connect an PC to the docking station through Ethernet. 3. Open the IE explorer and input 192.168.100.41 (Username: config, Password: config). 4. Configure the following parameters: •BCC configuration panel: BCC 3.3x •Interface: com1 •Baudrate: 57600 •Stop bits: 1 •Databits: 8 •Character Stuffing: On •Operation Mode: Request 5. Select Configuration ? Database Setting: Bed ID, set the Bed No.
Fresenius	Agilia Injectomat, Agilia Injectomat MC, Agilia Injectomat TIVA, Agilia Volumat, Agilia Volumat MC Agilia Link+	/	115200	8	1	None	No need to set Connection method: • For Injectomat/Injectomat MC/Injectomat TIVA/Volumat/ Volumat MC, use TYPE G adapting cable+ ID adapter • For Link+ (4 Port Metal), use Type G adapting cable + ID adapter • For Link+ (8 Port Metal+Plasic), use Fesenius Cable + Type C adapting cable + ID adapter

8.3.5 Setting the Serial Ports of Other External Devices

Brand	Model	Protocol	Baud Rate	Data Bits	Stop Bits	Parity	Remark
Masimo/ pulse CO-oximeter	Radical 7	IAP	9600	8	1	/	• Method 1: Connecting Radical 7 via Docking Station: Main Menu → Device Settings → Device output → Serial: IAP • Method 2: Connecting Radical 7 via Root: 1. Main Menu → Device Settings → Device Output → IAP 2. Main Menu → Device Settings → Access Control Output (password: 6274) → set USB Port to 1 or 2, baudrate to 9600
Organon/NMT monitoring device	TOF-Watch SX	/	19200	8	1	None	No Need to set. The serial interface adapter with cable from Organon is required.

8.4 Troubleshooting Device Integration Failures

Failure Description	Possible Cause	Troubleshooting
The “Devices Integrated” window displays nothing after connection	The ID adapter is not compatible with the external device	1. Replace the ID adapter. 2. Upgrade the ID of the ID adapter in "Factory Maintenance" menu.
	The serial port adapter cable not compatible with the external device	Replace the serial port adapter cable.
	Wrong software version or wrong protocol version of the external device	Verify the protocol version and software version are supported by the ID adapter.
Generate the alarm: "BeneLink Comm Stop"	The BeneLink module application software is corrupted	Upgrade or update the software application of the BeneLink module with the network upgrading tool.
The patient monitor has no response when loading the ID adapter	The BeneLink module application software is corrupted	Upgrade or update the software application of the BeneLink module with the network upgrading tool.
	BeneLink module damaged	Replace the module.

8.5 Installation and Test Report

Basic Information			
Hospital		Department	
Serial number of ID adapter		Name of external device	
ID of the external device		Type of serial port adapting cable	
Software version and other information of the external device			

Checking the connection	**Test Result (Yes/No)**
Can the patient monitor and the external device be assembled together using designated accessories?	
Does the green indicator of corresponding port on the BeneLink module illuminate while the other indicators are not?	
Are there numerics or characters displayed on the **Integrated Devices** screen of the patient monitor?	
Are the device type and parameter values displayed correctly on the **Integrated Devices** screen of the patient monitor when the external device just enters working mode?	
Is the ventilation mode correctly displayed on the patient monitor? Does it change correctly when the ventilation mode on the external device is changed?	

Other information

9 Alarm ID of External Devices (For BeneVision N Series Monitors)

For the BeneVision N Series monitor, if it is desired that the storage, display, or audio settings of a specific external device alarm be different from its category or priority, you can set it individually by adding the Alarm ID to the alarm list. Refer to "Interfacing with External Devices" of the N series Operator's Manual (P/N: 046-011259-00) for the method.

This chapter lists the alarm IDs of external devices.

9.1 Alarm IDs of Anesthesia Machines

Alarm ID	Alarm message	Category	Alarm priority	Source
0xA5A1	Apnea	Phys	High	Anes
0xA5A2	Volume Apnea > 2 min	Phys	High	Anes
0xA5A3	Pressure Apnea	Phys	High	Anes
0xA5A4	Paw High	Phys	High	Anes
0xA5A5	Paw Low	Phys	High	Anes
0xA5A6	High Paw Sustained	Phys	High	Anes
0xA5A7	Pressure Limiting	Phys	Low	Anes
0xA5A8	Sub-Atmospheric Paw	Phys	Medium	Anes
0xA5A9	FiO2 High	Phys	Medium	Anes
0xA5AA	FiO2 Low	Phys	High	Anes
0xA5AB	TVe High	Phys	Medium	Anes
0xA5AC	TVe Low	Phys	Medium	Anes
0xA5AD	MV High	Phys	Medium	Anes
0xA5AE	MV Low	Phys	Medium	Anes
0xA5AF	RR High	Phys	Low	Anes
0xA5B0	RR Low	Phys	Low	Anes
0xA5B1	PEEP High	Phys	Medium	Anes
0xA5B2	PRESS EXP High	Phys	Medium	Anes

Alarm ID	Alarm message	Category	Alarm priority	Source
0xA5B3	PRESSURE LIM	Phys	Low	Anes
0xA5B4	CONT PRES	Phys	High	Anes
0xA5B5	Volume Apnea	Phys	Medium	Anes
0xA5B6	CO2 Apnea	Phys	High	Anes
0xA5B7	RR Low	Phys	Medium	Anes
0xA5B8	RR High	Phys	Medium	Anes
0xA5B9	EtCO2 High	Phys	Medium	Anes
0xA5BA	EtCO2 Low	Phys	Medium	Anes
0xA5BB	FiCO2 High	Phys	Medium	Anes
0xA5BC	FiCO2 Low	Phys	Medium	Anes
0xA5BD	EtN2O High	Phys	Medium	Anes
0xA5BE	EtN2O Low	Phys	Medium	Anes
0xA5BF	FiN2O High	Phys	Medium	Anes
0xA5C0	FiN2O Low	Phys	Medium	Anes
0xA5C1	EtHal High	Phys	Medium	Anes
0xA5C2	EtHal Low	Phys	Medium	Anes
0xA5C3	FiHal High	Phys	Medium	Anes
0xA5C4	FiHal Low	Phys	Medium	Anes
0xA5C5	EtEnf High	Phys	Medium	Anes
0xA5C6	EtEnf Low	Phys	Medium	Anes
0xA5C7	FiEnf High	Phys	Medium	Anes
0xA5C8	FiEnf Low	Phys	Medium	Anes
0xA5C9	EtIso High	Phys	Medium	Anes
0xA5CA	EtIso Low	Phys	Medium	Anes
0xA5CB	FiIso High	Phys	Medium	Anes
0xA5CC	FiIso Low	Phys	Medium	Anes
0xA5CD	EtSev High	Phys	Medium	Anes
0xA5CE	EtSev Low	Phys	Medium	Anes
0xA5CF	FiSev High	Phys	Medium	Anes
0xA5D0	FiSev Low	Phys	Medium	Anes

