Reference manual

Servo Communication Interface
SCI Protocol version 0010

GETINGE

Notes

Table of Contents

1 INTRODUCTION

1.1 General information

The purpose of this Reference Manual is to describe the Servo Communication Interface (SCI), Protocol version 0010. The older protocol versions 0001 – 0009 are emulated.

The Servo Communication Interface is used in Servo Ventilator Systems with protocol versions according to chapter 1.6. The manual provides information about commands and responses in using the Servo Communication Interface.

Maquet Critical Care AB, part of Getinge AB, is the legal manufacturer of the Servo Ventilator Systems.

Throughout this Reference Manual, Servo represents the Servo-u, Servo-u MR, Servo-n, Servo-air or Servo-c Ventilator Systems.

The mapping between Servo Communication Interface and the data displayed on the Servo user interface is described in chapter 3 Appendix A – Servo User Interface presentation.

The Servo Communication Interface described herein interfaces an external equipment via an RS-232C serial interface. This specification states the requirements for the communication protocol between the Servo Communication Interface and an external equipment.

Updated revisions of the Reference Manual will be published when new protocol versions are released or when other changes require an updated Reference Manual. It is recommended to use the latest version of the Reference Manual, contact your Getinge representative for updates.

The Servo Communication Interface is an integrated part of the Servo Ventilator System. In addition to the information given here, always pay attention to the information in the User's Manual.

The Servo Communication Interface must not be used as a component in a remote alarm system.

Maquet Critical Care AB has no responsibility for the safe operation of the equipment if service or repair is done by a non-professional or by persons who are not employed by or authorized by Getinge. We recommend that service be done as part of a service contract with Getinge.

1.2 Operation

Due to factors not controlled by Maquet Critical Care AB, the correctness of processed metering values obtained from the Servo Communication Interface cannot be guaranteed. Maquet Critical Care AB disclaims all responsibility for the correctness of signals processed by external equipment.

If there should be any deviation between information shown on Servo and that shown by external equipments, the parameters shown on Servo shall be considered the primary source for information.
It is therefore recommended that the data is verified against actual preset and measured values of Servo.

Data obtained from the Servo Communication Interface, which have been processed in external equipments, must not be used as a substitute for therapeutic or diagnostic decisions. Such decisions can be made only by staff with medical expertise, according to established and accepted practice.

1.3 Equipment combinations

Only components, accessories, supplies and external equipment recommended by Maquet Critical Care AB should be used with the Servo Ventilator Systems. Use of any other components, accessories, supplies and external equipment may cause degraded system performance and safety.

Before starting to use the Servo Ventilator System with connected external equipment, ensure that the whole combination complies with the international IEC 60601-series standards and the requirements of the local authorities.

1.4 Definitions and Acronyms

1.4.1 Definitions

Alarm	Alarm data is alarm information generated by the Servo.
Alarm settings	Alarm settings data represent alarm limit settings.
Breath	Breath data is updated once a breath.
Curve	Curve data changes very often and is typically used to draw real time graphs. It is sampled periodically.
Control Modes	PC, VC, PRVC, NIV-PC, Bi-Vent/APRV.
Parameter	SCI command parameter, i.e. extra information needed to define the semantics of a given SCI command. For instance, for a read command the parameter designates the data to read.
Settings	Settings data represent panel settings.
Support Modes	VS, PS, NIV-PS, NAVA, NIV-NAVA.
Technical	Technical information, e.g. module version, configuration etc.

1.4.2 Common acronyms

Bi-Vent/APRV	Pressure controlled ventilation mode with the possibility of spontaneous breathing/pressure support on two different pressure levels. APRV: Airway Pressure Release Ventilation.
BPM	Breaths per minute.
Breath cycle T	See SIMV Cycle.
CMV	Continuous Mandatory Ventilation.
CPAP	Continuous Positive Airway Pressure.
Edi	Electrical activity of the diaphragm.
Exp. time	Expiration time.
HFO	HFO Pressure control
HFO (V TGT)	HFO Volume Target
HFOV	High Frequency Oscillation Ventilation. Includes HFO and HFO (V TGT) ventilation modes.
Insp. time	Inspiration time.
NAVA	Neurally Adjusted Ventilatory Assist.
NIV	Non Invasive Ventilation.
NIV-NAVA	Non Invasive – NAVA.
NIV-PC	Non Invasive – Pressure Control.
NIV-PS	Non Invasive – Pressure Support.
NPS	Neural Pressure Support
PEEP	Positive End Expiratory Pressure.
PC	Pressure Control.
PS	Pressure Support.
PRVC	Pressure Regulated Volume Control.
RM	Recruitment Maneuver
SIMV Cycle	The time between the mandatory breaths in an SIMV mode.
SIMV (PC)	SIMV (Pressure Control). Synchronized Intermittent Mandatory Ventilation with Pressure Control (PC) mandatory breaths.

SIMV (PRVC)	SIMV (Pressure Regulated Volume Control). Synchronized Intermittent Mandatory Ventilation with Pressure Regulated Volume Control (PRVC) mandatory breaths.
SIMV Rate	A Ventilation Setting used to set the mandatory breathing rate in SIMV mode.
SIMV (VC)	SIMV (Volume Control). Synchronized Intermittent Mandatory Ventilation with Volume Control (VC) mandatory breaths.
VC	Volume Control.
VS	Volume Support.
ZAM	Zero Assist Maneuver.

1.4.3 Abbreviations and terms used in this document

AD	Alarm data
BR	Breath data.
CU	Curve data.
Device type	The Servo Ventilator Systems product name.
N/A	Not applicable
SCI	The Servo Communication Interface.
SCI Protocol version	The version of the SCI protocol. New SCI protocol versions are usually part of a System version upgrade.
SD	Settings/Alarm settings data.
SE	Settings data, also available as event data.
Servo	Servo-u, Servo-u MR, Servo-n Servo-air or Servo-c ventilator systems
Servo-xyz	Device type (current or future).
Servo user interface	The Servo Ventilator Systems screen on the User Interface.
Software option	An optional function for the Servo Ventilator System. Software options are enabled with a Software option installation.
System SW version	The actual System SW version for the Servo Ventilator System. The System SW version can be updated with a System software installation.
System version	The Servo Ventilator Systems functional level. The System version can be upgraded with a System software installation.

1.5 Typographical conventions

When reading this specification, note that:

< >	encloses abbreviations, numerical value, etc.
NN_{16}	means hexadecimal value
[ ]	encloses parameters that are not necessary to use
{ }	encloses the set of valid data
...	indicates sequence

1.6 Protocol version/System version matrix

The SCI protocol is used in Servo-u, Servo-u MR, Servo-n, Servo-air or Servo-c with Protocol/System versions according to table below:

Device type	System version	Protocol version									
		0001	0002	0003	0004	0005	0006	0007	0008	0009	0010
Servo-u Servo-u MR Servo-n	1.0	X									
	1.1	X	X								
	2.0	X	X	X	X						
	2.1	X	X	X	X						
	2.2	X	X	X	X	X					
	3.0	X	X	X	X	X	X				
	4.0	X	X	X	X	X	X	X			
	4.1	X	X	X	X	X	X	X	X		
	4.2	X	X	X	X	X	X	X	X		
	4.4	X	X	X	X	X	X	X	X	X	X
	4.5	X	X	X	X	X	X	X	X	X	X
	4.6	X	X	X	X	X	X	X	X	X	X
Servo-air	1.0	X	X	X							
	2.1	X	X	X	X						
	2.2	X	X	X	X	X					
	4.0	X	X	X	X	X	X	X			
	4.1	X	X	X	X	X	X	X	X		
	4.2	X	X	X	X	X	X	X	X		
	4.3	X	X	X	X	X	X	X	X	X	
	4.4	X	X	X	X	X	X	X	X	X	X
	4.6	X	X	X	X	X	X	X	X	X	X
Servo-c	4.4	X	X	X	X	X	X	X	X	X	X
	4.6	X	X	X	X	X	X	X	X	X	X

Notes:

- In each new protocol version, the older protocol versions are emulated.
- Not all Device types, System versions and Software options described in this document are available in all countries. For details, contact your Getinge representative.

1.7 Compatibility

To consider when writing a SCI driver:

- The SCI Protocol is designed to be backwards compatible. However, even if the SCI driver is not updated with new functionality, it is still important to make sure that the SCI driver works with the new System version.
- At Servo startup, the functionality from SCI Protocol version 0001 is selected by default. Command SPVE must be used to set a higher protocol version.
- New or modified data channels are available after selecting higher SCI Protocol versions with the command SPVE. The protocol version is selectable from SCI Protocol version 0001 to highest for the current System version, read by the RHVE command. See chapter 2.2.7 Support for different SCI Protocol versions.

- The output from the command RSWV will be updated when a new System version is released.
  The output from the command RHVE will be updated when a new SCI Protocol version is released.
- After sending a command to SCI, wait for the response or abort the command with ESC.

1.8 Disclaimer

Not all Device types, System versions and Software options described in this document are available in all countries. For details, contact your Getinge representative.

Caution: Federal (US) law restricts sale of this device to, or on the order of, a physician.

2 PROTOCOL SPECIFICATION

2.1 Introduction

The SCI interfaces an external equipment via an RS-232C serial interface.

The information transfer between the SCI and the external equipment is performed via a serial communication line. The external equipment acts as the master and transmits commands to the SCI in order to retrieve information.

Curve data, breath data, settings data, alarm settings data, alarm data and technical information may be retrieved from the Servo through SCI.

2.2 Communication Requirements – General

2.2.1 RS-232 communication settings

The serial interface is according to RS-232C and fulfills the following requirements:

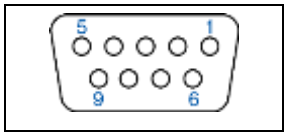
Baud rate:	38 400
Data length:	8 bits
Stop bits:	1 bit
Parity:	Even
Data format:	Binary
Handshake:	None

2.2.2 Command/Response format

SCI commands are always in ASCII format, unless stated otherwise. The response can be in either ASCII or binary format, as specified per command.

2.2.3 RS-232 connectors

Isolated RS-232 serial ports. 9 pin D-Sub female connector:



1. –	4. DTR_ISO	7. RTS_ISO
2. RXD_ISO	5. GND_ISO	8. –
3. TXD_ISO	6. –	9. –

Note that DTR_ISO and RTS_ISO are permanetly high (active).

2.2.4 Signal Handshake protocol

The following control characters are used, in order to control the data flow from the SCI:

<EOT>= 04_{16}	End of transmission. General character to be used to define the end of an instruction or end of an ASCII response from the SCI. Note: An ASCII string is not null terminated.
<ESC> = $1B_{16}$	Issued by the computer to interrupt the data transfer from the SCI. Upon reception of ESC, SCI aborts transmission and any running command, e.g. RADC, and sends the error message “Command aborted by ESC”. Transmission is restarted upon reception of the next valid command.
<CHK>	Calculated checksum. Checksum is sent either as one byte or two bytes; one byte in binary answer or two bytes in ASCII answer. The checksum calculation is defined in chapter 2.5.

2.2.5 Error handling

The SCI validates input data in order to detect errors. In case of error the SCI replies with an error message depending on the type of error and the response type, i.e. ASCII or binary.

The following error messages apply to ASCII response:

Error	Error name	Error code (ASCII)	Error message (ASCII)
Not a valid command	ER10	ER10	ER10<CHK><EOT>
Syntax error, e.g. too many, too few parameters, or same parameter twice	ER11	ER11	ER11<CHK><EOT>
Parameter value out of range or parameter not supported by the Servo	ER12	ER12	ER12<CHK><EOT>
No event data for the requested sequence numbers	N/A	N/A	N/A
Event channel not defined	N/A	N/A	N/A
SCI not configured	N/A	N/A	N/A
Servo is in Standby mode	N/A	N/A	N/A
Checksum error	ER18	ER18	ER18<CHK><EOT>
Output buffer full	ER19	ER19	ER19<CHK><EOT>
Command aborted by ESC	ER20	ER20	ER20<CHK><EOT>
Data not available, e.g. required option not installed or function not enabled/activated.	ER21	ER21	ER21<CHK><EOT>

The ASCII error message consists of the error code followed by the checksum and end of transmission:
<error code><CHK><EOT>

The following error messages apply to Binary response:

Error	Error name	Error code (Binary)	Error message (Binary)
Not a valid command	N/A	N/A	N/A
Syntax error, e.g. too many, too few parameters, or same parameter twice	BER11	$0B_{16}$	$E00B7F_{16}$<CHK>
Parameter value out of range or parameter not supported by the Servo	BER12	$0C_{16}$	$E00C7F_{16}$<CHK>
No event data for the requested sequence numbers	BER13	$0D_{16}$	$E00D7F_{16}$<CHK>
Event channel not defined	BER15	$0F_{16}$	$E00F7F_{16}$<CHK>
SCI not configured	BER16	10_{16}	$E0107F_{16}$<CHK>
Servo is in Standby mode	BER17	11_{16}	$E0117F_{16}$<CHK>
Checksum error	N/A	N/A	N/A
Output buffer full	BER19	13_{16}	$E0137F_{16}$<CHK>
Command aborted by ESC	BER20	14_{16}	$E0147F_{16}$<CHK>
Data not available, e.g. required option not installed or function not enabled/activated.	BER21	15_{16}	$E0157F_{16}$<CHK>

Note that the binary error code is preceded by the error flag ($E0_{16}$) and followed by the end flag ($7F_{16}$) and the checksum in a binary error response: <error_flag><error code><end_flag><CHK>

Note that since all SCI command messages are ASCII messages, the error “Not a valid command” is always returned as an ASCII response message. This is the reason why the error “Not a valid command” is not applicable as a binary response message.

Note that “Checksum error” is always returned as an ASCII response, since it is not possible to determine what command generated the error.

If it is not possible to calculate or retrieve data designated by a command within the SCI, a “Missing value” or “Undefined value” is transferred, which is **$7EFF_{16}$** for Binary response.

2.2.6 Performance requirements

The SCI needs to receive any character within set timeout, otherwise the previous characters are ignored. See command RTOU, chapter 2.4.18 and command STOU, chapter 2.4.22 for more information.

SCI sends the first character of the response to all commands within 500 ms, unless otherwise stated in the description of each specific command.

2.2.7 Support for different SCI Protocol versions

The SCI provides a mechanism for selecting between different protocol versions. The following commands are used:

- Read Highest Protocol Version, RHVE: Requests information about the highest available SCI Protocol version for the current System SW version.
- Read Protocol Version, RPVE: Requests information about the SCI Protocol version currently in use.
- Set Protocol Version, SPVE: Configures SCI to use a specific Protocol version.

The lowest selectable protocol version is SCI Protocol version 0001. This protocol version is selected at startup and when the RCTY command is received.

The difference between protocol versions are that:

- Existing channels can be deleted
- New channels can be added
- The configuration, or switch parameters, for existing channels can be changed
- New commands can be added.

2.2.8 Design/compatibility considerations for driver developers

Command RCCO, see chapter 2.4.6, shall be used to get the list with actual channels and corresponding configurations.

2.3 Channels

A Servo parameter corresponds to a channel number in the SCI protocol.

When a Servo parameter shall be read with the command RADC or RADA, the command SDAD is used to add a channel number to the list of activated channels.

The following table defines channels and corresponding Servo parameters:

Channels 00 – 99:	Reserved for the real time curves.
Channels 100 – 399:	Reserved for the breath data.
Channels 400 – 599:	Reserved for the settings.
Channels 600 – 799:	Reserved for the alarm settings.
Channels 800 – 999:	Reserved for the alarms.

The list with activated SCI channels is cleared at startup, with the commands ”Read CI Type” (RCTY) and “Set Protocol Version“ (SPVE).

2.3.1 Channel 0-99 – Real time curves

Channels used for real time curves. The configuration, i.e. actual scale factors, is received via the command Read Channel Configuration (RCCO). For more information about the configuration see the description of the command RCCO.