Alarm ID	Alarm message	Category	Alarm priority	Source
0xA5D1	EtDes High	Phys	Medium	Anes
0xA5D2	EtDes Low	Phys	Medium	Anes
0xA5D3	FiDes High	Phys	Medium	Anes
0xA5D4	FiDes Low	Phys	Medium	Anes
0xA5D5	MAC Low	Phys	Medium	Anes
0xA5D6	EtAA Low	Phys	Medium	Anes
0xA5D7	EtAA High	Phys	Medium	Anes
0xA5D8	FiAA Low	Phys	Medium	Anes
0xA5D9	FiAA High	Phys	Medium	Anes
0xA5DA	EtO2 High	Phys	High	Anes
0xA5DB	EtO2 Low	Phys	High	Anes
0xA5DC	FiO2 High	Phys	High	Anes
0xA5DD	FiO2 Low	Phys	High	Anes
0xA5DE	BIS High	Phys	Medium	Anes
0xA5DF	BIS Low	Phys	Medium	Anes
0xA5E0	No Pulse	Phys	High	Anes
0xA5E1	PR Low	Phys	High	Anes
0xA5E2	PR High	Phys	Medium	Anes
0xA5E3	SpO2 High	Phys	Medium	Anes
0xA5E4	SpO2 Low	Phys	High	Anes
0xA5E5	Patient Circuit Leak	Tech	Medium	Anes
0xA5E6	O2 Sensor Unconnected	Tech	Low	Anes
0xA5E7	Drive Gas Pressure Low	Tech	High	Anes
0xA5E8	O2 Supply Failure	Tech	High	Anes
0xA5E9	Battery in Use	Tech	Low	Anes
0xA5EA	APL VALVE?	Tech	High	Anes
0xA5EB	EXP-VALVE?	Tech	Medium	Anes
0xA5EC	FRESH GAS?	Tech	Medium	Anes
0xA5ED	No Fresh Gas	Tech	High	Anes

Alarm ID	Alarm message	Category	Alarm priority	Source
0xA5EE	Circuit Occluded	Tech	High	Anes
0xA5EF	VENT DISC	Tech	High	Anes
0xA5F0	NO AIR	Tech	Low	Anes
0xA5F1	NO O2 SUPPLY	Tech	Low	Anes
0xA5F2	High Technical Alarm	Tech	High	Anes
0xA5F3	Medium Technical Alarm	Tech	Medium	Anes
0xA5F4	Low Technical Alarm	Tech	Low	Anes
0xA5F5	Prompt	Tech	Prompt	Anes
0xA5F6	CO2 Module Abnormal	Tech	Medium	Anes
0xA5F7	AG Module Abnormal	Tech	Medium	Anes
0xA5F8	BIS Module Abnormal	Tech	Medium	Anes
0xA5F9	SpO2 Module Abnormal	Tech	Low	Anes
0xA5FA	PEEP Low	Phys	Medium	Anes
0xAA63	BIS L High	Phys	Medium	Anes
0xAA64	BIS L Low	Phys	Medium	Anes
0xAA65	BIS R High	Phys	Medium	Anes
0xAA66	BIS R Low	Phys	Medium	Anes
0xBA14	Paw High	Phys	High	Anes
0xBA15	MAC High	Phys	High	Anes

9.2 Alarm IDs of Ventilators

Alarm ID	Alarm message	Category	Alarm priority	Source
0xA66D	FiCO2 High	Phys	Medium	Vent
0xA66E	VOL INCONST	Phys	Medium	Vent
0xA66F	RR High	Phys	Medium	Vent
0xA670	AW-TEMP HIGH	Phys	High	Vent
0xA671	PEEP High	Phys	High	Vent
0xA672	ASB > 4s	Phys	High	Vent
0xA673	ASB > 1.5s	Phys	Low	Vent
0xA674	PPS-TI > 1.5s	Phys	Low	Vent
0xA675	ASB > Tinsp	Phys	Low	Vent
0xA676	No Pulse	Phys	High	Vent
0xA677	PR Low	Phys	High	Vent
0xA678	SpO2 Low	Phys	High	Vent
0xA679	PR High	Phys	High	Vent
0xA67A	SpO2 High	Phys	High	Vent
0xA67B	TVe Low	Phys	Medium	Vent
0xA67C	High Paw Sustained	Phys	High	Vent
0xA67D	Pressure Sustained	Phys	High	Vent
0xA67E	Sub-Atmospheric Paw	Phys	Medium	Vent
0xA67F	Pmax Reached	Phys	High	Vent
0xA680	Pinsp Not Achieved	Phys	High	Vent
0xA681	PEEP Not Achieved	Phys	High	Vent
0xA682	No Pressure PEEP/CPAP	Phys	High	Vent
0xA683	TV Not Achieved	Phys	High	Vent
0xA684	Volume Apnea	Phys	Medium	Vent
0xA685	Volume Apnea > 2 min	Phys	High	Vent
0xA686	High Circuit O2	Phys	High	Vent
0xA687	Low Circuit O2	Phys	High	Vent
0xA688	CO2 Apnea	Phys	High	Vent

Alarm ID	Alarm message	Category	Alarm priority	Source
0xA689	EtO2 High	Phys	Medium	Vent
0xA68A	EtO2 Low	Phys	Medium	Vent
0xA68B	Ppeak High	Phys	High	Vent
0xA68C	Ppeak Low	Phys	High	Vent
0xA68D	PEEPe High	Phys	Medium	Vent
0xA68E	PEEPe Low	Phys	Medium	Vent
0xA68F	PEEPi High	Phys	Medium	Vent
0xA690	Paux High	Phys	Medium	Vent
0xA691	Base Flow High	Phys	Low	Vent
0xA692	Loss of PEEP	Phys	High	Vent
0xA693	Low Baseline	Phys	High	Vent
0xA694	High Baseline	Phys	High	Vent
0xA695	Sustained Hbline	Phys	High	Vent
0xA696	Air Supply Pressure Low	Tech	High	Vent
0xA697	O2 Supply Pressure Low	Tech	High	Vent
0xA698	No Gas Supply Pressure	Tech	High	Vent
0xA699	Airway Obstructed?	Tech	High	Vent
0xA69A	Tube Disconnected?	Tech	High	Vent
0xA69B	Airway Leak?	Tech	Low	Vent
0xA69C	Battery in Use	Tech	Low	Vent
0xA69D	Check Flow Sensors	Tech	High	Vent
0xA69E	EXP-VALVE?	Tech	High	Vent
0xA69F	CLEAN CO2	Tech	High	Vent
0xA6A0	Drive Gas Pressure Low	Tech	High	Vent
0xA6A1	Patient Circuit Leak	Tech	Medium	Vent
0xA6A2	Neo Flow Sensor Error	Tech	High	Vent
0xA6A3	O2 and air supply	Tech	Medium	Vent
0xA6A4	O2 and heliox supply	Tech	Medium	Vent
0xA6A5	Sustained Airway Pressure	Tech	High	Vent
0xA6A6	Insp gas temperature high	Tech	High	Vent

Alarm ID	Alarm message	Category	Alarm priority	Source
0xA6A7	Tinsp Long	Tech	Low	Vent
0xA6A8	CO2 No Watertrap	Tech	Low	Vent
0xA6A9	No VO2, High FiN2O	Tech	High	Vent
0xA6AA	No O2 Pressure	Tech	High	Vent
0xA6AB	No Fresh Gas Flow	Tech	High	Vent
0xA6AC	No VO2, FiO2 > 85%	Tech	High	Vent
0xA6AD	MGAS Replace Water Trap	Tech	High	Vent
0xA6AE	12 Hour Test	Tech	Low	Vent
0xA6AF	Patient Connected?	Tech	High	Vent
0xA6B0	Negative Airway Pressure	Tech	High	Vent
0xA6B1	Circuit Leak	Tech	High	Vent
0xA6B2	Patient Connection Leak	Tech	High	Vent
0xA6B3	Patient Disconnected	Tech	High	Vent
0xA6B4	O2 cell disconnect	Tech	High	Vent
0xA6B5	Check tubing	Tech	Low	Vent
0xA6B6	Disconnection ventilator side	Tech	High	Vent
0xA6B7	O2 cell cal Needed	Tech	High	Vent
0xA6B8	Circuit Disconnect	Tech	High	Vent
0xA6B9	Power Failure	Tech	High	Vent
0xA6BA	Tinsp Short	Tech	High	Vent
0xA6BB	FiO2 Sensor Disconnected	Tech	Medium	Vent
0xA6BC	High Technical Alarm	Tech	High	Vent
0xA6BD	Medium Technical Alarm	Tech	Medium	Vent
0xA6BE	Low Technical Alarm	Tech	Low	Vent
0xA6BF	Prompt	Tech	Prompt	Vent
0xA6C0	PEEP Low	Phys	High	Vent
0xA6C1	FiO2 Alarm	Phys	High	Vent
0xA96E	High DCO2	Tech	Medium	Vent
0xA96F	Low DCO2	Tech	Medium	Vent
0xBA60	Cycle Fail	Phys	High	Vent

Alarm ID	Alarm message	Category	Alarm priority	Source
0xBA61	Continuing Positive Pressure	Phys	High	Vent
0xBA62	CPAP High	Phys	High	Vent
0xBA63	No Breath Detected	Phys	Medium	Vent
0xBA64	Sub Ambient Pressure	Phys	High	Vent
0xBA65	Pmean High	Phys	High	Vent
0xBA66	Pmean Low	Phys	High	Vent
0xBA67	Pressure change detected	Phys	High	Vent
0xBA68	ΔP High	Phys	High	Vent
0xBA69	ΔP Low	Phys	High	Vent
0xBA6A	FiCO2 Low	Phys	Medium	Vent
0xBA6B	High EtCO2 Spont	Phys	Medium	Vent
0xBA6C	PI Low	Phys	Medium	Vent
0xBA6D	PI High	Phys	Medium	Vent
0xBA56	PPV Pressure Too High	Tech	High	Vent
0xBA57	PPV TV Too High	Tech	High	Vent
0xBA58	VAPS: Target TV Not Achieved. Insufficient Pmax	Tech	High	Vent
0xBA59	VAPS: Target TV Exceeded. Pmin Too High	Tech	High	Vent
0xBA5A	Low Leak-CO2 Rebreathing Risk	Tech	High	Vent
0xBA5B	Proximal Pressure Line Disconnected	Tech	High	Vent
0xBA5C	High O2 Supply Pressure	Tech	High	Vent

9.3 Alarm IDs of tcGas Monitoring Devices

Alarm ID	Alarm message	Category	Alarm priority	Source
0xA6CB	PR Alarm	Phys	Medium	TcGas
0xA6CC	SpO2 Alarm	Phys	Medium	TcGas
0xA6CD	tcpCO2 Alarm	Phys	Medium	TcGas
0xA6CE	tcpO2 Alarm	Phys	Medium	TcGas

Alarm ID	Alarm message	Category	Alarm priority	Source
0xA6CF	tcGas Low Battery	Tech	Medium	TcGas
0xA6D0	tcGas Battery Depleted	Tech	High	TcGas
0xA6D1	TCM Temperature High	Tech	High	TcGas
0xA6D2	TCM Alert	Tech	Low	TcGas

9.4 Alarm IDs of NMT Monitoring Device

Alarm ID	Alarm message	Category	Alarm priority	Source
0xA6C2	TWSX Low Battery	Tech	Medium	NMT
0xA6C3	TWSX Battery Depleted	Tech	High	NMT
0xA6C4	TWSX No Acceleration Sensor	Tech	Low	NMT
0xA6C5	TWSX No Temp Sensor	Tech	Low	NMT
0xA6C6	TWSX No Stimulation Cable	Tech	Low	NMT
0xA6C7	TWSX Technical Alarm	Tech	Low	NMT
0xA6C8	TWSX Technical Alarm	Tech	Low	NMT
0xA6C9	TWSX Technical Alarm	Tech	Low	NMT
0xA6CA	TOF Alarm	Phys	Medium	NMT
0xA6D3	TWSX Technical Alarm	Tech	Low	NMT
0xA6D4	TWSX Technical Alarm	Tech	Low	NMT
0xA6D5	TWSX Not Cal	Tech	Prompt	NMT

9.5 Alarm IDs of Infusion Systems (for BeneVision N series Monitors)

Alarm ID	Alarm message	Category	Alarm priority	Source
0xA73F	Pre-Occlusion	Tech	Medium	Pump
0xA740	Pre-Occlusion	Tech	Medium	Pump
0xA741	Pre-Occlusion	Tech	Medium	Pump
0xA742	Pre-Occlusion	Tech	Medium	Pump
0xA743	Pre-Occlusion	Tech	Medium	Pump
0xA744	Pre-Occlusion	Tech	Medium	Pump
0xA745	Pre-Occlusion	Tech	Medium	Pump
0xA746	Pre-Occlusion	Tech	Medium	Pump
0xA747	Pre-Occlusion	Tech	Medium	Pump
0xA748	Pre-Occlusion	Tech	Medium	Pump
0xA749	Pre-Occlusion	Tech	Medium	Pump
0xA74A	Pre-Occlusion	Tech	Medium	Pump
0xA74B	Pre-Occlusion	Tech	Medium	Pump
0xA74C	Pre-Occlusion	Tech	Medium	Pump
0xA74D	Pre-Occlusion	Tech	Medium	Pump
0xA74E	Pre-Occlusion	Tech	Medium	Pump
0xA74F	Pre-Occlusion	Tech	Medium	Pump
0xA750	Pre-Occlusion	Tech	Medium	Pump
0xA751	Pre-Occlusion	Tech	Medium	Pump
0xA752	Pre-Occlusion	Tech	Medium	Pump
0xA753	Pre-Occlusion	Tech	Medium	Pump
0xA754	Pre-Occlusion	Tech	Medium	Pump
0xA755	Pre-Occlusion	Tech	Medium	Pump
0xA756	Pre-Occlusion	Tech	Medium	Pump
0xA757	Occlusion	Tech	High	Pump
0xA758	Occlusion	Tech	High	Pump
0xA759	Occlusion	Tech	High	Pump