SCI supports curve channels according to the following table:

Ch No	**Parameter Name** Available in Protocol version:	0001	0002	0003	0004	0005	0006	0007	0008	0009	0010	**Configuration (gain, offset, unit, type)**
0	Airway Flow	X	X	X	X	X	X	X	X	X	X	+2500E-004, +4000E+000, 02, CU
1	Airway Pressure	X	X	X	X	X	X	X	X	X	X	+1000E-004, +2000E-001, 04, CU
2	Volume	X	X	X	X	X	X	X	X	X	X	+2000E-004, +0000E+000, 01, CU
3	Edi	X	X	X	X	X	X	X	X	X	X	+1000E-005, +0000E+000, 19, CU
4	CO_2 concentration (%)	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 07, CU
5	CO_2 concentration (mmHg)	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 10, CU
6	CO_2 concentration (kPa)	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 11, CU
7	Esophageal pressure							X	X	X	X	+1000E-004, +2000E-001, 04, CU

8	Transpulmonary pressure							X	X	X	X	+1000E-004, +2000E-001, 04, CU
9	Uncompensated Inlet Airway Flow									X	X	+2500E-004, +4000E+000, 02, CU
10 ↓ 99	Not defined											

2.3.2 Channel 100-399 – Breath data

Channels used for breath data. The configuration, i.e. actual scale factors, is received via the command Read Channel Configuration (RCCO). For more information about the configuration see the description of the command RCCO. Most breath data will be based on Y-piece data when Y-piece measurement is active.

SCI supports breath channels according to the following table:

Ch No	Parameter Name Available in Protocol version:	0001	0002	0003	0004	0005	0006	0007	0008	0009	0010	Configuration (gain, offset, unit, type)
100	Measured breath frequency	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 06, BR
101	Exp. tidal volume	X	X	X	X	X	X	X	X	X	X	+2000E-004, +0000E+000, 01, BR
102	Insp. Tidal volume	X	X	X	X	X	X	X	X	X	X	+2000E-004, +0000E+000, 01, BR
103	Insp. Minute volume	X	X	X	X	X	X	X	X	X	X	+1000E-005, +0000E+000, 08, BR
104	Exp. minute volume	X	X	X	X	X	X	X	X	X	X	+1000E-005, +0000E+000, 08, BR
105	Peak pressure	X	X	X	X	X	X	X	X	X	X	+1000E-004, +2000E-001, 04, BR
106	Mean airway pressure	X	X	X	X	X	X	X	X	X	X	+1000E-004, +2000E-001, 04, BR
107	Pause pressure	X	X	X	X	X	X	X	X	X	X	+1000E-004, +2000E-001, 04, BR
108	End exp. pressure	X	X	X	X	X	X	X	X	X	X	+1000E-004, +2000E-001, 04, BR
109	O_2 concentration	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 07, BR
110	Barometric pressure	X	X	X	X	X	X	X	X	X	X	+1000E-003, +0000E+000, 12, BR
111	Gas supply pressure, Air (Note 3)	X	X	X	X	X	X	X	X	X	X	+1000E-003, +0000E+000, 12, BR
112	Gas supply pressure, O_2	X	X	X	X	X	X	X	X	X	X	+1000E-003, +0000E+000, 12, BR
113	CO_2 tidal production	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 01, BR
114	End tidal CO_2 concentration (%)	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 07, BR
115	End tidal CO_2 concentration (mmHg)	X	X									+1000E-004, +0000E+000, 10, BR
				X	X	X	X	X	X	X	X	+1000E-003, +0000E+000, 10, BR
116	End tidal CO_2 concentration (kPa)	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 11, BR
117	CO_2 minute production	X	X	X	X	X	X	X	X	X	X	+1000E-003, +0000E+000, 03, BR
118	Exp. Resistance	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 09, BR
119	Static Compliance	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 05, BR

Ch No	Parameter Name Available in Protocol version:	0001	0002	0003	0004	0005	0006	0007	0008	0009	0010	Configuration (gain, offset, unit, type)
120	End exp. Flow	X	X	X	X	X	X	X	X	X	X	+2500E-004, +4000E+000, 02, BR
121	Insp. Resistance	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 09, BR
122	I:E Ratio (Note 1)	X	X	X	X	X	X	X	X	X	X	+1000E-005, +0000E+000, 20, BR
123	Ti (Insufflation time)	X	X	X	X	X	X	X	X	X	X	+1000E-005, +0000E+000, 14, BR
124	Fixed value = $7EFF_{16}$ (Note 2)	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 05, BR
125	Dynamic compliance	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 05, BR
126	Leakage fraction	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 07, BR
127	Elastance	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 16, BR
128	Ti/Ttot	X	X	X	X	X	X	X	X	X	X	+1000E-007, +0000E+000, 20, BR
129	Total PEEP	X	X	X	X	X	X	X	X	X	X	+1000E-004, +2000E-001, 04, BR
130	Spontaneous Breath frequency	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 06, BR
131	MVe spont	X	X	X	X	X	X	X	X	X	X	+1000E-005, +0000E+000, 08, BR
132	MVe spont/MVe in Bi-Vent/ APRV	X	X	X	X	X	X	X	X	X	X	+1000E-007, +0000E+000, 20, BR
133	Time constant	X	X	X	X	X	X	X	X	X	X	+1000E-005, +0000E+000,14, BR
134	Work of Breathing, Ventilator	X	X	X	X	X	X	X	X	X	X	+1000E-005, +0000E+000, 18, BR
135	Work of Breathing, Patient	X	X	X	X	X	X	X	X	X	X	+1000E-005, +0000E+000, 18, BR
136	CPAP	X	X	X	X	X	X	X	X	X	X	+1000E-004, +2000E-001, 04, BR
137	P01	X	X	X	X	X	X	X	X	X	X	+1000E-004, +2000E-001, 04, BR
138	Edi peak	X	X	X	X	X	X	X	X	X	X	+1000E-005, +0000E+000, 19, BR
139	Edi min	X	X	X	X	X	X	X	X	X	X	+1000E-005, +0000E+000, 19, BR
140	Insp. Trigger cause	X	X	X	X	X	X	X	X	X	X	-, -, -, BR
141	Cycle off cause	X	X	X	X	X	X	X	X	X	X	-, -, -, BR

Ch No	Parameter Name Available in Protocol version:	0001	0002	0003	0004	0005	0006	0007	0008	0009	0010	Configuration (gain, offset, unit, type)
142	Exp. Trigger cause	X	X	X	X	X	X	X	X	X	X	-, -, -, BR
143	Shallow Breathing Index (SBI)	X	X	X	X	X	X	X	X	X	X	+1000E-003, +0000E+000, 22, BR
144	Remaining Nebulization time	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 23, BR
145	VTe/Predicted Body Weight VT_{HF}/Body Weight in HFOV	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 25, BR
146	Average Edi peak				X	X	X	X	X	X	X	+1000E-005, +0000E+000, 19, BR
147	Average Edi min				X	X	X	X	X	X	X	+1000E-005, +0000E+000, 19, BR
148	Pdrive				X	X	X	X	X	X	X	+1000E-004, +2000E-001, 04, BR
149	Flow (in High Flow Therapy)				X	X	X	X	X	X	X	+2500E-004, +4000E+000, 02, BR
150	Stress Index					X	X	X	X	X	X	+1000E-006, +0000E+000, 20, BR
151	Pressure amplitude in HFOV						X	X	X	X	X	+1000E-004, +0000E-000, 04, BR
152	Tidal volume in HFOV						X	X	X	X	X	+1000E-004, +0000E+000, 01, BR
153	Carbon dioxide diffusion coefficient in HFOV						X	X	X	X	X	+1000E-003, +0000E+000, 29, BR
154	End insp. transpulmonary pressure							X	X	X	X	+1000E-004, +2000E-001, 04, BR
155	End exp. transpulmonary pressure							X	X	X	X	+1000E-004, +2000E-001, 04, BR
156	Transpulmonary driving pressure							X	X	X	X	+1000E-004, +2000E-001, 04, BR
157	Esophageal insp. pressure swing							X	X	X	X	+1000E-004, +2000E-001, 04, BR
158	Neuro Ventilatory Efficiency NVE								X	X	X	+1000E-004, +0000E-000, 30, BR
159	Average Neuro Ventilatory Efficiency								X	X	X	+1000E-004, +0000E-000, 30, BR
160	HeO_2 consumption								X	X	X	+1000E-005, +0000E+000, 08, BR

Ch No	Parameter Name Available in Protocol version:	0001	0002	0003	0004	0005	0006	0007	0008	0009	0010	Configuration (gain, offset, unit, type)
161 ↓ 399	Not defined											

Note 1: SCI sends I:E Ratio in the format “value:1”. This format is also used by the User Interface as long as “value” ≥1. Example: SCI value 2.0 is displayed as 2.0:1.
With a “value” <1 the I:E Ratio is displayed in the format “1:1/value”. Example: SCI value 0.5 is displayed as 1:2.0.

Note 2: Channel supported for backward compatibility.

Note 3: Heliox supply pressure when applicable.

2.3.2.1 Switch Parameters for channel 100 – 399

Ch No	Switch Parameters
140	Insp. Trigger cause Value: Trig cause undefined ..... = 0001_{16} Trig by CMV rate..... = 0002_{16} Flow Trig ..... = 0003_{16} Pressure Trig ..... = 0004_{16} Edi Trig ..... = 0005_{16} Time to give a mandatory breath..... = 0006_{16} “Start breath” button pressed..... = 0007_{16} Reserved for future use ..... = 0008_{16}-$7EFE_{16}$ Undefined ..... = $7EFF_{16}$
141	Cycle off cause Value: Cycle off cause undefined ..... = 0001_{16} Cycle off due to Edi drop to 70% of its peak value..... = 0002_{16} Cycle off due to pressure criteria..... = 0003_{16} Cycle off due to a too big TV ..... = 0004_{16} Cycle off due to an inspiratory time limitation..... = 0005_{16} Cycle off due to flow level below set cycle off criteria ..... = 0006_{16} Reserved for future use ..... = 0007_{16}-$7EFE_{16}$ Undefined ..... = $7EFF_{16}$

142	Exp. Trigger cause Value: Trig cause undefined ..... = 0001_{16} A cycle off criteria is reached..... = 0002_{16} Pressure limit reached (Safety limit)..... = 0003_{16} Pressure limit reached (UPL)..... = 0004_{16} Reserved for future use ..... = 0005_{16}-$7EFE_{16}$ Undefined..... = $7EFF_{16}$

2.3.3 Channel 400-599 – Settings

Channels used for settings. The configuration, i.e. actual scale factors, is received via the command Read Channel Configuration (RCCO). For more information about the configuration see the description of the command RCCO.

Displayed parameter setting values may be rounded at ventilation mode change for values that are inherited from measured metrics in the previous ventilation mode. Transmitted values are not rounded and may in these cases therefore slightly differ from displayed values.

SCI supports settings channels according to the following table:

Ch No	**Parameter Name** Available in Protocol version:	0001	0002	0003	0004	0005	0006	0007	0008	0009	0010	**Configuration (gain, offset, unit, type)**
400	RR (in Control modes)	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 06, SD
401	Leakage compensation Status	X	X	X	X	X	X	X	X	X	X	-, -, -, SD
402	T pause (%)	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 07, SD
403	SIMV rate	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 06, SD
404	Tinsp. rise (%)	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 07, SD
405	Minute volume	X	X	X	X	X	X	X	X	X	X	+1000E-005, +0000E+000, 08, SD
406	PC above PEEP (Pressure Control Level above PEEP)	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 04, SD

Ch No	Parameter Name Available in Protocol version:	0001	0002	0003	0004	0005	0006	0007	0008	0009	0010	Configuration (gain, offset, unit, type)
407	PS above PEEP (Pressure Support Level above PEEP)	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 04, SD
408	PEEP	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 04, SD
409	Patient range selection	X	X	X	X	X	X	X	X	X	X	-, -, -, SD
410	Ventilation Mode	X	X	X	X	X	X	X	X	X	X	-, -, -, SD
411	Status of current user request (e.g. Inspiratory Hold)	X	X	X	X	X	X					-, -, -, SD
								X	X	X	X	-, -, -, SE
412	CPAP	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 04, SD
413	Alarm mute/pre-mute Status	X	X	X	X	X	X	X	X	X	X	-, -, -, SD
414	O_2 conc.	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 07, SD
415	Trigger sensitivity (Pressure trigger sensitivity level)	X	X	X	X	X	X	X	X	X	X	-1000E-004, +0000E+000, 04, SD
416	Trigger sensitivity (Flow trigger sensitivity level)	X	X	X	X	X	X	X	X	X	X	+1000E-005, +0000E+000, 08, SD
417	Language	X	X	X	X	X	X	X	X	X	X	-, -, -, SD
418	Displayed CO_2 Unit	X	X	X	X	X	X	X	X	X	X	-, -, -, SD
419	I:E Ratio $I:E_{HF}$ in HFOV (Note 1)	X	X	X	X	X	X	X	X	X	X	+1000E-005, +0000E+000, 20, SD

Ch No	Parameter Name Available in Protocol version:	0001	0002	0003	0004	0005	0006	0007	0008	0009	0010	Configuration (gain, offset, unit, type)
420	Tidal volume	X	X	X	X	X	X	X	X	X	X	+2000E-004, +0000E+000, 01, SD
421	Backup RR (in Support modes)	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 06, SD
422	Backup Ti (s) (in Support modes)	X	X	X	X	X	X	X	X	X	X	+1000E-005, +0000E+000, 14, SD
423	NIV Program Status	X	X	X	X	X	X	X	X	X	X	-, -, -, SD
424	Phigh (High-pressure level in Bi-Vent/ APRV)	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 04, SD
425	Thigh (High pressure level time in Bi-Vent/APRV)	X	X	X	X	X	X	X	X	X	X	+1000E-005, +0000E+000, 14, SD
426	TPEEP (Low pressure level, PEEP, time in Bi-Vent/APRV)	X	X	X	X	X	X	X	X	X	X	+1000E-005, +0000E+000, 14, SD
427	PS above Phigh (Pressure Support level above Phigh in Bi-Vent/APRV)	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 04, SD
428	PS above PEEP (Pressure Support level above PEEP in Bi-Vent/APRV)	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 04, SD
429	Ti (s) (Inspiration Time in Seconds)	X	X	X	X	X	X	X	X	X	X	+1000E-005, +0000E+000, 14, SD

Ch No	Parameter Name Available in Protocol version:	0001	0002	0003	0004	0005	0006	0007	0008	0009	0010	Configuration (gain, offset, unit, type)
430	T pause (s) (Pause Time in Seconds)	X	X	X	X	X	X	X	X	X	X	+1000E-005, +0000E+000, 14, SD
431	Tinsp. rise (s) (Insp. Rise time in Seconds)	X	X	X	X	X	X	X	X	X	X	+1000E-005, +0000E+000, 14, SD
432	Breath cycle T (in SIMV modes)	X	X	X	X	X	X	X	X	X	X	+1000E-005, +0000E+000, 14, SD
433	Backup PC above PEEP (in Support modes)	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 04, SD
434	Flow (Inspiration Peak Flow)	X	X	X	X	X	X	X	X	X	X	+1000E-006, +0000E+000, 15, SD
435	Suction Support Status	X	X	X	X	X	X					-, -, -, SD
								X	X	X	X	-, -, -, SE
436	End inspiration (Cycle off Fraction Level)	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 07, SD
437	Circuit compliance compensation Status	X	X	X	X	X	X	X	X	X	X	-, -, -, SD
438	Max. apnea time (Trigger timeout in Automode)	X	X	X	X	X	X	X	X	X	X	+1000E-005, +0000E+000, 14, SD
439	Y-piece measurement Status	X	X	X	X	X	X	X	X	X	X	-, -, -, SD
440	Edi trigger	X	X	X	X	X	X	X	X	X	X	+1000E-005, +0000E+000, 19, SD
441	NAVA level	X	X	X	X	X	X	X	X	X	X	+1000E-005, +0000E+000, 21, SD

Ch No	Parameter Name Available in Protocol version:	0001	0002	0003	0004	0005	0006	0007	0008	0009	0010	Configuration (gain, offset, unit, type)
442	Gas Type Setting	X	X	X	X	X	X	X	X	X	X	-, -, -, SD
443	Backup Tidal volume (in Support modes)	X	X	X	X	X	X	X	X	X	X	+2000E-004, +0000E+000, 01, SD
444	Backup I:E (in Support modes) (See Note 1)	X	X	X	X	X	X	X	X	X	X	+1000E-005, +0000E+000, 20, SD
445	Leakage too high alarm (in non invasive ventilation)	X	X	X	X	X	X	X	X	X	X	-, -, -, SD
446	Nebulization mode	X	X	X	X	X	X	X	X	X	X	-, -, -, SD
447	Nebulization time	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 23, SD
448	No patient effort alarm	X	X	X	X	X	X	X	X	X	X	-, -, -, SD
449	Backup ventilation On/Off (in Support modes)	X	X	X	X	X	X	X	X	X	X	-, -, -, SD
450	Backup ventilation status (in Support modes)	X	X	X	X	X	X	X	X	X	X	-, -, -, SD
451	Predicted Body Weight	X	X	X	X	X	X	X	X	X	X	+1000E-005, +0000E+000, 24, SD
452	Leakage too high alarm (in invasive ventilation)		X	X	X	X	X	X	X	X	X	-, -, -, SD
453	Inspiratory tidal volume too high alarm		X	X	X	X	X	X	X	X	X	-, -, -, SD

Ch No	Parameter Name Available in Protocol version:	0001	0002	0003	0004	0005	0006	0007	0008	0009	0010	Configuration (gain, offset, unit, type)
454	Expiratory minute volume high alarm		X	X	X	X	X	X	X	X	X	-, -, -, SD
455	Expiratory minute volume low alarm		X	X	X	X	X	X	X	X	X	-, -, -, SD
456	VC Flow Adaptation				X	X	X	X	X	X	X	-, -, -, SD
457	VC Flow Deceleration (Percentage of peak flow)				X	X	X	X	X	X	X	+1000E-004, +0000E+000, 07, SD
458	Flow (in High Flow Therapy)				X	X	X	X	X	X	X	+1000E-006, +0000E+000, 15, SD
459	Mean pressure in HFOV						X	X	X	X	X	+1000E-004, +0000E+000, 04, SD
460	Pressure amplitude in HFO						X	X	X	X	X	+1000E-004, +0000E+000, 04, SD
461	Frequency in HFOV						X	X	X	X	X	+1000E-003, +0000E+000, 28, SD
462	Tidal volume in HFO (V TGT)						X	X	X	X	X	+1000E-004, +0000E+000, 01, SD
463	Backup pressure amplitude in HFO (V TGT)						X	X	X	X	X	+1000E-004, +0000E+000, 04, SD
464	Auto RM status							X	X	X	X	-, -, -, SE
465	Expiratory tidal volume high alarm										X	-, -, -, SD
466	Expiratory tidal volume low alarm										X	-, -, -, SD
467 ↓ 599	Not defined											

Note 1: SCI sends I:E Ratio in the format “value:1”. This format is also used by the User Interface as long as “value” ≥1. Example: SCI value 2.0 is displayed as 2.0:1.
With a “value” <1, the I:E Ratio is displayed in the format “1:1/value”. Example: SCI value 0.5 is displayed as 1:2.0.