Alarm ID	Alarm message	Category	Alarm priority	Source
0xA75A	Occlusion	Tech	High	Pump
0xA75B	Occlusion	Tech	High	Pump
0xA75C	Occlusion	Tech	High	Pump
0xA75D	Occlusion	Tech	High	Pump
0xA75E	Occlusion	Tech	High	Pump
0xA75F	Occlusion	Tech	High	Pump
0xA760	Occlusion	Tech	High	Pump
0xA761	Occlusion	Tech	High	Pump
0xA762	Occlusion	Tech	High	Pump
0xA763	Occlusion	Tech	High	Pump
0xA764	Occlusion	Tech	High	Pump
0xA765	Occlusion	Tech	High	Pump
0xA766	Occlusion	Tech	High	Pump
0xA767	Occlusion	Tech	High	Pump
0xA768	Occlusion	Tech	High	Pump
0xA769	Occlusion	Tech	High	Pump
0xA76A	Occlusion	Tech	High	Pump
0xA76B	Occlusion	Tech	High	Pump
0xA76C	Occlusion	Tech	High	Pump
0xA76D	Occlusion	Tech	High	Pump
0xA76E	Occlusion	Tech	High	Pump
0xA76F	Air bubble	Tech	High	Pump
0xA770	Air bubble	Tech	High	Pump
0xA771	Air bubble	Tech	High	Pump
0xA772	Air bubble	Tech	High	Pump
0xA773	Air bubble	Tech	High	Pump
0xA774	Air bubble	Tech	High	Pump
0xA775	Air bubble	Tech	High	Pump
0xA776	Air bubble	Tech	High	Pump
0xA777	Air bubble	Tech	High	Pump

Alarm ID	Alarm message	Category	Alarm priority	Source
0xA778	Air bubble	Tech	High	Pump
0xA779	Air bubble	Tech	High	Pump
0xA77A	Air bubble	Tech	High	Pump
0xA77B	Air bubble	Tech	High	Pump
0xA77C	Air bubble	Tech	High	Pump
0xA77D	Air bubble	Tech	High	Pump
0xA77E	Air bubble	Tech	High	Pump
0xA77F	Air bubble	Tech	High	Pump
0xA780	Air bubble	Tech	High	Pump
0xA781	Air bubble	Tech	High	Pump
0xA782	Air bubble	Tech	High	Pump
0xA783	Air bubble	Tech	High	Pump
0xA784	Air bubble	Tech	High	Pump
0xA785	Air bubble	Tech	High	Pump
0xA786	Air bubble	Tech	High	Pump
0xA787	Drop too less	Tech	High	Pump
0xA788	Drop too less	Tech	High	Pump
0xA789	Drop too less	Tech	High	Pump
0xA78A	Drop too less	Tech	High	Pump
0xA78B	Drop too less	Tech	High	Pump
0xA78C	Drop too less	Tech	High	Pump
0xA78D	Drop too less	Tech	High	Pump
0xA78E	Drop too less	Tech	High	Pump
0xA78F	Drop too less	Tech	High	Pump
0xA790	Drop too less	Tech	High	Pump
0xA791	Drop too less	Tech	High	Pump
0xA792	Drop too less	Tech	High	Pump
0xA793	Drop too less	Tech	High	Pump
0xA794	Drop too less	Tech	High	Pump
0xA795	Drop too less	Tech	High	Pump

Alarm ID	Alarm message	Category	Alarm priority	Source
0xA796	Drop too less	Tech	High	Pump
0xA797	Drop too less	Tech	High	Pump
0xA798	Drop too less	Tech	High	Pump
0xA799	Drop too less	Tech	High	Pump
0xA79A	Drop too less	Tech	High	Pump
0xA79B	Drop too less	Tech	High	Pump
0xA79C	Drop too less	Tech	High	Pump
0xA79D	Drop too less	Tech	High	Pump
0xA79E	Drop too less	Tech	High	Pump
0xA79F	Drop too many	Tech	High	Pump
0xA7A0	Drop too many	Tech	High	Pump
0xA7A1	Drop too many	Tech	High	Pump
0xA7A2	Drop too many	Tech	High	Pump
0xA7A3	Drop too many	Tech	High	Pump
0xA7A4	Drop too many	Tech	High	Pump
0xA7A5	Drop too many	Tech	High	Pump
0xA7A6	Drop too many	Tech	High	Pump
0xA7A7	Drop too many	Tech	High	Pump
0xA7A8	Drop too many	Tech	High	Pump
0xA7A9	Drop too many	Tech	High	Pump
0xA7AA	Drop too many	Tech	High	Pump
0xA7AB	Drop too many	Tech	High	Pump
0xA7AC	Drop too many	Tech	High	Pump
0xA7AD	Drop too many	Tech	High	Pump
0xA7AE	Drop too many	Tech	High	Pump
0xA7AF	Drop too many	Tech	High	Pump
0xA7B0	Drop too many	Tech	High	Pump
0xA7B1	Drop too many	Tech	High	Pump
0xA7B2	Drop too many	Tech	High	Pump
0xA7B3	Drop too many	Tech	High	Pump

Alarm ID	Alarm message	Category	Alarm priority	Source
0xA7B4	Drop too many	Tech	High	Pump
0xA7B5	Drop too many	Tech	High	Pump
0xA7B6	Drop too many	Tech	High	Pump
0xA7DE	Drop alarm	Tech	High	Pump
0xA7DF	Drop alarm	Tech	High	Pump
0xA7E0	Drop alarm	Tech	High	Pump
0xA7E1	Drop alarm	Tech	High	Pump
0xA7E2	Drop alarm	Tech	High	Pump
0xA7E3	Drop alarm	Tech	High	Pump
0xA7E4	Drop alarm	Tech	High	Pump
0xA7E5	Drop alarm	Tech	High	Pump
0xA7E6	Drop alarm	Tech	High	Pump
0xA7E7	Drop alarm	Tech	High	Pump
0xA7E8	Drop alarm	Tech	High	Pump
0xA7E9	Drop alarm	Tech	High	Pump
0xA7EA	Drop alarm	Tech	High	Pump
0xA7EB	Drop alarm	Tech	High	Pump
0xA7EC	Drop alarm	Tech	High	Pump
0xA7ED	Drop alarm	Tech	High	Pump
0xA7EE	Drop alarm	Tech	High	Pump
0xA7EF	Drop alarm	Tech	High	Pump
0xA7F0	Drop alarm	Tech	High	Pump
0xA7F1	Drop alarm	Tech	High	Pump
0xA7F2	Drop alarm	Tech	High	Pump
0xA7F3	Drop alarm	Tech	High	Pump
0xA7F4	Drop alarm	Tech	High	Pump
0xA7F5	Drop alarm	Tech	High	Pump
0xA7F6	Syringe disengagement	Tech	High	Pump
0xA7F7	Syringe disengagement	Tech	High	Pump
0xA7F8	Syringe disengagement	Tech	High	Pump

Alarm ID	Alarm message	Category	Alarm priority	Source
0xA7F9	Syringe disengagement	Tech	High	Pump
0xA7FA	Syringe disengagement	Tech	High	Pump
0xA7FB	Syringe disengagement	Tech	High	Pump
0xA7FC	Syringe disengagement	Tech	High	Pump
0xA7FD	Syringe disengagement	Tech	High	Pump
0xA7FE	Syringe disengagement	Tech	High	Pump
0xA7FF	Syringe disengagement	Tech	High	Pump
0xA800	Syringe disengagement	Tech	High	Pump
0xA801	Syringe disengagement	Tech	High	Pump
0xA802	Syringe disengagement	Tech	High	Pump
0xA803	Syringe disengagement	Tech	High	Pump
0xA804	Syringe disengagement	Tech	High	Pump
0xA805	Syringe disengagement	Tech	High	Pump
0xA806	Syringe disengagement	Tech	High	Pump
0xA807	Syringe disengagement	Tech	High	Pump
0xA808	Syringe disengagement	Tech	High	Pump
0xA809	Syringe disengagement	Tech	High	Pump
0xA80A	Syringe disengagement	Tech	High	Pump
0xA80B	Syringe disengagement	Tech	High	Pump
0xA80C	Syringe disengagement	Tech	High	Pump
0xA80D	Syringe disengagement	Tech	High	Pump
0xA80E	Mechanical Abnormal	Tech	High	Pump
0xA80F	Mechanical Abnormal	Tech	High	Pump
0xA810	Mechanical Abnormal	Tech	High	Pump
0xA811	Mechanical Abnormal	Tech	High	Pump
0xA812	Mechanical Abnormal	Tech	High	Pump
0xA813	Mechanical Abnormal	Tech	High	Pump
0xA814	Mechanical Abnormal	Tech	High	Pump
0xA815	Mechanical Abnormal	Tech	High	Pump
0xA816	Mechanical Abnormal	Tech	High	Pump

Alarm ID	Alarm message	Category	Alarm priority	Source
0xA817	Mechanical Abnormal	Tech	High	Pump
0xA818	Mechanical Abnormal	Tech	High	Pump
0xA819	Mechanical Abnormal	Tech	High	Pump
0xA81A	Mechanical Abnormal	Tech	High	Pump
0xA81B	Mechanical Abnormal	Tech	High	Pump
0xA81C	Mechanical Abnormal	Tech	High	Pump
0xA81D	Mechanical Abnormal	Tech	High	Pump
0xA81E	Mechanical Abnormal	Tech	High	Pump
0xA81F	Mechanical Abnormal	Tech	High	Pump
0xA820	Mechanical Abnormal	Tech	High	Pump
0xA821	Mechanical Abnormal	Tech	High	Pump
0xA822	Mechanical Abnormal	Tech	High	Pump
0xA823	Mechanical Abnormal	Tech	High	Pump
0xA824	Mechanical Abnormal	Tech	High	Pump
0xA825	Mechanical Abnormal	Tech	High	Pump
0xA826	Sensor alarm	Tech	High	Pump
0xA827	Sensor alarm	Tech	High	Pump
0xA828	Sensor alarm	Tech	High	Pump
0xA829	Sensor alarm	Tech	High	Pump
0xA82A	Sensor alarm	Tech	High	Pump
0xA82B	Sensor alarm	Tech	High	Pump
0xA82C	Sensor alarm	Tech	High	Pump
0xA82D	Sensor alarm	Tech	High	Pump
0xA82E	Sensor alarm	Tech	High	Pump
0xA82F	Sensor alarm	Tech	High	Pump
0xA830	Sensor alarm	Tech	High	Pump
0xA831	Sensor alarm	Tech	High	Pump
0xA832	Sensor alarm	Tech	High	Pump
0xA833	Sensor alarm	Tech	High	Pump
0xA834	Sensor alarm	Tech	High	Pump

Alarm ID	Alarm message	Category	Alarm priority	Source
0xA835	Sensor alarm	Tech	High	Pump
0xA836	Sensor alarm	Tech	High	Pump
0xA837	Sensor alarm	Tech	High	Pump
0xA838	Sensor alarm	Tech	High	Pump
0xA839	Sensor alarm	Tech	High	Pump
0xA83A	Sensor alarm	Tech	High	Pump
0xA83B	Sensor alarm	Tech	High	Pump
0xA83C	Sensor alarm	Tech	High	Pump
0xA83D	Sensor alarm	Tech	High	Pump
0xA83E	Door Open	Tech	High	Pump
0xA83F	Door Open	Tech	High	Pump
0xA840	Door Open	Tech	High	Pump
0xA841	Door Open	Tech	High	Pump
0xA842	Door Open	Tech	High	Pump
0xA843	Door Open	Tech	High	Pump
0xA844	Door Open	Tech	High	Pump
0xA845	Door Open	Tech	High	Pump
0xA846	Door Open	Tech	High	Pump
0xA847	Door Open	Tech	High	Pump
0xA848	Door Open	Tech	High	Pump
0xA849	Door Open	Tech	High	Pump
0xA84A	Door Open	Tech	High	Pump
0xA84B	Door Open	Tech	High	Pump
0xA84C	Door Open	Tech	High	Pump
0xA84D	Door Open	Tech	High	Pump
0xA84E	Door Open	Tech	High	Pump
0xA84F	Door Open	Tech	High	Pump
0xA850	Door Open	Tech	High	Pump
0xA851	Door Open	Tech	High	Pump
0xA852	Door Open	Tech	High	Pump

Alarm ID	Alarm message	Category	Alarm priority	Source
0xA853	Door Open	Tech	High	Pump
0xA854	Door Open	Tech	High	Pump
0xA855	Door Open	Tech	High	Pump
0xA856	end of infusion	Tech	High	Pump
0xA857	end of infusion	Tech	High	Pump
0xA858	end of infusion	Tech	High	Pump
0xA859	end of infusion	Tech	High	Pump
0xA85A	end of infusion	Tech	High	Pump
0xA85B	end of infusion	Tech	High	Pump
0xA85C	end of infusion	Tech	High	Pump
0xA85D	end of infusion	Tech	High	Pump
0xA85E	end of infusion	Tech	High	Pump
0xA85F	end of infusion	Tech	High	Pump
0xA860	end of infusion	Tech	High	Pump
0xA861	end of infusion	Tech	High	Pump
0xA862	end of infusion	Tech	High	Pump
0xA863	end of infusion	Tech	High	Pump
0xA864	end of infusion	Tech	High	Pump
0xA865	end of infusion	Tech	High	Pump
0xA866	end of infusion	Tech	High	Pump
0xA867	end of infusion	Tech	High	Pump
0xA868	end of infusion	Tech	High	Pump
0xA869	end of infusion	Tech	High	Pump
0xA86A	end of infusion	Tech	High	Pump
0xA86B	end of infusion	Tech	High	Pump
0xA86C	end of infusion	Tech	High	Pump
0xA86D	end of infusion	Tech	High	Pump
0xA86E	Syringe Empty	Tech	High	Pump
0xA86F	Syringe Empty	Tech	High	Pump
0xA870	Syringe Empty	Tech	High	Pump

Alarm ID	Alarm message	Category	Alarm priority	Source
0xA871	Syringe Empty	Tech	High	Pump
0xA872	Syringe Empty	Tech	High	Pump
0xA873	Syringe Empty	Tech	High	Pump
0xA874	Syringe Empty	Tech	High	Pump
0xA875	Syringe Empty	Tech	High	Pump
0xA876	Syringe Empty	Tech	High	Pump
0xA877	Syringe Empty	Tech	High	Pump
0xA878	Syringe Empty	Tech	High	Pump
0xA879	Syringe Empty	Tech	High	Pump
0xA87A	Syringe Empty	Tech	High	Pump
0xA87B	Syringe Empty	Tech	High	Pump
0xA87C	Syringe Empty	Tech	High	Pump
0xA87D	Syringe Empty	Tech	High	Pump
0xA87E	Syringe Empty	Tech	High	Pump
0xA87F	Syringe Empty	Tech	High	Pump
0xA880	Syringe Empty	Tech	High	Pump
0xA881	Syringe Empty	Tech	High	Pump
0xA882	Syringe Empty	Tech	High	Pump
0xA883	Syringe Empty	Tech	High	Pump
0xA884	Syringe Empty	Tech	High	Pump
0xA885	Syringe Empty	Tech	High	Pump
0xA886	Syringe Near Empty	Tech	Low	Pump
0xA887	Syringe Near Empty	Tech	Low	Pump
0xA888	Syringe Near Empty	Tech	Low	Pump
0xA889	Syringe Near Empty	Tech	Low	Pump
0xA88A	Syringe Near Empty	Tech	Low	Pump
0xA88B	Syringe Near Empty	Tech	Low	Pump
0xA88C	Syringe Near Empty	Tech	Low	Pump
0xA88D	Syringe Near Empty	Tech	Low	Pump
0xA88E	Syringe Near Empty	Tech	Low	Pump