2.3.3.1 Switch Parameters for channel 400 – 599

Ch. No.	Switch Parameters
401	Leakage compensation Status Value: OFF ..... = 0001_{16} ON ..... = 0002_{16} Reserved for future use ..... = 0003_{16}-$7EFE_{16}$ Undefined ..... = $7EFF_{16}$
409	Patient range selection Value: Neonate ..... = 0001_{16} Adult ..... = 0002_{16} Pediatric ..... = 0003_{16} Reserved for future use ..... = 0004_{16}-$7EFE_{16}$ Undefined ..... = $7EFF_{16}$

Ch. No.	Switch Parameters
410	Ventilation Mode Value: Pressure Control (PC), Automode off ..... = 0001_{16} PC - PS, Automode on, no patient trigg ..... = 0002_{16} PC - PS, Automode on, patient trigg ..... = 0003_{16} Volume Control (VC), Automode off..... = 0004_{16} VC - VS, Automode on, no patient trigg ..... = 0005_{16} VC - VS, Automode on, patient trigg ..... = 0006_{16} Pressure Reg. Volume Control (PRVC), Automode off... = 0007_{16} PRVC - VS, Automode on, no patient trigg ..... = 0008_{16} PRVC - VS, Automode on, patient trigg ..... = 0009_{16} Volume Support (VS)..... = $000A_{16}$ Pressure Support (PS) / CPAP..... = $000B_{16}$ SIMV (Vol. Contr.) + Pressure Support ..... = $000C_{16}$ SIMV (Press. Contr.) + Pressure Support ..... = $000D_{16}$ SIMV (Pressure Reg. Volume Control) + Pressure Support..... = $000E_{16}$ Bi-Vent/APRV ..... = $000F_{16}$ NIV Pressure Control (NIV PC) ..... = 0010_{16} NIV Pressure Support (NIV PS) ..... = 0011_{16} Nasal CPAP..... = 0012_{16} NAVA..... = 0013_{16} NIV NAVA..... = 0014_{16} Available in Protocol version 0004 or higher High Flow Therapy ..... = 0015_{16} Available in Protocol version 0006 or higher HFO ..... = 0016_{16} HFO Volume Target ..... = 0017_{16} Available in Protocol version 0008 or higher NPS ..... = 0018_{16} NIV NPS ..... = 0019_{16} Reserved for future use ..... = $001A_{16}$-$7EFE_{16}$ Undefined ..... = $7EFF_{16}$

Ch. No.	Switch Parameters
411	Status of current user request, issued by means of a panel button: Insp./Exp. Hold, O_2 Boost, Manual Breath, Pause Oscillation in HFOV or ZAM breaths for NPS and NAVA. The status is synchronized with the ventilation cycle. Combined channel. Output value is the sum of all active functions. Example: 5 = O_2 Boost and Insp. Hold. Value: Normal state, no active function ..... = 0000_{16} INSPIRATORY HOLD ..... = 0001_{16} EXPIRATORY HOLD..... = 0002_{16} O_2 BOOST ..... = 0004_{16} MANUAL BREATH ..... = 0008_{16} Available in Protocol version 0006 or higher Pause Oscillation in HFOV ..... = 0010_{16} Available in Protocol version 0008 or higher ZAM BREATH..... = 0020_{16} Reserved for future use ..... = 0040_{16}-$7EFE_{16}$ Undefined ..... = $7EFF_{16}$
413	Alarm mute/pre-mute Status Value: Normal state, no muted/pre-muted alarms ..... = 0001_{16} Alarms muted/pre-muted ..... = 0002_{16} Reserved for future use ..... = 0003_{16}-$7EFE_{16}$ Undefined ..... = $7EFF_{16}$
417	Language Value: English…… = 0001_{16} Portuguese…. = 0009_{16} Czech…….. = 0011_{16} Swedish…….. = 0002_{16} Danish…… = $000A_{16}$ Finnish…… = 0012_{16} German…….. = 0003_{16} Turkish…… = $000B_{16}$ Norwegian…… = 0013_{16} French……. = 0004_{16} Greek…….. = $000C_{16}$ Slovak…….. = 0014_{16} Italian…….. = 0005_{16} Chinese…….. = $000D_{16}$ Romanian (Note 1) = 0015_{16} Spanish…… = 0006_{16} Russian…….. = $000E_{16}$ Reserved for future use…… = 0016_{16}-$7EFE_{16}$ Japanese…… = 0007_{16} Polish…….. = $000F_{16}$ Dutch…….. = 0008_{16} Hungarian… = 0010_{16} Undefined…… = $7EFF_{16}$ Note 1: Available in Protocol version 0006 or higher.

Ch. No.	Switch Parameters
418	Displayed CO_2 Unit Value: %..... = 0001_{16} kPa ..... = 0002_{16} mmHg ..... = 0003_{16} Reserved for future use ..... = 0004_{16}-$7EFE_{16}$ Undefined ..... = $7EFF_{16}$
423	NIV Program Status Value: Undefined Status ..... = 0000_{16} Waiting position ..... = 0001_{16} Ventilation ..... = 0002_{16} Disconnected ..... = 0003_{16} Reserved for future use ..... = 0004_{16}-$7EFE_{16}$ Undefined ..... = $7EFF_{16}$
435	Suction Support Status Value: Undefined Status ..... = 0000_{16} Normal ventilation ..... = 0001_{16} Waiting for disconnect ..... = 0002_{16} Disconnected ..... = 0003_{16} Post oxygenation ..... = 0004_{16} Reserved for future use ..... = 0005_{16}-$7EFE_{16}$ Undefined ..... = $7EFF_{16}$
437	Circuit compliance compensation Status Value: OFF..... = 0001_{16} ON ..... = 0002_{16} Reserved for future use ..... = 0003_{16}-$7EFE_{16}$ Undefined ..... = $7EFF_{16}$

Ch. No.	Switch Parameters
439	Y-piece Measurement Status Value: Inactive ..... = 0001_{16} Active ..... = 0002_{16} Reserved for future use ..... = 0003_{16}-$7EFE_{16}$ Undefined ..... = $7EFF_{16}$
442	Gas Type Setting Value: Undefined Gas Type ..... = 0000_{16} Heliox ..... = 0001_{16} Air ..... = 0002_{16} Reserved for future use ..... = 0003_{16}-$7EFE_{16}$ Undefined ..... = $7EFF_{16}$
445	Leakage too high alarm (in non invasive ventilation) Value: Alarm OFF ..... = 0001_{16} Alarm ON ..... = 0002_{16} Reserved for future use ..... = 0003_{16}-$7EFE_{16}$ Undefined ..... = $7EFF_{16}$
446	Nebulization mode Value: OFF ..... = 0001_{16} Intermittent ..... = 0002_{16} Continuous ..... = 0003_{16} Reserved for future use ..... = 0004_{16}-$7EFE_{16}$ Undefined ..... = $7EFF_{16}$
448	No patient effort alarm Value: Alarm OFF ..... = 0001_{16} Alarm ON ..... = 0002_{16} Reserved for future use ..... = 0003_{16}-$7EFE_{16}$ Undefined ..... = $7EFF_{16}$

Ch. No.	Switch Parameters
449	Backup ventilation Value: Backup ventilation disabled ..... = 0001_{16} Backup ventilation enabled..... = 0002_{16} Reserved for future use ..... = 0003_{16}-$7EFE_{16}$ Undefined ..... = $7EFF_{16}$
450	Backup ventilation status Value: Support breath ..... = 0001_{16} Control breath ..... = 0002_{16} Reserved for future use ..... = 0003_{16}-$7EFE_{16}$ Undefined ..... = $7EFF_{16}$
452	Leakage too high alarm (in invasive ventilation) Value: Alarm OFF ..... = 0001_{16} Alarm ON ..... = 0002_{16} Reserved for future use ..... = 0003_{16}-$7EFE_{16}$ Undefined ..... = $7EFF_{16}$
453	Inspiratory tidal volume too high alarm Value: Alarm OFF ..... = 0001_{16} Alarm ON ..... = 0002_{16} Reserved for future use ..... = 0003_{16}-$7EFE_{16}$ Undefined ..... = $7EFF_{16}$
454	Expiratory minute volume high alarm Value: Alarm OFF ..... = 0001_{16} Alarm ON ..... = 0002_{16} Reserved for future use ..... = 0003_{16}-$7EFE_{16}$ Undefined ..... = $7EFF_{16}$

Ch. No.	Switch Parameters
455	Expiratory minute volume low alarm Value: Alarm OFF ..... = 0001_{16} Alarm ON ..... = 0002_{16} Reserved for future use ..... = 0003_{16}-$7EFE_{16}$ Undefined ..... = $7EFF_{16}$
456	VC Flow Adaptation Value: OFF..... = 0001_{16} ON..... = 0002_{16} Reserved for future use ..... = 0003_{16}-$7EFE_{16}$ Undefined ..... = $7EFF_{16}$
464	Auto RM status Value: Undefined Status ..... = 0000_{16} Auto RM Started ..... = 0001_{16} Auto SRM Started..... = 0002_{16} Auto RM/SRM Completed ..... = 0003_{16} Aborted By User..... = 0010_{16} Aborted Cdyn Error..... = 0011_{16} Aborted Tech Problem..... = 0012_{16} Aborted Safety Valve ..... = 0013_{16} Evaluate Time Out..... = 0014_{16} Reserved for future use ..... = 0015_{16}-$7EFE_{16}$ Undefined..... = $7EFF_{16}$

465	Expiratory tidal volume high alarm Value: Alarm off…….. = 0001_{16} Alarm on…….. = 0002_{16} Reserved for future use..... = 0003_{16}-$7EFE_{16}$ Undefined…….. = $7EFF_{16}$
466	Expiratory tidal volume low alarm Value: Alarm off…… = 0001_{16} Alarm on…… = 0002_{16} Reserved for future use..... = 0003_{16}-$7EFE_{16}$ Undefined…….. = $7EFF_{16}$

2.3.4 Channel 600-799 – Alarm settings

Channels used for alarm settings. The actual configuration is received via the command Read Channel Configuration (RCCO). For more information about the configuration see the description of the command RCCO.

SCI supports alarm settings channels according to the following table:

Ch No	**Parameter Name** Available in Protocol version:	0001	0002	0003	0004	0005	0006	0007	0008	0009	0010	**Configuration (gain, offset, unit, type)**
600	Upper pressure limit	X	X	X	X	X	X	X	X	X	X	+1000E-003, +0000E+000, 04, SD
601	O_2 concentration Upper alarm limit	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 07, SD
602	O_2 concentration Lower alarm limit	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 07, SD
603	Respiratory rate Upper alarm limit	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 06, SD
604	Respiratory rate Lower alarm limit	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 06, SD
605	Apnea time	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 14, SD
606	PEEP High limit	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 04, SD
607	PEEP Low limit	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 04, SD
608	CPAP Upper alarm limit	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 04, SD
609	CPAP Lower alarm limit	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 04, SD
610	Exp. minute vol. Upper alarm limit	X	X	X	X	X	X	X	X	X	X	+1000E-005, +0000E+000, 08, SD
611	Exp. minute vol. Lower alarm limit	X	X	X	X	X	X	X	X	X	X	+1000E-005, +0000E+000, 08, SD
612	$EtCO_2$ concentration Upper alarm limit (%)	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 07, SD

Ch No	Parameter Name Available in Protocol version:	0001	0002	0003	0004	0005	0006	0007	0008	0009	0010	Configuration (gain, offset, unit, type)
613	$EtCO_2$ concentration Lower alarm limit (%)	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 07, SD
614	$EtCO_2$ concentration Upper alarm limit (mmHg)	X	X									+1000E-004, +0000E+000, 10, SD
				X	X	X	X	X	X	X	X	+1000E-003, +0000E+000, 10, SD
615	$EtCO_2$ concentration Lower alarm limit (mmHg)	X	X									+1000E-004, +0000E+000, 10, SD
				X	X	X	X	X	X	X	X	+1000E-003, +0000E+000, 10, SD
616	$EtCO_2$ concentration Upper alarm limit (kPa)	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 11, SD
617	$EtCO_2$ concentration Lower alarm limit (kPa)	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 11, SD
618	Apnea audio delay	X	X	X	X	X	X	X	X	X	X	+1000E-004, +0000E+000, 14, SD
619	VTi Upper alarm limit	X	X	X	X	X	X	X	X	X	X	+2000E-004, +0000E+000, 01, SD
620	Pressure amplitude High limit in HFO (V TGT)						X	X	X	X	X	+1000E-004, +0000E+000, 04, SD
621	Pressure amplitude Low limit in HFO (V TGT)						X	X	X	X	X	+1000E-004, +0000E+000, 04, SD
622	HF tidal volume High limit in HFO						X	X	X	X	X	+1000E-004, +0000E+000, 01, SD
623	HF tidal volume Low limit in HFO						X	X	X	X	X	+1000E-004, +0000E+000, 01, SD
624	VTe Upper alarm limit										X	+1000E-003, +0000E+000, 01, SD
625	VTe Lower alarm limit										X	+1000E-003, +0000E+000, 01, SD

Ch No	**Parameter Name** Available in Protocol version:	0001	0002	0003	0004	0005	0006	0007	0008	0009	0010	**Configuration (gain, offset, unit, type)**
626 ↓ 799	Not defined											

2.3.5 Channel 800-999 – Alarms

Channels used for alarms. The configuration is received via the command Read Channel Configuration (RCCO). For more information about the configuration see the description of the command RCCO.