Alarm ID	Alarm message	Category	Alarm priority	Source
0xA88F	Syringe Near Empty	Tech	Low	Pump
0xA890	Syringe Near Empty	Tech	Low	Pump
0xA891	Syringe Near Empty	Tech	Low	Pump
0xA892	Syringe Near Empty	Tech	Low	Pump
0xA893	Syringe Near Empty	Tech	Low	Pump
0xA894	Syringe Near Empty	Tech	Low	Pump
0xA895	Syringe Near Empty	Tech	Low	Pump
0xA896	Syringe Near Empty	Tech	Low	Pump
0xA897	Syringe Near Empty	Tech	Low	Pump
0xA898	Syringe Near Empty	Tech	Low	Pump
0xA899	Syringe Near Empty	Tech	Low	Pump
0xA89A	Syringe Near Empty	Tech	Low	Pump
0xA89B	Syringe Near Empty	Tech	Low	Pump
0xA89C	Syringe Near Empty	Tech	Low	Pump
0xA89D	Syringe Near Empty	Tech	Low	Pump
0xA89E	Infusion Near Done	Tech	Low	Pump
0xA89F	Infusion Near Done	Tech	Low	Pump
0xA8A0	Infusion Near Done	Tech	Low	Pump
0xA8A1	Infusion Near Done	Tech	Low	Pump
0xA8A2	Infusion Near Done	Tech	Low	Pump
0xA8A3	Infusion Near Done	Tech	Low	Pump
0xA8A4	Infusion Near Done	Tech	Low	Pump
0xA8A5	Infusion Near Done	Tech	Low	Pump
0xA8A6	Infusion Near Done	Tech	Low	Pump
0xA8A7	Infusion Near Done	Tech	Low	Pump
0xA8A8	Infusion Near Done	Tech	Low	Pump
0xA8A9	Infusion Near Done	Tech	Low	Pump
0xA8AA	Infusion Near Done	Tech	Low	Pump
0xA8AB	Infusion Near Done	Tech	Low	Pump
0xA8AC	Infusion Near Done	Tech	Low	Pump

Alarm ID	Alarm message	Category	Alarm priority	Source
0xA8AD	Infusion Near Done	Tech	Low	Pump
0xA8AE	Infusion Near Done	Tech	Low	Pump
0xA8AF	Infusion Near Done	Tech	Low	Pump
0xA8B0	Infusion Near Done	Tech	Low	Pump
0xA8B1	Infusion Near Done	Tech	Low	Pump
0xA8B2	Infusion Near Done	Tech	Low	Pump
0xA8B3	Infusion Near Done	Tech	Low	Pump
0xA8B4	Infusion Near Done	Tech	Low	Pump
0xA8B5	Infusion Near Done	Tech	Low	Pump
0xA8B6	System Abnormal	Tech	Medium	Pump
0xA8B7	System Abnormal	Tech	Medium	Pump
0xA8B8	System Abnormal	Tech	Medium	Pump
0xA8B9	System Abnormal	Tech	Medium	Pump
0xA8BA	System Abnormal	Tech	Medium	Pump
0xA8BB	System Abnormal	Tech	Medium	Pump
0xA8BC	System Abnormal	Tech	Medium	Pump
0xA8BD	System Abnormal	Tech	Medium	Pump
0xA8BE	System Abnormal	Tech	Medium	Pump
0xA8BF	System Abnormal	Tech	Medium	Pump
0xA8C0	System Abnormal	Tech	Medium	Pump
0xA8C1	System Abnormal	Tech	Medium	Pump
0xA8C2	System Abnormal	Tech	Medium	Pump
0xA8C3	System Abnormal	Tech	Medium	Pump
0xA8C4	System Abnormal	Tech	Medium	Pump
0xA8C5	System Abnormal	Tech	Medium	Pump
0xA8C6	System Abnormal	Tech	Medium	Pump
0xA8C7	System Abnormal	Tech	Medium	Pump
0xA8C8	System Abnormal	Tech	Medium	Pump
0xA8C9	System Abnormal	Tech	Medium	Pump
0xA8CA	System Abnormal	Tech	Medium	Pump

Alarm ID	Alarm message	Category	Alarm priority	Source
0xA8CB	System Abnormal	Tech	Medium	Pump
0xA8CC	System Abnormal	Tech	Medium	Pump
0xA8CD	System Abnormal	Tech	Medium	Pump
0xA8CE	Low Battery	Tech	High	Pump
0xA8CF	Low Battery	Tech	High	Pump
0xA8D0	Low Battery	Tech	High	Pump
0xA8D1	Low Battery	Tech	High	Pump
0xA8D2	Low Battery	Tech	High	Pump
0xA8D3	Low Battery	Tech	High	Pump
0xA8D4	Low Battery	Tech	High	Pump
0xA8D5	Low Battery	Tech	High	Pump
0xA8D6	Low Battery	Tech	High	Pump
0xA8D7	Low Battery	Tech	High	Pump
0xA8D8	Low Battery	Tech	High	Pump
0xA8D9	Low Battery	Tech	High	Pump
0xA8DA	Low Battery	Tech	High	Pump
0xA8DB	Low Battery	Tech	High	Pump
0xA8DC	Low Battery	Tech	High	Pump
0xA8DD	Low Battery	Tech	High	Pump
0xA8DE	Low Battery	Tech	High	Pump
0xA8DF	Low Battery	Tech	High	Pump
0xA8E0	Low Battery	Tech	High	Pump
0xA8E1	Low Battery	Tech	High	Pump
0xA8E2	Low Battery	Tech	High	Pump
0xA8E3	Low Battery	Tech	High	Pump
0xA8E4	Low Battery	Tech	High	Pump
0xA8E5	Low Battery	Tech	High	Pump
0xBA3D	Secondary VTBI Completed	Tech	High	Pump
0xBA3E	Secondary VTBI Completed	Tech	High	Pump
0xBA3F	Secondary VTBI Completed	Tech	High	Pump