SCI supports alarm channels according to the following table:

Ch No	**Parameter Name** Available in Protocol version:	0001	0002	0003	0004	0005	0006	0007	0008	0009	0010	**Configuration (gain, offset, unit, type)**
800	O_2 concentration high	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
801	O_2 concentration low	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
802	$EtCO_2$ concentration high	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
803	$EtCO_2$ concentration low	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
804	Airway pressure high (Upper pressure limit exceeded)	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
805	Apnea	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
806	Gas supply alarm One or more of following alarms: **Servo-u/Servo-u MR/Servo-n:** Gas supply pressures low Air supply pressure low Air supply pressure high O_2 supply pressure low O_2 supply pressure high HeO2 supply pressure low HeO2 supply pressure high **Servo-c:** Gas supply pressures low Air supply pressure low Air supply pressure high	X	X	X	X	X	X	X	X	X	X	-, -, -, AD

Ch No	Parameter Name Available in Protocol version:	0001	0002	0003	0004	0005	0006	0007	0008	0009	0010	Configuration (gain, offset, unit, type)
	O2 supply pressure low O2 supply pressure high **Servo-air:** Gas supply pressures low O_2 supply pressure low O_2 supply pressure high Blocked air inlet Turbine failure											
807	Battery alarm One or more of following alarms: **Servo-u/Servo-u MR/Servo-n:** Missing battery Limited battery capacity Battery voltage low No battery capacity **Servo-air/Servo-c:** No slot 2 battery capacity No battery backup Limited battery capacity Battery voltage low No battery capacity	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
808	Fixed value = $7EFF_{16}$ (Note 1)	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
809	Battery operation	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
810	No consistent patient effort	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
811	Airway pressure continuously high	X	X	X	X	X	X	X	X	X	X	-, -, -, AD

Ch No	Parameter Name Available in Protocol version:	0001	0002	0003	0004	0005	0006	0007	0008	0009	0010	Configuration (gain, offset, unit, type)
812	Overrange alarm One or more of following alarms: Inspiratory tidal volume too high Pressure delivery is restricted	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
813	O_2 cell/sensor failure	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
814	Time in waiting position > 2 min	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
815	No patient effort	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
816	Leakage too high	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
817	Disconnect alarm One or more following alarms: Patient circuit disconnected Check tubing	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
818	Pressure limitation alarm One or more of the following alarms: Volume delivery is restricted Peak pressure limited	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
819	Respiratory rate high	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
820	Respiratory rate low	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
821	PEEP high	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
822	PEEP low	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
823	CPAP high	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
824	CPAP low	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
825	Fixed value = $7EFF_{16}$ (Note 1)	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
826	Fixed value = $7EFF_{16}$ (Note 1)	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
827	Fixed value = $7EFF_{16}$ (Note 1)	X	X	X	X	X	X	X	X	X	X	-, -, -, AD

Ch No	Parameter Name Available in Protocol version:	0001	0002	0003	0004	0005	0006	0007	0008	0009	0010	Configuration (gain, offset, unit, type)
828	Patient disconnected > 1 min	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
829	Expiratory minute volume high	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
830	Expiratory minute volume low	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
831	Expiratory cassette disconnected	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
832	Expiratory cassette replaced	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
833	Edi signal invalid	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
834	Edi signal interference from ECG	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
835	Delivered gas temperature high			X	X	X	X	X	X	X	X	-, -, -, AD
836	Inspiratory pressure high				X	X	X	X	X	X	X	-, -, -, AD
837	Flow through expiratory tube				X	X	X	X	X	X	X	-, -, -, AD
838	Pressure amplitude high in HFOV One or more of following alarms: Pressure amplitude high Pressure amplitude limited at max						X	X	X	X	X	-, -, -, AD
839	Pressure amplitude low in HFOV						X	X	X	X	X	-, -, -, AD
840	HF tidal volume high in HFOV						X	X	X	X	X	-, -, -, AD
841	HF tidal volume low in HFOV One or more of following alarms: HF tidal volume low HF tidal volume restricted						X	X	X	X	X	-, -, -, AD

Ch No	Parameter Name Available in Protocol version:	0001	0002	0003	0004	0005	0006	0007	0008	0009	0010	Configuration (gain, offset, unit, type)
842	Y sensor flow too high in HFOV						X	X	X	X	X	-, -, -, AD
843	Y sensor pressure measurement deviation in HFOV						X	X	X	X	X	-, -, -, AD
844	Patient circuit failure in HFOV						X	X	X	X	X	-, -, -, AD
845	Mean airway pressure high in HFOV						X	X	X	X	X	-, -, -, AD
846	Mean airway pressure low in HFOV						X	X	X	X	X	-, -, -, AD
847	Edi triggering disabled - Edi signal invalid								X	X	X	-, -, -, AD
848	Edi triggering disabled - Edi signal interference from ECG								X	X	X	-, -, -, AD
849	HeO_2/Patient category mismatch								X	X	X	-, -, -, AD
850	Check Heliox adapter								X	X	X	-, -, -, AD
851	HeO_2/Y sensor mismatch								X	X	X	-, -, -, AD
852	Expiratory tidal volume high										X	-, -, -, AD
853	Expiratory tidal volume low										X	-, -, -, AD
854	Amplitude limited by Pmean in HFOV										X	-, -, -, AD
855 ↓ 993	Not defined											
994	Internal communication failure alarm. (Reserved for internal use)	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
995	Any low priority alarm active (Note 2)	X	X	X	X	X	X	X	X	X	X	-, -, -, AD

Ch No	**Parameter Name** Available in Protocol version:	0001	0002	0003	0004	0005	0006	0007	0008	0009	0010	**Configuration (gain, offset, unit, type)**
996	Any medium priority alarm active (Note 2)	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
997	Any high priority alarm active (Note 2)	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
998	Any technical alarm active (Note 2)	X	X	X	X	X	X	X	X	X	X	-, -, -, AD
999	Any alarm active (Note 2)	X	X	X	X	X	X	X	X	X	X	-, -, -, AD

Note 1: Channel supported for backward compatibility.

Note 2: Priority is not defined in the output for this alarm.

2.4 Commands

Equipment administration commands:

Command	Description	Valid in Standby	Possible errors
Empty command	The empty command can be used for connection check.	Yes	ER19
Escape	The escape command clears the input command buffer, and aborts any running RADC or RADAUC command. Sends the error message “Command aborted by ESC”.	Yes	ER19, BER19, ER20, BER20
Ping request, PING	Restarts the external communication supervision timer. A response message containing incoming message id will be sent back to the client.	Yes	BER11, BER12, ER18, BER19, BER21
Read Channel Configuration, RCCO	Reads the channel configuration.	Yes	ER11, ER12, ER18, ER19
Read Configuration, RCFG	Reads device configuration data.	Yes	ER11, ER12, ER18, ER19, ER21
Read CI Type, RCTY	Reads the device type (SERVO-U, SERVO-n or SERVO-air) and the internal communication status. It also clears the list with activated channels and sets the sample time and the input character time out to default. It also set the SCI Protocol version to 0001 (default at startup). Device type for new devices (Servo-xyz) will be SERVO-U. This command is supported for compatibility with older System versions. For System version 3.0 or higher, use the RPTY and RCFG commands instead.	Yes	ER11, ER18, ER19
Read Highest Protocol Version, RHVE	Reads the highest available SCI Protocol version for the current System SW version.	Yes	ER11, ER18, ER19
Read Protocol Type, RPTY	Reads the protocol type (SCI), and the internal communication status. Clears the list with activated channels and sets the sample time and the input character time-out to default. Sets the SCI Protocol version to 0001 (default at startup).	Yes	ER11, ER18, ER19
Read Protocol Version, RPVE	Reads the SCI Protocol version currently in use.	Yes	ER11, ER18, ER19
Read Software Version, RSWV	Reads the device type and the System SW version.	Yes	ER11, ER18, ER19
Read Serial Number, RSEN	Reads the serial number of the Servo.	Yes	ER11, ER18, ER19
Read Time, RTIM	Reads the internal clock.	Yes	ER11, ER18, ER19
Read input character timeout, RTOU	Reads the input character timeout.	Yes	ER11, ER18, ER19

Set Protocol Version, SPVE	Configures SCI to use a specific Protocol version.	Yes	ER11, ER12, ER18, ER19
Set input character timeout, STOU	Defines the input character timeout.	Yes	ER11, ER12, ER18, ER19

Data acquisition commands:

Command	Description	Valid in Standby	Possible errors
Set Data Acquisition Definition, SDAD	Defines the table of channels to be read by the commands Read Acquired Data or Read Acquired Data Continuously.	Yes	ER11, ER12, ER18, ER19
Read Data Acquisition Definition, RDAD	Reads the data acquisition channel table defined by the command Set Data Acquisition Definition.	Yes	ER11, ER18, ER19
Read Acquired Data, RADA (Note 2)	Reads the data (curve-, breath-, settings-, alarm settings-, alarm- or event data) according to the channel table.	No (Note 1) (Note 3)	BER11, BER12, BER13, BER15, BER16, BER17, ER18, BER19, BER20
Read Acquired Data Continuously, RADC	Reads combined data stream (curve-, breath-, settings-, alarm settings- and alarm data) continuously.	No	BER11, BER16, BER17, ER18, BER19, BER20
Read Sampling Time, RSTI	Reads the sampling time for real time curves (in milliseconds).	Yes	ER11, ER18, ER19
Set Sampling Time, SSMP	Sets the sampling time for real time curves (in milliseconds).	Yes	ER11, ER12, ER18, ER19
Read Alarm Output, RALO	Reads the summary alarm status.	Yes	ER11, ER18, ER19

Note 1: RADAB is allowed in standby mode in Protocol version 0004 or higher.
RADAA is allowed in standby mode in protocol version 0009 or higher.

Note 2: RADAEV is available in Protocol version 0007 or higher.

Note 3: RADAEV is allowed in standby mode and does not require that channels are set up with SDAD. Therefore RADAEV shall not return BER16 and BER17.

Patient administration commands:

Command	Description	Valid in Standby	Possible errors
Read Patient Info, RPAI	Reads the patient information from the active patient field.	Yes	ER11, ER18, ER19

2.4.1 Empty command

The empty command can be used for connection check.

Input syntax:	<EOT>
Output syntax:	*<CHK><EOT>

2.4.2 Escape

The escape command clears the input command buffer, and abort any running RADC or RADAUC command.

If a RADC or RADAUC command is running, the data stream is terminated and a binary error message BER20 is sent. Otherwise escape results in an ER20 message in ASCII format.

Input syntax:	<ESC>
Output syntax: (ASCII):	ER20<CHK><EOT>
Output syntax: (binary):	E0147F$_{16}$<CHK>

2.4.3 Ping request PING

Restarts the external communication supervision timer. A response message containing incoming message id will be sent back to the client.

Input syntax:	PING<msg_id><CHK><EOT>
Input parameters:	<msg_id> = 0000 – 9999
Output syntax: (binary):	<ping_response_data_flag><msg_id ><end_flag><CHK>
Output syntax in case of error:	<error_flag><error><end_flag><CHK>
Output parameters:	<ping_response_data_flag> = 50$_{16}$ (ASCII character 'P') <msg_id > = 0000$_{16}$ – 270F$_{16}$ (0000 – 9999 in ASCII) <end_flag> = 7F$_{16}$ <CHK> = 00$_{16}$ - FF$_{16}$

If selected protocol version lower than 0009 or the external communication supervision is not activated, this command returns binary error BER21.

External communication supervision, if activated, will begin 120 seconds after power on. Periodic ping requests are expected with an interval of no more than two seconds. A new ping request should not be sent until a response message has been received.

Response messages during RADC will be sent according to RADC definition, see chapter 2.4.5.

No response message will be sent during RADAUC.

2.4.4 Read Acquired Data RADA

This command reads the data, i.e. curve-, breath-, settings-, alarm settings- or alarm data, according to the channel table defined by the command Set Data Acquisition Definition. Each type of RADA command is described in detail in the subsections below.

For error handling see chapter 2.2.5.

2.4.4.1 Curve Data

It is possible to have 1 or more curves at the same time. Up to 6 curves are allowed.

Input syntax:	RADA<curve_parameters><CHK><EOT>
Input parameters	<curve_parameters> = UC<n>[<trigger_point>][<end_trigger_point>] n = 0001 – 1500 (number of samples) <trigger_point> = { 0 (free run) – default, 1 (start insp), 2 (end insp), 3 (start exp), 4 (end exp)} <end_trigger_point> = { 0 (free run), 1 (start insp), 2 (end insp), 3 (start exp), 4 (end exp)}
Output syntax: **(binary)**	<phase_flag><phase><value_flag><value$_{(0,0)}$> [<value_flag><value$_{(1,0)}$>[<value_flag><value$_{(2,0)}$> [<value_flag><value$_{(3,0)}$>[<value_flag><value$_{(4,0)}$>[<value_flag> <value$_{(5,0)}$>]]]]] [<phase_flag><phase>](<diff_value$_{(0,1)}$>|<value_flag><value$_{(0,1)}$>) [(<diff_value$_{(1,1)}$>|<value_flag><value$_{(1,1)}$>) [(<diff_value$_{(2,1)}$>|<value_flag><value$_{(2,1)}$>) [(<diff_value$_{(3,1)}$>|<value_flag><value$_{(3,1)}$>) [(<diff_value$_{(4,1)}$>|<value_flag><value$_{(4,1)}$>) [(<diff_value$_{(5,1)}$>|<value_flag><value$_{(5,1)}$>)]]]]]... <end_flag><CHK>
Output syntax in case of error:	<error_flag><error><end_flag><CHK>
Output syntax in case of buffer full error:	…data<end_flag><CHK><error_flag>13_{16}<end_flag><CHK>
Output syntax in case of Standby:	…data<end_flag><CHK><error_flag>11_{16}<end_flag><CHK>
Output syntax in case of ESC:	…data<end_flag><CHK><error_flag>14_{16}<end_flag><CHK>

Output parameters:	<phase_flag> =	81_{16}
	<phase> = {	10_{16} (insp phase), 20_{16} (pause phase), 30_{16} (exp phase)}
	<value_flag>	= 80_{16}
	<value$_{(x)}$>	= 0000_{16} – $7EFF_{16}$ (MSB first)
	<diff_value$_{(x)}$>	= 82_{16} – $7E_{16}$ (82_{16} = -126_{10} ; $7E_{16}$ = 126_{10})
	<error_flag>	= $E0_{16}$
	<error>	= XX_{16} (binary error code)
	<end_flag>	= $7F_{16}$
	<CHK>	= 00_{16} – FF_{16}
	During Nasal CPAP, High Flow Therapy and HFOV:	
	<trigger_point>	ignored and treated as 0 (free run)
	<phase>	will always be 30_{16} (exp phase)

If no <trigger_point> selected, the default value 0 (free run) is applied.

If no <end_trigger_point> selected, <n> samples are transmitted.

If <end_trigger_point> selected, <trigger_point> must also be selected. In this case the command transmits samples until the trigger condition <end_trigger_point> is true or a maximum of <n> samples are transmitted.

Values are sent as differences <diff_value> when possible in order to save bandwidth, where <diff_value> is the difference between the current and the preceding value, i.e. <diff_value> = <value$_{(t)}$> - <value$_{(t-1)}$>.

Absolute values <value> are sent the first time and when the difference is too large. An absolute value is preceded by a value flag <value_flag>.The most significant byte (MSB) of an absolute value is sent first.

The breath phase <phase> is sent the first time and then only upon breath phase changes. It is preceded by a phase flag <phase_flag>.

Note that RADAUC in combination with the start trigger can result in delay of answer.

ESC command shall be used if RADAUC command shall be aborted before start trigger point is reached.

All other commands, except ESC and PING, are ignored during execution of this command. ESC aborts an ongoing command, PING restarts the external communication timer but does not send any response while RADAUC is active.

When in standby mode this command returns the binary error BER17.

If no curve channels are defined this command returns the binary error BER16.

If the Servo is set in standby mode before the <trigger_point> is reached, this command returns the binary error BER17.

Note that the min curve sampling time (see the command Set Sampling Time) for SCI is 10 ms, which is too high to present a full resolution curve when HFOV is used.

2.4.4.2 Breath Data

Input syntax:	RADA<breath_parameters><CHK><EOT>
Input parameters	<breath_parameters> = B
Output syntax: (binary)	<value$_{(0)}$>...<value$_{(n)}$><end_flag><CHK> n = 0 – 99
Output syntax in case of error:	<error_flag><error><end_flag><CHK>
Output parameters:	<value$_{(n)}$> = 0000_{16} - $7EFF_{16}$ (MSB first) <error_flag> = $E0_{16}$ <error> = XX_{16} (binary error code) <end_flag> = $7F_{16}$ <CHK> = 00_{16} - FF_{16}

Protocol version 0001 – 0003: When the Servo is in standby mode, this command returns binary error BER17.
Protocol version 0004 or higher: This command is allowed in standby mode.
If no breath channels are defined this command returns binary error BER16.