Alarm ID	Alarm message	Category	Alarm priority	Source
0xBA40	Secondary VTBI Completed	Tech	High	Pump
0xBA41	Secondary VTBI Completed	Tech	High	Pump
0xBA42	Secondary VTBI Completed	Tech	High	Pump
0xBA43	Secondary VTBI Completed	Tech	High	Pump
0xBA44	Secondary VTBI Completed	Tech	High	Pump
0xBA45	Secondary VTBI Completed	Tech	High	Pump
0xBA46	Secondary VTBI Completed	Tech	High	Pump
0xBA47	Secondary VTBI Completed	Tech	High	Pump
0xBA48	Secondary VTBI Completed	Tech	High	Pump
0xBA49	Secondary VTBI Completed	Tech	High	Pump
0xBA4A	Secondary VTBI Completed	Tech	High	Pump
0xBA4B	Secondary VTBI Completed	Tech	High	Pump
0xBA4C	Secondary VTBI Completed	Tech	High	Pump
0xBA4D	Secondary VTBI Completed	Tech	High	Pump
0xBA4E	Secondary VTBI Completed	Tech	High	Pump
0xBA4F	Secondary VTBI Completed	Tech	High	Pump
0xBA50	Secondary VTBI Completed	Tech	High	Pump
0xBA51	Secondary VTBI Completed	Tech	High	Pump
0xBA52	Secondary VTBI Completed	Tech	High	Pump
0xBA53	Secondary VTBI Completed	Tech	High	Pump
0xBA54	Secondary VTBI Completed	Tech	High	Pump

9.6 Alarm IDs of Other Devices

Alarm ID	Alarm message	Category	Alarm priority	Source
0xAB37	RSO2 Reach Critical	Tech	Low	Monitor
0xAB38	Pod Comm. Lost	Tech	High	Monitor
0xAB39	SPO2-2 High	Phys	High	Monitor
0xAB3A	SPO2-2 Low	Phys	High	Monitor
0xAB3B	SPO2-3 High	Phys	High	Monitor

Alarm ID	Alarm message	Category	Alarm priority	Source
0xAB3C	SPO2-3 Low	Phys	High	Monitor
0xAB3D	SPO2-4 High	Phys	High	Monitor
0xAB3E	SPO2-4 Low	Phys	High	Monitor
0xAB3F	SPO2-5 High	Phys	High	Monitor
0xAB40	SPO2-5 Low	Phys	High	Monitor
0xAB41	SPO2-6 High	Phys	High	Monitor
0xAB42	SPO2-6 Low	Phys	High	Monitor
0xAB43	PR-2 High	Phys	High	Monitor
0xAB44	PR -2 Low	Phys	High	Monitor
0xAB45	PR -3 High	Phys	High	Monitor
0xAB46	PR -3 Low	Phys	High	Monitor
0xAB47	PR -4 High	Phys	High	Monitor
0xAB48	PR -4 Low	Phys	High	Monitor
0xAB49	PR -5 High	Phys	High	Monitor
0xAB4A	PR -5 Low	Phys	High	Monitor
0xAB4B	PR -6 High	Phys	High	Monitor
0xAB4C	PR -6 Low	Phys	High	Monitor
0xA9B7	SPO2 High	Phys	High	Monitor
0xA9B8	SPO2 Low	Phys	High	Monitor
0xA9B9	PR High	Phys	High	Monitor
0xA9BA	PR Low	Phys	High	Monitor
0xAA26	RSO2-1 Low	Phys	High	Monitor
0xAA27	RSO2-1 High	Phys	High	Monitor
0xAA28	RSO2-2 Low	Phys	High	Monitor
0xAA29	RSO2-2 High	Phys	High	Monitor
0xAA2A	RSO2-1' Low	Phys	High	Monitor
0xAA2B	RSO2-1' High	Phys	High	Monitor
0xAA2C	RSO2-2' Low	Phys	High	Monitor
0xAA2D	RSO2-2' High	Phys	High	Monitor
0xAA22	Low Perfusion	Tech	Low	Monitor

Alarm ID	Alarm message	Category	Alarm priority	Source
0xA9DF	Sensor Error	Tech	High	Monitor
0xA9A6	Poor Signal Quality	Tech	High	Monitor
0xA6D6	No Cable Connected	Tech	High	SpO2
0xA6D7	Cable Life Expired	Tech	Low	SpO2
0xA6D8	Incompatible Cable	Tech	Medium	SpO2
0xA6D9	Unrecognized Cable	Tech	Medium	SpO2
0xA6DA	Defective Cable	Tech	Medium	SpO2
0xA6DB	Cable Life Near Expiration	Tech	Low	SpO2
0xA6DC	No Sensor Connected	Tech	High	SpO2
0xA6DD	Sensor Life Expired	Tech	Low	SpO2
0xA6DE	Incompatible Sensor	Tech	Medium	SpO2
0xA6DF	Unrecognized Sensor	Tech	Medium	SpO2
0xA6E0	Defective Sensor	Tech	Medium	SpO2
0xA6E1	Emitter Temp Out of Range	Tech	Low	SpO2
0xA6E2	Sensor Current Limit Exceeded	Tech	Low	SpO2
0xA6E3	Sensor Life Near Expiration	Tech	Low	SpO2
0xA6E4	No Tape	Tech	High	SpO2
0xA6E5	Tape Life Expired	Tech	Low	SpO2
0xA6E6	Incompatible Tape	Tech	Medium	SpO2
0xA6E7	Unrecognized Tape	Tech	Medium	SpO2
0xA6E8	Defective Tape	Tech	Medium	SpO2
0xA6E9	Sensor Calibrating	Tech	Prompt	SpO2
0xA6EA	Sensor Off Patient	Tech	High	SpO2
0xA6EB	Pulse Search	Tech	Prompt	SpO2
0xA6EC	Interference Detected	Tech	Prompt	SpO2
0xA6ED	Low Perfusion Index	Tech	Prompt	SpO2

Alarm ID	Alarm message	Category	Alarm priority	Source
0xA6EE	Demo Mode	Tech	Prompt	SpO2
0xA6EF	Tape Life Near Expiration	Tech	Low	SpO2
0xA6F0	Long Calibration	Tech	Prompt	SpO2
0xA6F1	Check Sensor Connection	Tech	Prompt	SpO2
0xA6F2	SpO2 Only Mode	Tech	Prompt	SpO2
0xA6F3	No Cable Connected	Tech	High	SpO2
0xA6F4	Incompatible Cable	Tech	Medium	SpO2
0xA6F5	Unrecognized Cable	Tech	Medium	SpO2
0xA6F6	Defective Cable	Tech	Medium	SpO2
0xA6F7	No Sensor Connected	Tech	High	SpO2
0xA6F8	Incompatible Sensor	Tech	Medium	SpO2
0xA6F9	Unrecognized Sensor	Tech	Medium	SpO2
0xA6FA	Defective Sensor	Tech	Medium	SpO2
0xA6FB	Sensor Off Patient	Tech	High	SpO2
0xA6FC	Patient Interference Detected	Tech	Prompt	SpO2
0xA6FD	Background Interference Detected	Tech	Prompt	SpO2
0xA6FE	No Tape	Tech	High	SpO2
0xA6FF	Incompatible Tape	Tech	Medium	SpO2
0xA700	Defective Tape	Tech	Medium	SpO2
0xA701	Cable Life Expired	Tech	Low	SpO2
0xA702	Sensor Life Expired	Tech	Low	SpO2
0xA703	Tape Life Expired	Tech	Low	SpO2
0xA704	Cable Life Near Expiration	Tech	Low	SpO2
0xA705	Sensor Life Near Expiration	Tech	Low	SpO2