2.4.4.3 Settings Data

Input syntax:	RADA<setting_parameters><CHK><EOT>
Input parameters	<setting_parameters> = S
Output syntax: (binary)	<value$_{(0)}$>...<value$_{(n)}$><end_flag><CHK> n = 0 – 99
Output syntax in case of error:	<error_flag><error><end_flag><CHK>
Output parameters:	<value$_{(n)}$> = 0000_{16} - $7EFF_{16}$ (MSB first) <error_flag> = $E0_{16}$ <error> = XX_{16} (binary error code) <end_flag> = $7F_{16}$ <CHK> = 00_{16} - FF_{16}

When in standby mode this command returns binary error BER17.
If no settings channels are defined this command returns binary error BER16.

2.4.4.4 Alarm Settings Data

Input syntax:	RADA<alarm_setting_parameters><CHK><EOT>
Input parameters	<alarm_setting_parameters> = L
Output syntax: (binary)	<value$_{(0)}$>...<value$_{(n)}$><end_flag><CHK> n = 0 – 49
Output syntax in case of error:	<error_flag><error><end_flag><CHK>
Output parameters:	<value$_{(n)}$> = 0000_{16} - $7EFF_{16}$ (MSB first) <error_flag> = $E0_{16}$ <error> = XX_{16} (binary error code) <end_flag> = $7F_{16}$ <CHK> = 00_{16} – FF_{16}

When in standby mode this command returns binary error BER17.
If no settings channels are defined this command returns binary error BER16.

2.4.4.5 Alarm Data

Input syntax:	RADA<alarm_parameters><CHK><EOT>
Input parameters	<alarm_parameters> = A
Output syntax: (binary)	<prio$_{(0)}$><value$_{(0)}$>...<prio$_{(n)}$><value$_{(n)}$> <end_flag><CHK> n = 0 – 99
Output syntax in case of error:	<error_flag><error><end_flag><CHK>
Output parameters:	<prio$_{(n)}$> = { 00_{16} (Undefined prio) 01_{16} (Low prio) 02_{16} (Medium prio) 03_{16} (High prio) } <value$_{(n)}$> = { 00_{16} (No Alarm) 01_{16} (Alarm active) 02_{16} (Alarm active but silenced) } <prio><value> = $7EFF_{16}$ (Alarm not applicable) <error_flag> = $E0_{16}$ <error> = XX_{16} (binary error code) <end_flag> = $7F_{16}$ <CHK> = 00_{16} - FF_{16}

Protocol version 0001 – 0008: When in standby mode this command returns binary error BER17.
Protocol version 0009 or higher: This command is allowed in standby mode.
If no alarm channels are defined this command returns binary error BER16.
Alarm prio can change dynamically. Defined only when the alarm is active.

2.4.4.6 Event Data

This command reads the event data independent of the channel table setup via Set Data Acquisition Definition. A change in the channel's value results in a timestamped event data entry with the channel's value.

Input syntax:	RADA<event_parameters><CHK><EOT>
Input parameters:	<event_parameters> = EV<chan>S<sequence_nr> <chan> = 400 – 599, channel number <sequence_nr> = 0 – 32511, first event data entry to be read
Output syntax: (binary)	<event_data_flag><sequence_nr$_{(0)}$><time_stamp$_{(0)}$><value$_{(0)}$> [<sequence_nr$_{(n)}$><time_stamp$_{(n)}$><value$_{(n)}$>] <end_flag><CHK> n = 0 – 499
Output syntax in case of error:	<error_flag><error><end_flag><CHK>
Output parameters:	<event_data_flag> = 45_{16} (ASCII character 'E') <sequence_nr> = 0000_{16} – $7EFF_{16}$ (MSB first) <time_stamp> = <year><month><day><hour><min><sec> <year> = 0000_{16} - $7EFF_{16}$ (MSB first) <month> = 01_{16} – $0C_{16}$ (1 – 12) <day> = 01_{16} – $1F_{16}$ (1 – 31) <hour> = 00_{16} – 17_{16} (0 – 23) <minute> = 00_{16} – $3B_{16}$ (0 – 59) <sec> = 00_{16} – $3B_{16}$ (0 – 59) <value> = 0000_{16} – $7EFF_{16}$ (MSB first) <error_flag> = $E0_{16}$ <error> = XX_{16} (binary error code) <end_flag> = $7F_{16}$ <CHK> = 00_{16} – FF_{16}

This command returns all data entries from the entry defined by <sequence_nr> to the latest entry.

The data entries are sent with the oldest entry first.

At most 500 event data entries will be available. When 500 entries exist, a new event data entry will replace the oldest entry.

All event data entries are cleared and the sequence number is set to 0 when a new patient is admitted.

The sequence numbers are consecutive and in increasing order.

If the requested event channel does not contain any data for the requested sequence numbers, this command returns binary error BER13.

If the requested event channel is not defined, this command returns binary error BER15.

If a required option for the requested event channel is not installed, this command returns binary error BER21.

2.4.5 Read Acquired Data Continuously RADC

This command reads the data continuously, i.e. curve-, breath-, settings-, alarm settings- and alarm data according to the channel table defined by the command Set Data Acquisition Definition.

It is possible to read 1 or more curves at the same time. Up to 6 curves are allowed.

New breath data are transmitted when the breath is finished, i.e. when a new breath is started.

In Nasal CPAP new breath data is transmitted at the end of the breath or every two seconds, whichever comes first. In High Flow Therapy and in HFOV, new breath data is transmitted every two seconds.

Breath/Setting/Alarm setting/Alarm data package is transmitted when some of the data, according to the channel table set-up, is updated.

The curve data is transferred continuously. However, if an alarm occur, a Ping request is received, a setting changes or new breath data are available, the curve data transfer will be temporarily interrupted. If curve data is not interrupted, a forced interrupt occurs every minute to send out checksum.

If buffer overflow occur, ESC is received or ”Standby” mode set, the transmission will stop.

Input syntax:	RADC<CHK><EOT>
Output syntax: **(binary)**	[<settings_data><end_flag><CHK>] [<alarm_settings_data><end_flag><CHK>] [<alarm_data><end_flag><CHK>] [<breath_data><end_flag><CHK>] [<curve_data><end_flag><CHK>] [<ping_response_data><end_flag><CHK>]
Output syntax in case of error:	<error_flag><error><end_flag><CHK>
Output syntax in case of buffer full error:	…data<end_flag><CHK><error_flag>13_{16}<end_flag><CHK>
Output syntax in case of Standby:	…data<end_flag><CHK><error_flag>11_{16}<end_flag><CHK>
Output syntax in case of ESC:	…data<end_flag><CHK><error_flag>14_{16}<end_flag><CHK>
Output syntax in case of Ping request:	…data<end_flag><CHK><ping_response_data><end_flag><CHK>…data…
Output syntax in case of error from Ping request:	…data<end_flag><CHK><error_flag><error><end_flag><CHK>…data…

Output parameters:	<curve_data> = <phase_flag><phase><value_flag><value$_{(0,0)}$> [<value_flag><value$_{(1,0)}$>[<value_flag><value$_{(2,0)}$> [<value_flag><value$_{(3,0)}$>[<value_flag><value$_{(4,0)}$> [<value_flag><value$_{(5,0)}$>]]]]] [<phase_flag><phase>](<diff_value$_{(0,1)}$>|<value_flag><value$_{(0,1)}$>) [(<diff_value$_{(1,1)}$>|<value_flag><value$_{(1,1)}$>) [(<diff_value$_{(2,1)}$> |<value_flag><value$_{(2,1)}$>) [(<diff_value$_{(3,1)}$>|<value_flag><value$_{(3,1)}$>) [(<diff_value$_{(4,1)}$>|<value_flag><value$_{(4,1)}$>) [(<diff_value$_{(5,1)}$> |<value_flag><value$_{(5,1)}$>)]]]]]... <phase_flag> = 81_{16} <phase> = { 10_{16} (insp phase), 20_{16} (pause phase), 30_{16} (exp phase)} During Nasal CPAP, High Flow Therapy and HFOV <phase> will always be 30_{16} (exp phase) <value_flag> = 80_{16} <value$_{(n)}$> = 0000_{16} - $7EFF_{16}$ (MSB first) <diff_value$_{(n)}$> = 82_{16} - $7E_{16}$ (82_{16} = -126_{10} ; $7E_{16}$ = 126_{10}) n = 0 – infinity <alarm_data> = <alarm_data_flag> <prio$_{(0)}$><value$_{(0)}$>…<prio$_{(n)}$><value$_{(n)}$> <alarm_data_flag> = 41_{16} (ASCII character ‘A’) <prio$_{(n)}$> = { 00_{16} (Undefined prio) 01_{16} (Low prio) 02_{16} (Medium prio) 03_{16} (High prio) } <value$_{(n)}$> = { 00_{16} (No Alarm) 01_{16} (Alarm active) 02_{16} (Alarm active but silenced)} n = 0 – 99 <prio><value> = $7EFF_{16}$ (Alarm not applicable) <breath_data> = <breath_data_flag> <value$_{(0)}$>…<value$_{(n)}$> <breath_data_flag> = 42_{16} (ASCII character ‘B’) <value$_{(0)}$>…<value$_{(n)}$> = 0000_{16} - $7EFF_{16}$ (MSB first) n = 0 – 99 <settings_data> = <settings_data_flag> <value$_{(0)}$>…<value$_{(n)}$>

	<settings_data_flag> = 53_{16} (ASCII character 'S') <value$_{(0)}$>…<value$_{(n)}$> = 0000_{16} - $7EFF_{16}$ (MSB first) n = 0 – 99 <alarm_settings_data> = <alarm_settings_data_flag> <value$_{(0)}$>…<value$_{(n)}$> <alarm_settings_data_flag> = $4C_{16}$ (ASCII character 'L') <value$_{(0)}$>…<value$_{(n)}$> = 0000_{16} - $7EFF_{16}$ (MSB first) n = 0 – 49 <ping_response_data> = <ping_response_data_flag><msg_id> <ping_response_data_flag> = 50_{16} (ASCII character 'P') <msg_id> = 0000_{16} – $270F_{16}$ (message id fom Ping request, 0000 – 9999 in ASCII) <error_flag> = $E0_{16}$ <error> = XX_{16} (binary error code) <end_flag> = $7F_{16}$ <CHK> = 00_{16} - FF_{16}

The SCI transmits channel data according to the channel table set-up via Set Data Acquisition Definition command.

The <end_flag> is transmitted when curve data transfer is interrupted. The curve data transfer continues, after an interrupt, from where it was interrupted. When curve data transfer continues, absolute values must be sent first.

The breath phase <phase> is sent the first time and then only upon breath phase changes. It is preceded by a phase flag <phase_flag>.

All other commands, except ESC and PING, are ignored during execution of this command.

If output buffer is full this command returns the binary error BER19.

When in standby mode this command returns the binary error BER17.

If no curve channels are defined this command returns the binary error BER16.

Alarm prio can change dynamically. Defined only when the alarm is active.

Note that the min curve sampling time (see the command Set Sampling Time) for SCI is 10 ms, which is too high to present a full resolution curve when HFOV is used.

2.4.6 Read Alarm Output RALO

This command reads the summary alarm status.

The output of this command covers all alarms. Not depending on configuration made with command SDADA.

Input syntax:	RALO<CHK><EOT>
Output syntax:	<value><CHK><EOT>
Output parameters:	<value> = { 0 (No Alarm), 1 (Alarm active), 2 (Alarm active but silenced)}

2.4.7 Read Channel Configuration RCCO

This command reads the channel configuration, e.g. gain, offset, either for a specific channel or for all available channels.

Input syntax:	RCCO[<ch>]<CHK><EOT>
Input parameters:	<ch> = 0 – 999 , channel number
Output syntax:	<sampling_time>; <ch_0>,<gain>,<offset>,<unit>,<type>; [<ch_1>,<gain>,<offset>,<unit>,<type>; <ch_n>,<gain>,<offset>,<unit>,<type>;] <CHK><EOT>
Output parameters:	<sampling_time> = 010 - 220 (ms) (Sampling time for curve data. In ms, even numbers only.) <ch_0>...< ch_n > = 0 - 999 , channel <gain> = <X>E<Y> Interpretation: Gain = X * 10^Y <X> = -9999 to +9999, 5 ASCII characters <Y> = -127 to +127, 4 ASCII characters <offset> = <X>E<Y> Interpretation: Offset = X * 10^Y <X> = -9999 to +9999, 5 ASCII characters <Y> = -127 to +127, 4 ASCII characters <unit> = 01 to 99, 2 ASCII characters

<unit>	Unit	<unit>	Unit	<unit>	Unit
01....	ml	11 ...	kPa	21 ...	$cmH_2O/\mu V$
02....	ml/s	12 ...	mbar	22 ...	breaths/min/l
03....	ml/min	13 ...	mV	23 ...	min
04....	cmH_2O	14 ...	s	24 ...	kg
05....	ml/cmH_2O	15 ...	l/s	25 ...	ml/kg
06....	breaths/min	16 ...	cmH_2O/l	26 ...	years
07....	%	17 ...	l	27 ...	cm
08....	l/min	18 ...	Joule/l	28 ...	Hz
09....	$cmH_2O/l/s$	19 ...	µV	29 ...	ml^2/s
10....	mmHg	20 ...	no unit	30 ...	ml/µV

	<type> = {	CU (Curve Data), BR (Breath Data), SD (Settings and Alarm settings Data), SE (Settings and alarm settings Data, also available as event), AD (Alarm Data)}

If channel is omitted in the received command, information concerning all available channels are transferred.

The ASCII character '-' represents information not applicable.

Any CU, BR, SD parameter which has defined value of gain has the following magnitude:
Magnitude = {$Value_n$ * Gain - Offset}

2.4.8 Read Configuration RCFG

This command reads the device configuration data. Input parameter controls data selection.

For error handling see chapter 2.2.5.

2.4.8.1 Device type

Input syntax:	RCFG<device_type_param><CHK><EOT>
Input parameters:	<device_type_param> = DT
Output syntax:	<device_type><CHK><EOT>
Output parameters:	<device_type> = ASCII character string (without terminating null character) containing device type.
Output example:	SERVO-air<CHK><EOT>

2.4.8.2 Applicable channels

Input syntax:	RCFG<applicable_channels_param><ventilation_mode><CHK><EOT>
Input parameters:	<applicable_channels_param> = AC <ventilation_mode> = 0001 – xxxx
Output syntax:	B<nB0>...<nB99>S<nS0>...<nS99>L<nL0>...<nL49><CHK><EOT>
Output parameters:	<nB0>...<nB99> = 100 – 399, applicable breath channels <nS0>...<nS99> = 400 – 599, applicable settings channels <nL0>...<nL49> = 600 – 799, applicable alarm settings channels
Output example:	B100101S400401L600601<CHK><EOT>

The requested ventilation mode:

- Shall be expressed with 4 digits, otherwise this command will return ER11.
- Shall have a value range (in ASCII) according to switch parameters for channel 410, otherwise this command will return ER12.
- Shall be applicable for the currently connected device type, otherwise this command will return ER21.

For automode ventilation modes, command will return same result for no patient triggering and patient triggering modes, e.g. “RCFGAC0002” and “RCFGAC0003” will return the same result.

In output parameters, a list of all applicable Breath, Settings, and Alarm Settings channels for a given ventilation mode is provided, see Appendix B – Channel applicability tables. Applicable means that this channel might have a defined value in this ventilation mode, not that this channel currently has a defined value. Channels that are not available in selected protocol version or for the current device type are not applicable and not included in the output.

2.4.9 Read CI Type RCTY

This command returns the device type (SERVO-U, SERVO-n and SERVO-air) and the internal communication status.

This command also clears the list with activated channels and sets the sample time and the input character time out to default.

This command also set the SCI Protocol version to 0001 (default at startup).

Input syntax:	RCTY<CHK><EOT>
Output syntax:	<device_type><status><CHK><EOT>
Output parameters:	<device_type> = SERVO-U, SERVO-n or SERVO-air <device_type> = ASCII character string (without a terminating null character) containing device type. <status> = { 1 (there is an error in the internal communication) 0 (OK) }

Device type for new devices (Servo-xyz) will be SERVO-U.

This command is supported for compatibility with older System versions. For System version 3.0 or higher, use the RPTY and RCFG commands instead.

2.4.10 Read Data Acquisition Definition RDAD

This command reads the data acquisition channel table defined by the command Set Data Acquisition Definition.

Input syntax:	RDAD<CHK><EOT>
Output syntax:	C[<n_{C0}>...<n_{C5}>] B[<n_{B0}>...<n_{B99}>] S[<n_{S0}>...<n_{S99}>] L[<n_{L0}>...<n_{L49}>] A[<n_{A0}>...<n_{A99}> <CHK><EOT>
Output parameters:	<n_{C0}>...<n_{C5}> = 000 – 099, curve channel number <n_{B0}>...<n_{B99}> = 100 – 399, breath channel number <n_{S0}>...<n_{S99}> = 400 – 599, settings channel number <n_{L0}>...<n_{L49}> = 600 – 799, alarm settings channel number <n_{A0}>...<n_{A99}> = 800 – 999, alarm channel number

2.4.11 Read Highest Protocol Version RHVE

This command reads the highest available SCI Protocol version for the current System SW version.

Input syntax:	RHVE<CHK><EOT>
Output syntax:	<highest_version><CHK><EOT>
Output parameters:	<highest_version> = 0010 (See chapter 1.6 Protocol version/System version matrix.) <highest_version> = Highest available SCI Protocol version.

2.4.12 Read Patient Info RPAI

This command reads the admittance time for the active patient.

Input syntax:	RPAI<CHK><EOT>
Output syntax:	<admittance_time><CHK><EOT>
Output parameters:	<admittance_time> = <year><month><day><hour><minute> <year> = 0000 – 9999 <month> = 01 – 12 <day> = 01 – 31 <hour> = 00 – 23 <minute> = 00 – 59
Output example: Protocol version 0001 – 0005:	----------201803011505<CHK><EOT>
	No active patient: ----------<CHK><EOT>
Output example: Protocol version 0006 or higher:	201803011505<CHK><EOT>
	No active patient: ----------<CHK><EOT> (No active patient)

A string (without a terminating null character) of 12 ASCII '-' characters will be transmitted if no active patient exists.

Protocol version 0001 – 0005: 20 ASCII ‘-‘ characters will be sent instead of patient id, due to backwards compatibility with older System versions.

2.4.13 Read Protocol Type RPTY

This command reads the protocol type (SCI) and the internal communication status.

This command also clears the list with activated channels and sets the sample time and the input character time-out to default.

This command also sets the SCI Protocol version to 0001 (default at startup).

Input syntax:	RPTY<CHK><EOT>
Output syntax:	SCI<status><CHK><EOT>
Output parameters:	<status> = { 1 (there is an error in the internal communication) 0 (OK)}

2.4.14 Read Protocol Version RPVE

This command reads the SCI Protocol version currently in use.

Input syntax:	RPVE<CHK><EOT>
Output syntax:	<current_version><CHK><EOT>
Output parameters:	<current_version> = 0001 – xxxx <current_version> = SCI protocol version currently used. Set to 0001 (first release) as default.

The protocol version is selected with the command SPVE.

The protocol version is set to 0001 at startup and when any of the commands RCTY or RPTY are received.

2.4.15 Read Serial Number RSEN

This command reads the serial number of the Servo.

Input syntax:	RSEN<CHK><EOT>
Output syntax:	<serial_number><CHK><EOT>
Output syntax in case of missing serial number:	0<CHK><EOT>
Output parameters:	<serial_number> = ASCII character string (without a terminating null character) containing serial number.

2.4.16 Read Sampling Time RSTI

This command reads the sampling time for real time curves (in milliseconds). See further the command Set Sampling Time.

Input syntax:	RSTI<CHK><EOT>
Output syntax:	<value><CHK><EOT>
Output parameters:	<value> = 010 - 220 (ms)

2.4.17 Read Software Version RSWV

This command reads the device type and the System SW version.

Input syntax:	RSWV<CHK><EOT>
Output syntax:	<device_type>,<version><CHK><EOT>
Output parameters:	<device_type> = SERVO-xyz <device_type> = ASCII character string (without a terminating null character) containing device type. <version> = ASCII character string (without terminating null character) containing System SW version.

When new device types are introduced in future protocol versions, they will be presented as SERVO_U when older protocol versions are selected due to backwards compatibility with older System versions.

2.4.18 Read Time RTIM

This command reads the internal clock.

Input syntax:	RTIM<CHK><EOT>
Output syntax:	<year><month><day><hour><minute><sec><CHK><EOT>
Output parameters:	<year> = 0000 – 9999 <month> = 01 – 12 <day> = 01 – 31 <hour> = 00 – 23 <minute> = 00 – 59 <sec> = 00 – 59

2.4.19 Read input character Timeout RTOU

This command reads the input character timeout. See further the command Set input character Timeout.

Input syntax:	RTOU<CHK><EOT>
Output syntax:	<value><CHK><EOT>
Output parameters:	<value> = 001 – 250 (steps of 0.1 seconds).

When receiving a command, SCI needs to receive any character within the character timeout. Otherwise the previous characters are ignored.

2.4.20 Set Data Acquisition Definition SDAD

This command defines the table of channels to be read by the commands Read Acquired Data or Read Acquired Data Continuously. The channels may contain curve, breath, settings, alarm settings and alarm data.

Input syntax:	SDADC[<n_{C0}>...<n_{C5}>]<CHK><EOT> or SDADB[<n_{B0}>...<n_{B99}>]<CHK><EOT> or SDADS[<n_{S0}>...<n_{S99}>]<CHK><EOT> or SDADL[<n_{L0}>...<n_{L49}>]<CHK><EOT> or SDADA[<n_{A0}>...<n_{A99}>]<CHK><EOT>
Input parameters	[<n_{C0}>...<n_{C5}>] = 000 - 099 , curve channel number [<n_{B0}>...<n_{B99}>] = 100 - 399 , breath channel number [<n_{S0}>...<n_{S99}>] = 400 - 599 , settings channel number [<n_{L0}>...<n_{L49}>] = 600 - 799 , alarm settings channel number [<n_{A0}>...<n_{A99}>] = 800 - 999 , alarm channel number
Output syntax:	*<CHK><EOT>

The SCI sets up a Data acquisition table in memory of channels to be read by the RADA or RADC commands.

The max number of curve channels that can be set is 6.

The max number of alarm settings channels that can be set is 50.

The max number of breath, settings and alarm channels that can be set is 100 for each category.

The definition will be valid until next time the command SDAD is received.

If no channel parameters are given, the corresponding data acquisition table is cleared.

The Data acquisition table will also be cleared if the command RCTY or SPVE is received.

The new channel table is activated within 500 ms after the variable has been set.

2.4.21 Set Protocol Version SPVE

This command configures SCI to use a specific Protocol version.

Input syntax:	SPVE<version><CHK><EOT>
Input parameters	<version> = 0001 – xxxx <version> = Selected SCI protocol version. Selectable from first version (0001) to highest (read by the RHVE command).
Output syntax:	*<CHK><EOT>

The requested version shall be expressed with 4 digits, otherwise this command will return ER11.

When the Set Protocol Version command is issued, the data acquisition table (set up with the Set Data Acquisition Definition command) is cleared.

If the requested protocol version is not available, this command returns ER12 and the Servo continues using the same protocol version and data acquisition definition as before the request.

If the selected protocol version is lower than the highest available, then the Servo behaves as the selected protocol version (use the same channel configuration, switch parameters etc.)
Note: New switch parameter values (e.g. a new ventilation mode) will be sent as “Undefined” if active when a lower protocol version is selected.

2.4.22 Set Sampling Time SSMP

This command sets the sampling time for real time curves (in milliseconds).

Input syntax:	SSMP<value><CHK><EOT>
Input parameters:	<value> = 010 – 220 (ms)
Output syntax:	*<CHK><EOT>

The sampling time is valid for all sampled real time curves until next time the command Set Sampling Time is received.

The default sampling time is 20 ms.

The sampling time is set to default at startup and when the command RCTY is received.

Odd requested sampling time is decremented by 1 ms.

The new sampling time is activated within 500 ms.

2.4.23 Set input character timeout STOU

This command defines the input character timeout.

Input syntax:	STOU<value><CHK><EOT>
Input parameters:	<value> = 001-250 (steps of 0.1 seconds)
Output syntax:	*<CHK><EOT>

If this command has not been received, the default timeout of 10 seconds is applied.

The new timeout is activated within 500 ms after command received.

The input character timeout is set to default at startup and when the command RCTY is received.

When receiving a command, SCI needs to receive any character within the character timeout. Otherwise the previous characters are ignored.

2.5 Checksum calculation

2.5.1 General

A checksum byte is included in transmission messages. The checksum is based on the exclusive OR operation (XOR).

2.5.2 Formula

The checksum is calculated according to the following formula:

Data:

Chk: Checksum byte

Number_Of_Bytes: Number of bytes in the message

^ : Bitwise XOR (exclusive OR)

Formula:

```
Chk = 0;
for ( i = 0; i < Number_Of_Bytes; i++ )
{
  Chk = Chk ^ Message_Byte[i];
}
```

2.5.3 Checksum transmission

If Message format is ASCII, the checksum byte is transmitted as two ASCII characters, representing the hexadecimal equivalent.

If Message format is Binary, the checksum byte is transmitted as one byte.

2.5.4 Example

The command ”Read CI Type”, RCTY is transmitted:

RCTY1C<EOT>

Checksum byte = $1C_{16}$

1C = ASCII equivalent

3 APPENDIX A – SERVO USER INTERFACE PRESENTATION

The tables in this appendix are guidelines for the displayed names, ranges, units, alarm texts and alarm priority on the Servo User Interface.

3.1 Waveforms

SCI channel	Description	Name	Range	Unit
0	Airway Flow (SCI unit: ml/s)	FLOW	-400 – 400	l/min
			-7.0 – 7.0	l/s
1	Airway Pressure (SCI unit: cmH_2O)	Paw	-40 – 150	cmH_2O mbar
2	Volume	VOLUME	0 – 9000	ml
3	Edi (Note 1)	Edi	0 – 200	µV
4	CO_2 concentration (%)	CO_2 conc.	0 – 25	%
5	CO_2 concentration (mmHg)	CO_2 conc.	0 – 200	mmHg
6	CO_2 concentration (kPa)	CO_2 conc.	0 – 25	kPa
7	Esophageal pressure (SCI unit: cmH_2O) (Note 1)	Pes	-150 – 150	cmH_2O mbar
8	Transpulmonary pressure (SCI unit: cmH_2O) (Note 1)	P_L	-150 – 150	cmH_2O mbar
9	Uncompensated inlet airway flow	Not displayed on the User Interface	-7000 – 7000	ml/s

Note 1: Not applicable to Servo-c/Servo-air.

3.2 Breath data

SCI channel	Description	Name	Range	Unit
100	Measured breath frequency	RR	0 – 200	b/min
101	Exp. tidal volume	VTe	0.0 – 4000 (0.0 – 19.9 20 – 4000)	ml
102	Insp. Tidal volume	VTi	0.0 – 4000 (0.0 – 19.9 20 – 4000)	ml
103	Insp. Minute volume	MVi	0.00 – 60.0 (0.00 – 0.50 0.6 – 60.0)	l/min
104	Exp. minute volume	MVe	0.00 – 60.0 (0.00 – 0.50 0.6 – 60.0)	l/min
105	Peak pressure (SCI unit: cmH_2O)	Ppeak	-40 – 150	cmH_2O mbar
106	Mean airway pressure Mean Pressure in HFOV (Note 3) (SCI unit: cmH_2O)	Pmean	-40 – 150 (-40 – -10 -9.9 – 9.9, 10 – 150)	cmH_2O mbar
107	Pause pressure (SCI unit: cmH_2O)	Pplat	-40 – 150	cmH_2O mbar
108	End exp. Pressure (SCI unit: cmH_2O)	PEEP	-40 – 150 (-40 – -10 -9.9 – 9.9, 10 – 150)	cmH_2O mbar
109	O_2 concentration	O_2 conc.	0 – 100	%
110	Barometric pressure (SCI unit: mbar)	Not displayed on the User Interface	650 – 1070	mbar
			650 – 1070	hPa
			488 – 803	mmHg
111	Gas supply pressure, Air (Note 2, Note 4) (SCI unit: mbar)	Air supply pressure	0.0 – 15.0	bar
			0 – 220	PSI
			0.0 – 15.0	kPa*100
112	Gas supply pressure, O_2 (SCI unit: mbar)	O_2 supply pressure	0.0 – 15.0	bar
			0 – 220	PSI
			0.0 – 15.0	kPa*100
113	CO_2 tidal production	$VTco_2$	0.0 – 100.0	ml
114	End tidal CO_2 concentration (%)	$etCO_2$	0.0 – 20.0	%
115	End tidal CO_2 concentration (mmHg)	$etCO_2$	0 – 100	mmHg
116	End tidal CO_2 concentration (kPa)	$etCO_2$	0.0 – 14.0	kPa
117	CO_2 minute production	Vco_2	0 – 1000	ml/min

SCI channel	Description	Name	Range	Unit
118	Exp. Resistance (SCI unit: $cmH_2O/l/s$)	Re	0 – 4000	$cmH_2O/l/s$ mbar/l/s
119	Static Compliance (SCI unit: ml/cmH_2O)	Cstatic	0.0 – 500 (0.0 – 99.9, 100 – 500)	ml/cmH_2O ml/mbar
120	End exp. Flow (SCI unit: ml/s)	Flowee	0 – 20	l/min
			0.00 – 0.35	l/s
121	Insp. Resistance (SCI unit: $cmH_2O/l/s$)	Ri	0 – 4000	$cmH_2O/l/s$ mbar/l/s
122	I:E Ratio (SCI sends I:E Ratio in the format “value:1”)	I:E	1:20.0 – 300.0:1	N/A
123	Ti (Insufflation time)	Ti	0.10 – 15.00	s
124	Fixed value = $7EFF_{16}$ (Note 5)	N/A	N/A	N/A
125	Dynamic compliance (SCI unit: ml/cmH_2O)	Cdyn	0.0 – 500 (0.0 – 99.9, 100 – 500)	ml/cmH_2O ml/mbar
126	Leakage fraction	Leakage	0 – 100	%
127	Elastance (SCI unit: cmH_2O/l)	E	0 – 1000	cmH_2O/l
128	Ti/Ttot	Ti/Ttot	0.00 – 1.00	N/A
129	Total PEEP (SCI unit: cmH_2O)	PEEPtot	-40 – 150 (-40 – -10 -9.9 – 9.9, 10 – 150)	cmH_2O mbar
130	Spontaneous Breath frequency	RRsp	0 – 200	b/min
131	MVe spont	MVe sp	0.00 – 60.0 (0.00 – 0.50 0.6 – 60.0)	l/min
132	MVe spont/MVe in Bi-Vent/APRV	MVe sp/MVe	0.0 – 100.0	N/A
133	Time constant	Tc	0.00 – 30.00	s
134	Work of Breathing, Ventilator	WOBvent	0.00 – 20.00	Joule/l
135	Work of Breathing, Patient	WOBpat	0.00 – 20.00	Joule/l
136	CPAP (Note 2) (SCI unit: cmH_2O)	CPAP	-40 – 150 (-40 – -10 -9.9 – 9.9, 10 – 150)	cmH_2O mbar
137	P01 (SCI unit: cmH_2O)	P 0.1	0.0 – 100.0	cmH_2O mbar
138	Edi peak (Note 1)	Edipeak	0.0 – 200.0	µV
139	Edi min (Note 1)	Edimin	0.0 – 200.0	µV
140	Insp. Trigger cause	Not displayed on the User Interface	See 3.2.1 Display range for channel 140 – Insp. Trigger cause	N/A

SCI channel	Description	Name	Range	Unit
141	Cycle off cause	Not displayed on the User Interface	See 3.2.2 Display range for channel 141 – Cycle off cause	N/A
142	Exp. Trigger cause	Not displayed on the User Interface	See 3.2.3 Display range for channel 142 – Exp. Trigger cause	N/A
143	Shallow Breathing Index (SBI)	SBI	0 – 9999	breaths/min/l
144	Remaining Nebulization time	Not displayed on the User Interface	0 – 30	min
145	VTe/Predicted Body Weight VTe/Body Weight (when PBW is not calculated) VT_{HF}/Body Weight in HFOV (Note 3)	VT/PBW VT/BW VT_{HF}/BW	0.0 – 20.0	ml/kg
146	Average Edi peak (Note 1)	Edi peak av.	0.0 – 200.0	µV
147	Average Edi min (Note 1)	Edi min av.	0.0 – 200.0	µV
148	Pdrive (SCI unit: cmH_2O)	Pdrive	-40 – 150	cmH_2O mbar
149	Flow (in High Flow Therapy) (SCI unit: ml/s)	Flow	0.0 – 60 (0.0 – 9.5, 10 – 60)	l/min
150	Stress Index (Note 2)	SI	0.50 – 1.50	N/A
151	Pressure amplitude in HFOV (Note 3) (SCI unit: cmH_2O)	Pampl	0 – 150	cmH_2O mbar
152	Tidal volume in HFOV (Note 3)	VT_{HF}	0.0 – 50 (0.0 – 19.5, 20 – 50)	ml
153	Carbon dioxide diffusion coefficient in HFOV (Note 3)	DCO_2	0 – 32000	ml^2/s
154	End insp. transpulmonary pressure (Note 1) (SCI unit: cmH_2O)	P_L ei	-150 – 150 (-150 – -10 -9.9 – 9.9, 10 – 150)	cmH_2O mbar
155	End exp. transpulmonary pressure (Note 1) (SCI unit: cmH_2O)	P_L ee	-150 – 150 (-150 – -10 -9.9 – 9.9, 10 – 150)	cmH_2O mbar
156	Transpulmonary driving pressure (Note 1) (SCI unit: cmH_2O)	P_L drive	-40 – 150 (-40 – -10 -9.9 – 9.9, 10 – 150)	cmH_2O mbar

SCI channel	Description	Name	Range	Unit
157	Esophageal insp. pressure swing (Note 1) (SCI unit: cmH_2O)	Δ Pes	-150 – 150 (-150 – -10 -9.9 – 9.9, 10 – 150)	cmH_2O mbar
158	Neuro Ventilatory Efficiency (Note 1)	NVE	0 – 500	ml/µV
159	Neuro Ventilatory Efficiency Average (Note 1)	NVEaverage	0 – 500	ml/µV
160	HeO_2 consumption (Note 1)	Mean HeO_2 gas consumption	0.0 – 100 (0.0 – 9.5, 10 – 100)	l/min

Note 1: Not applicable to Servo-c/Servo-air.
Note 2: Not applicable to Servo-air.
Note 3: Not applicable to Servo-u/Servo-u MR/Servo-c/Servo-air.
Note 4: Heliox supply pressure when applicable.
Note 5: Channel supported for backward compatibility.