Alarm ID	Alarm message	Category	Alarm priority	Source
0xA706	Tape Life Near Expiration	Tech	Low	SpO2
0xA707	Sensor initializing	Tech	Prompt	SpO2
0xA708	Check Sensor Connection	Tech	Prompt	SpO2
0xA709	Low Signal IQ	Tech	Prompt	SpO2
0xA70A	Low PR Confidence	Tech	Prompt	SpO2
0xA70B	Low PI Confidence	Tech	Prompt	SpO2
0xA70C	Low SpCO Confidence	Tech	Prompt	SpO2
0xA70D	Low SpCO Perfusion Index	Tech	Prompt	SpO2
0xA70E	Low SpMet Confidence	Tech	Prompt	SpO2
0xA70F	Low SpMet Perfusion Index	Tech	Prompt	SpO2
0xA710	Low SpHb Confidence	Tech	Prompt	SpO2
0xA711	Low SpHb Perfusion Index	Tech	Prompt	SpO2
0xA712	Low Desat Index Confidence	Tech	Prompt	SpO2
0xA713	Low PI Delta Confidence	Tech	Prompt	SpO2
0xA714	Low SpOC Confidence	Tech	Prompt	SpO2
0xA715	Low SpOC Perfusion Index	Tech	Prompt	SpO2
0xA716	Low PVI Confidence	Tech	Prompt	SpO2
0xA717	Low RR Confidence	Tech	Prompt	SpO2
0xA718	Low RR Signal Strength	Tech	Prompt	SpO2
0xA719	Bad Sensor Placement	Tech	Prompt	SpO2
0xA71A	Respiratory Pause	Phys	High	SpO2

Alarm ID	Alarm message	Category	Alarm priority	Source
0xA71B	Low RR Confidence	Tech	Prompt	SpO2
0xA71C	Low RR Signal Strength	Tech	Prompt	SpO2
0xA71D	Bad Sensor Placement	Tech	Prompt	SpO2
0xA71E	Respiratory Pause	Phys	High	SpO2
0xA71F	Low Confidence	Phys	Prompt	SpO2
0xA720	Low Perfusion Index	Phys	Prompt	SpO2
0xA721	SpO2 High	Phys	High	SpO2
0xA722	SpO2 Low	Phys	High	SpO2
0xA723	PR High	Phys	High	SpO2
0xA724	PR Low	Phys	High	SpO2
0xA725	PI High	Phys	Medium	SpO2
0xA726	PI Low	Phys	Medium	SpO2
0xA727	SpCO High	Phys	High	SpO2
0xA728	SpCO Low	Phys	High	SpO2
0xA729	SpMET High	Phys	High	SpO2
0xA72A	SpMET Low	Phys	High	SpO2
0xA72B	SpHb High	Phys	High	SpO2
0xA72C	SpHb Low	Phys	High	SpO2
0xA72D	Desat Index	Phys	Medium	SpO2
0xA72E	Desat Index	Phys	Medium	SpO2
0xA72F	PI Delta High	Phys	Medium	SpO2
0xA730	PI Delta low	Phys	Medium	SpO2
0xA731	SpOC High	Phys	High	SpO2
0xA732	SpOC Low	Phys	High	SpO2
0xA733	PVI High	Phys	Medium	SpO2
0xA734	PVI Low	Phys	Medium	SpO2
0xA735	RR High	Phys	High	SpO2
0xA736	RR Low	Phys	High	SpO2

Alarm ID	Alarm message	Category	Alarm priority	Source
0xA737	RR High	Phys	High	SpO2
0xA738	RR Low	Phys	High	SpO2
0xA739	ORI High	Phys	High	SpO2
0xA73A	ORI Low	Phys	High	SpO2
0xA73B	Spot Check	Tech	Prompt	SpO2
0xA73C	Alarm Silence	Tech	Prompt	SpO2
0xA73D	Alarm All Mute	Tech	Prompt	SpO2
0xA73E	Low Battery	Tech	High	SpO2

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10 Capturing Fault Data

The BeneLink module has a built-in data capture plug-in. If the external device connected to the monitor via the BeneLink module has a failure, protocol data when the failure happened can be captured for analysis and troubleshooting.

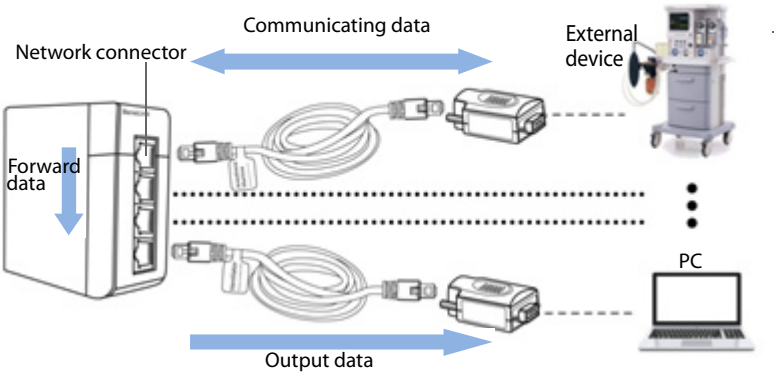
10.1 Tools Required for Data Capture

The following tools are required for data capture:

- ID adapter (ID: 5000B000)
- USB-to-serial cable
- Personal computer (PC)
- DeviceSimulator program (V2.3.0 or above) running on the PC
- Network cable

10.2 Data Capture Principle

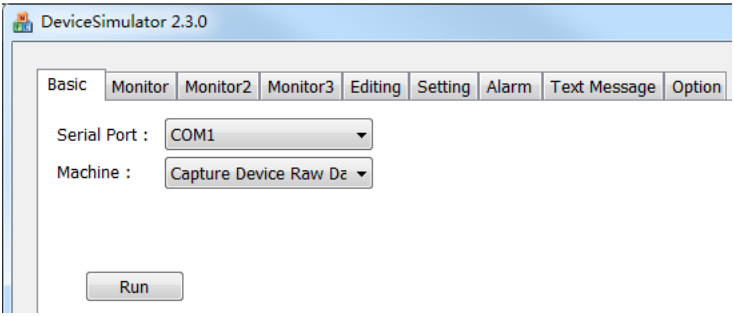
The external device communicates with the BeneLink module via the network connector on the BeneLink module. Communication data is output to a PC where the DeviceSimulator program runs. Then the data is analyzed on the PC to look for the cause of failure and to help troubleshooting. The following picture shows the principle of data capture:



10.3 Performing Data Capture

To capture data when the failure occurred, follow this procedure:

1. Connect the ID adapter (ID: 500B000) to the network connector of the BeneLink module via a network cable. For example, if the failed external device is connected to network connector 1, connect the data capture ID adapter to connector 2, or 3, or 4.
2. Connect the ID adapter to the PC via a USB-to-serial cable.
3. Run the DeviceSimulator program on the PC. Configure the program as follows:
   - **Serial Port**: select the COM where the USB-to-serial cable is connected.
   - **Machine**: select Capture Device Raw Data.
4. Select **Run** to start capturing data. Then a file named DeviceSimulatorCOM(X)xxxx-xx-xx-xx-xx-xx.txt is saved under the directory where the DeviceSimulator is located. The meaning of the file name is as follows:
   - X refers to the label of COM.
   - xxxx-xx-xx-xx-xx-xx refers to the time (year-month-day-hour-minute-second) when data is captured.



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