3.2.1 Display range for channel 140 – Insp. Trigger cause

SCI Description	SCI value	Display range
Trig cause undefined	0001_{16}	N/A
Trig by CMV rate	0002_{16}	N/A
Flow Trig	0003_{16}	N/A
Pressure Trig	0004_{16}	N/A
Edi Trig	0005_{16}	N/A (Note 1)
Time to give a mandatory breath	0006_{16}	N/A
“Start breath” button pressed	0007_{16}	N/A

Note 1: Not applicable to Servo-c/Servo-air

3.2.2 Display range for channel 141 – Cycle off cause

SCI Description	SCI value	Display range
Cycle off cause undefined	0001_{16}	N/A
Cycle off due to Edi drop to 70% of its peak value	0002_{16}	N/A (Note 1)
Cycle off due to pressure criteria	0003_{16}	N/A
Cycle off due to a too big TV	0004_{16}	N/A
Cycle off due to an inspiratory time limitation	0005_{16}	N/A
Cycle off due to flow level below set cycle off criteria	0006_{16}	N/A

Note 1: Not applicable to Servo-c/Servo-air

3.2.3 Display range for channel 142 – Exp. Trigger cause

SCI Description	SCI value	Display range
Trig cause undefined	0001_{16}	N/A
A cycle off criteria is reached	0002_{16}	N/A
Pressure limit reached (Safety limit)	0003_{16}	N/A
Pressure limit reached (UPL)	0004_{16}	N/A

3.3 Parameter settings

SCI channel	Description	Name	Range	Unit
400	RR (in Control modes)	RR	4 – 150	b/min
401	Leakage compensation Status (Note 4)	Leakage compensation	See 3.3.1 Display range for channel 401 – Leakage compensation Status	N/A
402	T pause (%)	T pause (%)	0 – 30	%
403	SIMV rate	SIMV rate	1 – 60	b/min
404	Tinsp. rise (%)	Tinsp. rise (%)	0 – 30	%
405	Minute volume	Minute volume	Servo-u/ Servo-u MR/ Servo-n/ Servo-c: 0.1 – 60.0 Servo-air: 0.3 – 60.0	l/min
406	PC above PEEP (Pressure Control Level above PEEP) (SCI unit: cmH_2O)	PC above PEEP	Servo-u/ Servo-u MR/ Servo-n/ Servo-c: 0 – 120 Servo-air: 0 – 100	cmH_2O mbar
407	PS above PEEP (Pressure Support Level above PEEP) (SCI unit: cmH_2O)	PS above PEEP	Servo-u/ Servo-u MR/ Servo-n/ Servo-c: 0 – 120 Servo-air: 0 – 100	cmH_2O mbar
408	PEEP (SCI unit: cmH_2O)	PEEP	0.0 – 50 (0.0 – 9.5, 10 – 50)	cmH_2O mbar
409	Patient range selection	Patient category	See 3.3.2 Display range for channel 409 – Patient range selection	N/A
410	Ventilation Mode	Modes	See 3.3.3 Display range for channel 410 – Ventilation Mode	N/A

SCI channel	Description	Name	Range	Unit
411	Status of current user request (e.g. Inspiratory Hold).	Manuevers - Static Measurements - Pause Oscillation (in HFOV) - O_2 Boost - Zero Assist Maneuver	See 3.3.4 Display range for channel 411 – Status of current user request	N/A
412	CPAP (Note 2) (SCI unit: cmH_2O)	CPAP	2.0 – 20 (2.0 – 10.0, 11 – 20)	cmH_2O mbar
413	Alarm mute/pre-mute Status	N/A	See 3.3.5 Display range for channel 413 – Alarm mute/pre-mute Status	N/A
414	O_2 conc.	O_2 conc.	21 – 100	%
415	Trigger sensitivity (Pressure trigger sensitivity level)	Trigger (cmH_2O)	(-20) – (-1)	cmH_2O
416	Trigger sensitivity (Flow trigger sensitivity level)	Trigger (l/min)	0.00 – 2.0 (0.00 – 0.50, 0.6 – 2.0)	l/min
417	Language	N/A	See 3.3.6 Display range for channel 417 – Language	N/A
418	Displayed CO_2 Unit	CO_2	See 3.3.7 Display range for channel 418 – Displayed CO_2 Unit	N/A
419	I:E Ratio $I:E_{HF}$ in HFOV (Note 3) (SCI sends I:E Ratio in the format “value:1”)	I:E $I:E_{HF}$	1:20.0 – 4.0:1	N/A
420	Tidal volume	Tidal volume	Servo-u/ Servo-u MR/ Servo-n/ Servo-c: 2.0 – 4000 (2.0 – 9.9 10 – 4000) Servo-air: 20 – 2000	ml

SCI channel	Description	Name	Range	Unit
421	Backup RR (in Support modes)	Backup RR	4 – 150	b/min
422	Backup Ti (s) (in Support modes)	Backup Ti	0.10 – 5.00	s
423	NIV Program Status	N/A	See 3.3.8 Display range for channel 423 – NIV Program Status	N/A
424	Phigh (High-pressure level in Bi-Vent/APRV) (SCI unit: cmH_2O)	Phigh	2.0 – 50 (2.0 – 9.5, 10 – 50)	cmH_2O mbar
425	Thigh (High pressure level time in Bi-Vent/APRV)	Thigh	0.20 – 30.0 (0.20 – 0.95, 1.0 – 30.0)	s
426	TPEEP (Low pressure level, PEEP, time in Bi-Vent/APRV)	TPEEP	0.10 – 10.0 (0.10 – 0.95, 1.0 – 10.0)	s
427	PS above Phigh (Pressure Support level above Phigh in Bi-Vent/APRV) (SCI unit: cmH_2O)	PS above Phigh	Servo-u/ Servo-u MR/ Servo-n/ Servo-c: 0 – 120 Servo-air: 0 – 99	cmH_2O mbar
428	PS above PEEP (Pressure Support level above PEEP in Bi-Vent/APRV) (SCI unit: cmH_2O)	PS above PEEP	Servo-u/ Servo-u MR/ Servo-n/ Servo-c: 0 – 120 Servo-air: 0 – 100	cmH_2O mbar
429	Ti (s) (Inspiration Time in Seconds)	Ti	0.10 – 5.00	s
430	T pause (s) (Pause Time in seconds)	T pause (s)	0.00 – 1.50	s
431	Tinsp. rise (s) (Insp. Rise time in seconds)	Tinsp. rise (s)	0.00 – 0.50	s
432	Breath cycle T (in SIMV modes)	Breath cycle T	0.5 – 15.0	s

SCI channel	Description	Name	Range	Unit
433	Backup PC above PEEP (in Support modes) (SCI unit: cmH_2O)	Backup PC above PEEP	Servo-u/ Servo-u MR/ Servo-n/ Servo-c: 5 – 120 Servo-air: 5 – 100	cmH_2O mbar
434	Flow (Inspiration peak flow) (SCI unit: l/s)	Flow	0 – 200 0 – 3.3	l/min l/s
435	Suction support status	Disconnection/ Suction	See 3.3.9 Display range for channel 435 – Suction Support Status	N/A
436	End inspiration (Cycle off fraction level)	End inspiration	1 – 70	%
437	Circuit compliance compensation status	Circuit compensation	See 3.3.10 Display range for channel 437 – Circuit compliance compensation Status	N/A
438	Max. apnea time (Trigger timeout in automode)	Max. apnea time	3 – 15	s
439	Y-piece measurement status (Note 1)	Y sensor measuring	See 3.3.11 Display range for channel 439 – Y-piece measurement Status	N/A
440	Edi trigger (Note 1)	Edi trigger	0.1 – 2.0	µV
441	NAVA level (Note 1)	NAVA level	0.1 – 15.0	$cmH_2O/\mu V$
442	Gas type setting	N/A	See 3.3.12 Display range for channel 442 – Gas Type Setting	N/A
443	Backup tidal volume (in support modes)	Backup tidal volume	Servo-u/ Servo-u MR/ Servo-n/ Servo-c: 2.0 – 4000 (2.0 – 9.9 10 – 4000) Servo-air: 20 – 2000	ml

SCI channel	Description	Name	Range	Unit
444	Backup I:E (in support modes) (SCI sends I:E Ratio in the format “value:1”)	Backup I:E	1:20.0 – 4.0:1	N/A
445	Leakage too high alarm (Note 2) (in non-invasive ventilation)	Leakage alarms	See 3.3.13 Display range for channel 445 – Leakage too high alarm	N/A
446	Nebulization mode	Maneuvers Nebulization - Start nebulization period - Start continous nebulization	See 3.3.14 Display range for channel 446 – Nebulization mode	N/A
447	Nebulization time	Maneuvers Nebulization - Time	5 – 30	min
448	No patient effort alarm	No patient effort	See 3.3.15 Display range for channel 448 – No patient effort alarm	N/A
449	Backup ventilation On/Off (in Support modes)	Backup ventilation	See 3.3.16 Display range for channel 449 – Backup ventilation On/Off	N/A
450	Backup ventilation status (in Support modes)	N/A	See 3.3.17 Display range for channel 450 – Backup ventilation status	N/A
451	Predicted body weight	Predicted Body Weight	For System version ≤2.0: Adult/Ped: 2 – 100 Neo: 200 – 10000 For System version ≥2.1: Adult: 2 – 100 Ped/Neo: N/A	kg g kg

SCI channel	Description	Name	Range	Unit
452	Leakage too high alarm (Note 1) (in invasive ventilation)	Leakage alarms	See 3.3.18 Display range for channel 452 – Leakage too high alarm	N/A
453	Inspiratory tidal volume too high alarm (Note 1)	Leakage alarms	See 3.3.19 Display range for channel 453 – Inspiratory tidal volume too high alarm	N/A
454	Expiratory minute volume high alarm	Leakage alarms	See 3.3.20 Display range for channel 454 – Expiratory minute volume high alarm	N/A
455	Expiratory minute volume low alarm	Leakage alarms	See 3.3.21 Display range for channel 455 – Expiratory minute volume low alarm	N/A
456	VC flow adaptation	Flow adaptation	See 3.3.22 Display range for channel 456 – VC Flow Adaptation	N/A
457	VC flow deceleration (percentage of peak flow)	Flow pattern	0 – 100	%
458	Flow (in high flow therapy) (SCI unit: l/s)	Flow	Servo-u Servo-u MR/ Servo-c: 0.5 – 60 (0.5, 1.0 – 4.5, 5 – 60) Servo-n: 0.5 – 50 (0.5, 1.0 – 4.5, 5 – 50) Servo-air: 2.0 - 60 (2.0, 2.5 - 4.5, 5 – 60)	l/min

SCI channel	Description	Name	Range	Unit
459	Mean pressure in HFOV (Note 3) (SCI unit: cmH_2O)	Pmean	5 – 40	cmH_2O mbar
460	Pressure amplitude in HFO (Note 3) (SCI unit: cmH_2O)	Pampl	0 – 100	cmH_2O mbar
461	Frequency in HFOV (Note 3)	f	5 – 20	Hz
462	Tidal volume in HFO (V TGT) (Note 3)	VT_{HF}	0.2 – 40 (0.2 – 19.9 20 – 40)	ml
463	Backup pressure amplitude in HFO (V TGT) (Note 3) (SCI unit: cmH_2O)	Backup Pampl	0 – 100	cmH_2O mbar
464	Auto RM status (Note 1)	N/A	See 3.3.23 Display range for channel 464 – Auto RM Status	N/A
465	Expiratory tidal volume high alarm	Expiratory tidal volume high	See 3.3.24 Display range for channel 465 – Expiratory tidal volume high alarm	N/A
466	Expiratory tidal volume low alarm	Expiratory tidal volume low alarm	See 3.3.25 Display range for channel 466 – Expiratory tidal volume low alarm	N/A

Note 1: Not applicable to Servo-c/Servo-air.
Note 2: Not applicable to Servo-air.
Note 3: Not applicable to Servo-u/Servo-u MR/Servo-c/Servo-air.
Note 4: Leakage compensation status will be reported as off in HFT for all protocol versions.

3.3.1 Display range for channel 401 – Leakage compensation Status

SCI Description	SCI value	Display range
Off	0001_{16}	Off
On	0002_{16}	On

3.3.2 Display range for channel 409 – Patient range selection

SCI Description	SCI value	Display range
Neonatal	0001_{16}	Neonatal (Note 1)
Adult	0002_{16}	Adult (Note 2)

Pediatric	0003_{16}	Pediatric

Note 1: Not applicable to Servo-air.
Note 2: Not applicable to Servo-n.

3.3.3 Display range for channel 410 – Ventilation mode

SCI Description	SCI value	Display range
Pressure Control (PC), Automode off	0001_{16}	PC
PC – PS, Automode on, no patient trigg	0002_{16}	AUTOMODE **PC**-PS
PC – PS, Automode on, patient trigg	0003_{16}	AUTOMODE PC-**PS**
Volume Control (VC), Automode off	0004_{16}	VC
VC – VS, Automode on, no patient trigg	0005_{16}	AUTOMODE **VC**-VS
VC – VS, Automode on, patient trigg	0006_{16}	AUTOMODE VC-**VS**
Pressure Reg. Volume Control (PRVC), Automode off	0007_{16}	PRVC
PRVC – VS, Automode on, no patient trigg	0008_{16}	AUTOMODE **PRVC**-VS
PRVC – VS, Automode on, patient trigg	0009_{16}	AUTOMODE PRVC-**VS**
Volume Support (VS)	$000A_{16}$	VS
Pressure Support (PS) / CPAP	$000B_{16}$	PS/CPAP
SIMV (Vol. Contr.) + Pressure Support	$000C_{16}$	SIMV (VC) + PS
SIMV (Press. Contr.) + Pressure Support	$000D_{16}$	SIMV (PC) + PS
SIMV (Pressure Reg. Volume Control) + Pressure Support	$000E_{16}$	SIMV (PRVC) + PS
Bi-Vent/APRV	$000F_{16}$	BI-VENT/APRV
NIV Pressure Control (NIV PC)	0010_{16}	NIV PC
NIV Pressure Support (NIV PS)	0011_{16}	NIV PS
Nasal CPAP (Note 2)	0012_{16}	NASAL CPAP
NAVA (Note 1)	0013_{16}	NAVA
NIV NAVA (Note 1)	0014_{16}	NIV NAVA
High Flow Therapy	0015_{16}	HIGH FLOW
HFO (Note 3)	0016_{16}	HFO
HFO Volume Target (Note 3)	0017_{16}	HFO (V TGT)
Neural Pressure Support (Note 1)	0018_{16}	NPS
NIV Neural Pressure Support (Note 1)	0019_{16}	NIV NPS

Note 1: Not applicable to Servo-c/Servo-air.
Note 2: Not applicable to Servo-air.
Note 3: Not applicable to Servo-u/Servo-u MR/Servo-c/Servo-air.

3.3.4 Display range for channel 411 – Status of current user request

SCI Description	SCI value	Display range
Normal state, no active function	0000_{16}	N/A
Inspiratory hold	0001_{16}	N/A
Expiratory hold	0002_{16}	N/A
O_2 boost	0004_{16}	N/A

Manual breath	0008_{16}	N/A
Pause Oscillation in HFOV (Note 2)	0010_{16}	N/A
Zero Assist Maneuver (Note 1)	0020_{16}	N/A
Combined channel. Output value is the sum of all active functions.		

Note 1: Not applicable to Servo-c/Servo-air.

Note 2: Not applicable to Servo-u/Servo-u MR/Servo-c/Servo-air.

3.3.5 Display range for channel 413 – Alarm mute/pre-mute Status

SCI Description	SCI value	Display range
Normal state, no muted/pre-muted alarms	0001_{16}	N/A
Alarms muted/pre-muted	0002_{16}	N/A

3.3.6 Display range for channel 417 – Language

SCI Description	SCI value	Display range
English	0001_{16}	N/A
Swedish	0002_{16}	N/A
German	0003_{16}	N/A
French	0004_{16}	N/A
Italian	0005_{16}	N/A
Spanish	0006_{16}	N/A
Japanese	0007_{16}	N/A
Dutch	0008_{16}	N/A
Portuguese	0009_{16}	N/A
Danish	$000A_{16}$	N/A
Turkish	$000B_{16}$	N/A
Greek	$000C_{16}$	N/A
Chinese	$000D_{16}$	N/A
Russian	$000E_{16}$	N/A
Polish	$000F_{16}$	N/A
Hungarian	0010_{16}	N/A
Czech	0011_{16}	N/A
Finnish	0012_{16}	N/A
Norwegian	0013_{16}	N/A
Slovak	0014_{16}	N/A
Romanian	0015_{16}	N/A

3.3.7 Display range for channel 418 – Displayed CO2 Unit

SCI Description	SCI value	Display range
%	0001_{16}	%
kPa	0002_{16}	kPa
mmHg	0003_{16}	mmHg

3.3.8 Display range for channel 423 – NIV Program Status

SCI Description	SCI value	Display range

Undefined Status	0000_{16}	N/A
Waiting position	0001_{16}	NIV waiting position
Ventilation	0002_{16}	N/A
Disconnected	0003_{16}	Leakage detected

3.3.9 Display range for channel 435 – Suction Support Status

SCI Description	SCI value	Display range
Undefined Status	0000_{16}	N/A
Normal ventilation	0001_{16}	Normal ventilation/Preparation
Waiting for disconnect	0002_{16}	Pre-oxygenation
Disconnected	0003_{16}	Patient disconnected
Post oxygenation	0004_{16}	Post-oxygenation

3.3.10 Display range for channel 437 – Circuit compliance compensation Status

SCI Description	SCI value	Display range
Off	0001_{16}	Off
On	0002_{16}	On

3.3.11 Display range for channel 439 – Y-piece measurement Status

SCI Description	SCI value	Display range
Disabled	0001_{16}	Disabled
Enabled	0002_{16}	Enabled

3.3.12 Display range for channel 442 – Gas Type Setting

SCI Description	SCI value	Display range
Undefined Gas Type	0000_{16}	N/A
Heliox	0001_{16}	N/A
Air	0002_{16}	N/A

3.3.13 Display range for channel 445 – Leakage too high alarm

SCI Description	SCI value	Display range
Alarm off	0001_{16}	Alarm off
Alarm on	0002_{16}	Alarm on

3.3.14 Display range for channel 446 – Nebulization mode

SCI Description	SCI value	Display range
OFF	0001_{16}	N/A
Intermittent	0002_{16}	Nebulization period
Continuous	0003_{16}	Continuous nebulization

3.3.15 Display range for channel 448 – No patient effort alarm

SCI Description	SCI value	Display range

Alarm off	0001_{16}	Alarm off (Note 1)
Alarm on	0002_{16}	Alarm on

Note 1: Not applicable to Servo-air.

3.3.16 Display range for channel 449 – Backup ventilation On/Off

SCI Description	SCI value	Display range
Backup ventilation disabled	0001_{16}	Backup ventilation off
Backup ventilation enabled	0002_{16}	Backup ventilation on

3.3.17 Display range for channel 450 – Backup ventilation status

SCI Description	SCI value	Display range
Support breath	0001_{16}	N/A
Control breath	0002_{16}	N/A

3.3.18 Display range for channel 452 – Leakage too high alarm

SCI Description	SCI value	Display range
Alarm off	0001_{16}	Alarm off
Alarm on	0002_{16}	Alarm on

3.3.19 Display range for channel 453 – Inspiratory tidal volume too high alarm

SCI Description	SCI value	Display range
Alarm off	0001_{16}	Alarm off
Alarm on	0002_{16}	Alarm on

3.3.20 Display range for channel 454 – Expiratory minute volume high alarm

SCI Description	SCI value	Display range
Alarm off	0001_{16}	Alarm off (Note 1)
Alarm on	0002_{16}	Alarm on

Note 1: Not applicable to Servo-air.

3.3.21 Display range for channel 455 – Expiratory minute volume low alarm

SCI Description	SCI value	Display range
Alarm off	0001_{16}	Alarm off (Note 1)
Alarm on	0002_{16}	Alarm on

Note 1: Not applicable to Servo-air.

3.3.22 Display range for channel 456 – VC Flow Adaption

SCI Description	SCI value	Display range
Off	0001_{16}	Off
On	0002_{16}	On

3.3.23 Display range for channel 464 – Auto RM Status

SCI Description	SCI value	Display range
Undefined Status	0000_{16}	N/A
Auto RM Started	0001_{16}	N/A
Auto SRM Started	0002_{16}	N/A
Auto RM/SRM Completed	0003_{16}	N/A
Aborted By User	0010_{16}	N/A
Aborted Cdyn Error	0011_{16}	N/A
Aborted Tech Problem	0012_{16}	N/A
Aborted Safety Valve	0013_{16}	N/A
Evaluate Time Out	0014_{16}	N/A

3.3.24 Display range for channel 465 - Expiratory tidal volume high alarm

SCI Description	SCI value	Display range
Alarm off	0001_{16}	N/A
Alarm on	0002_{16}	N/A

3.3.25 Display range for channel 466 - Expiratory tidal volume low alarm

SCI Description	SCI value	Display range
Alarm off	0001_{16}	N/A
Alarm on	0002_{16}	N/A

3.4 Alarm limit settings

SCI channel	Description	Name	Range	Unit
600	Upper pressure limit (SCI unit: cmH_2O)	Ppeak	Servo-u/ Servo-u MR/ Servo-n/ Servo-c: 16 – 120 Servo-air: 16 – 100	cmH_2O mbar
601	O_2 concentration Upper alarm limit	Not displayed on the User Interface	26 – 105	%
602	O_2 concentration Lower alarm limit	Not displayed on the User Interface	18 – 95	%
603	Respiratory rate Upper alarm limit	RR	2 – 160	b/min
604	Respiratory rate Lower alarm limit	RR	1 – 159	b/min
605	Apnea time	Apnea time	1.0 – 45 (1.0, 1.2 – 1.8, 2 – 45)	s
606	PEEP High limit (SCI unit: cmH_2O)	PEEP	0 – 55	cmH_2O mbar
607	PEEP Low limit (SCI unit: cmH_2O)	PEEP	0 – 47	cmH_2O mbar
608	CPAP Upper alarm limit (Note 2) (SCI unit: cmH_2O)	CPAP	0 – 25	cmH_2O mbar
609	CPAP Lower alarm limit (Note 2) (SCI unit: cmH_2O)	CPAP	0 – 25	cmH_2O mbar
610	Exp. minute vol. Upper alarm limit	MVe	0.01 – 60.0 (0.01 – 0.45, 0.5 – 60.0)	l/min
611	Exp. minute vol. Lower alarm limit	MVe	0.01 – 40.0 (0.01 – 0.45, 0.5 – 40.0)	l/min
612	$EtCO_2$ concentration Upper alarm limit (%)	$etCO_2$	0.5 – 20.0	%
613	$EtCO_2$ concentration Lower alarm limit (%)	$etCO_2$	0.0 – 20.0	%
614	$EtCO_2$ concentration Upper alarm limit (mmHg)	$etCO_2$	4 – 100	mmHg
615	$EtCO_2$ concentration Lower alarm limit (mmHg)	$etCO_2$	0 – 100	mmHg
616	$EtCO_2$ concentration Upper alarm limit (kPa)	$etCO_2$	0.5 – 14.0	kPa
617	$EtCO_2$ concentration Lower alarm limit (kPa)	$etCO_2$	0.0 – 14.0	kPa
618	Apnea audio delay (Note 1)	Apnea audio delay	0 – 30	s
619	VTi Upper alarm limit (Note 1)	VTi	2 – 70	ml
620	Pressure amplitude High limit in HFO (V TGT) (Note 3) (SCI unit: cmH_2O)	Pampl	11 – 120	cmH_2O mbar

SCI channel	Description	Name	Range	Unit
621	Pressure amplitude Low limit in HFO (V TGT) (Note3) (SCI unit: cmH_2O)	Pampl	10 – 100	cmH_2O mbar
622	HF tidal volume High limit in HFO (Note 3)	VT_{HF}	0.1 – 40 (0.1 – 10.0, 10.5 – 19.5, 20 – 40)	ml
623	HF tidal volume Low limit in HFO (Note 3)	VT_{HF}	0.0 – 39 (0.0 – 10.0, 10.5 – 19.5, 20 – 39)	ml
624	VTe Upper alarm limit	VTe	Servo-air: 60-2000 Servo-u/ Servo-c: 60 – 4000 (60, 70, …,1000, 1100, …, 4000) Servo-n: 6, 7, …, 450	ml
625	VTe Lower alarm limit	VTe	Servo-air: 50-1900 Servo-u/ Servo-c: 50 – 3900 (60, 70, …, 1000, 1100, …, 3900) Servo-n: 5, 6, …, 440	ml

Note 1: Not applicable to Servo-air.
Note 2: Not applicable to Servo-air.
Note 3: Not applicable to Servo-u/Servo-u MR/Servo-c/Servo-air.

3.5 Alarms

SCI channel	Description	Alarm text	Priority
800	O_2 concentration high	O_2 concentration high	Medium
801	O_2 concentration low	O_2 concentration low	High
802	$EtCO_2$ high	$EtCO_2$ high	Medium
803	$EtCO_2$ low	$EtCO_2$ low	Medium
804	Airway pressure high (Upper pressure limit exceeded)	Airway pressure high	High
805	Apnea	Apnea	High
806	Gas supply alarm	One or more of following alarms:	
		Servo-u/Servo-u MR/Servo-n:	
		Gas supply pressures low	High
		Air supply pressure low	Medium
		Air supply pressure high	Medium
		O_2 supply pressure low	Medium
		O_2 supply pressure high	Medium
		HeO2 supply pressure low	Medium
		HeO2 supply pressure high	Medium
		Servo-c:	
		Gas supply pressures low	High
		Air supply pressure low	Medium
		Air supply pressure high	Medium
		O2 supply pressure low	Medium
		O2 supply pressure high	Medium
		Servo-air:	
		Gas supply pressures low	High
		O_2 supply pressure low	Medium
		O_2 supply pressure high	Medium
		Blocked air inlet	Medium
		Turbine failure	High

SCI channel	Description	Alarm text	Priority
807	Battery alarm	One or more of following alarms: Servo-u/Servo-u MR/Servo-n: Missing battery Limited battery capacity Battery voltage low No battery capacity Servo-air/ Servo-c: No slot 2 battery capacity No battery backup Limited battery capacity Battery voltage low No battery capacity	 Medium Medium High High Low Medium Medium High High
808	Fixed value = $7EFF_{16}$ (Note 5)	N/A	N/A
809	Battery operation	Battery operation	Low
810	No consistent patient effort	No consistent patient effort	Medium
811	Airway pressure continuously high	Airway pressure continuously high	High
812	Overrange alarm (Note 2)	One or more of following alarms: Inspiratory tidal volume too high Pressure delivery restricted	 High Medium
813	O_2 cell/sensor failure	O_2 cell/sensor failure	Medium
814	Time in waiting position > 2 min	Time in waiting position > 2 min	High
815	No patient effort	No patient effort	Medium
816	Leakage too high	Leakage too high	Medium/High
817	Disconnect alarm	One or more of following alarms: Patient circuit disconnected Check tubing	High
818	Volume delivery restricted	One or more of the following alarms: Volume delivery restricted Peak pressure limited	 Low Medium
819	Respiratory rate high	Respiratory rate high	Medium
820	Respiratory rate low	Respiratory rate low	Medium
821	PEEP high	PEEP high	Medium
822	PEEP low	PEEP low	Medium
823	CPAP high (Note 2)	CPAP high	Medium

SCI channel	Description	Alarm text	Priority
824	CPAP low (Note 2)	CPAP low	Medium
825	Fixed value = $7EFF_{16}$ (Note 5)	N/A	N/A
826	Fixed value = $7EFF_{16}$ (Note 5)	N/A	N/A
827	Fixed value = $7EFF_{16}$ (Note 5)	N/A	N/A
828	Patient disconnected > 1 min	Patient disconnected > 1 min	High
829	Expiratory minute volume high	Expiratory minute volume high	Medium
830	Expiratory minute volume low	Expiratory minute volume low	High
831	Expiratory cassette disconnected	Expiratory cassette disconnected	Medium
832	Expiratory cassette replaced	Expiratory cassette replaced	Low
833	Edi signal invalid (Note 1)	Edi signal invalid	Medium
834	Edi signal interference from ECG (Note 1)	Edi signal interference from ECG	Medium
835	Delivered gas temperature high (Note 4)	Delivered gas temperature high	Medium
836	Inspiratory pressure high	Inspiratory pressure high	High
837	Flow through expiratory tube	Flow through expiratory tube	Medium
838	Pressure amplitude high in HFOV (Note 3)	One or more of following alarms: Pressure amplitude high Pressure amplitude limited at max	High
839	Pressure amplitude low in HFOV (Note 3)	Pressure amplitude low	Medium
840	HF tidal volume high in HFOV (Note 3)	HF tidal volume high	High in HFO (V TGT) Medium in HFO
841	HF tidal volume low in HFOV (Note 3)	One or more of following alarms: HF tidal volume low HF tidal volume restricted	Medium
842	Y sensor flow too high in HFOV (Note 3)	Y sensor flow too high	Medium
843	Y sensor pressure measurement deviation in HFOV (Note 3)	Y sensor pressure measurement deviation	Medium
844	Patient circuit failure in HFOV (Note 3)	Patient circuit failure	High
845	Mean airway pressure high in HFOV (Note 3)	Mean airway pressure high	High

SCI channel	Description	Alarm text	Priority
846	Mean airway pressure low in HFOV (Note 3)	Mean airway pressure low	High
847	Edi trigger disabled – signal invalid (Note 1)	Edi trigger disabled – signal invalid	Low
848	Edi trigger disabled – signal interference from ECG (Note 1)	Edi trigger disabled – signal interference from ECG	Low
849	HeO_2/Patient category mismatch (Note 1)	HeO_2 not supported for neonatal patient category	High
850	Check Heliox adapter (Note 1)	Check Heliox adapter	Medium
851	HeO_2/Y sensor mismatch (Note 1)	Y sensor is disabled – HeO_2 in use	Medium
852	Expiratory tidal volume high	Expiratory tidal volume high	Medium
853	Expiratory tidal volume low	Expiratory tidal volume low	Medium
854	Amplitude limited by Pmean in HFOV (Note 3)	Set Pampl cannot be reached	Medium
994	Internal communication failure alarm (Reserved for internal use)	N/A	N/A
995	Any low priority alarm active	Active low priority alarms from the alarm message area.	(Note 6)
996	Any medium priority alarm active	Active medium priority alarms from the alarm message area.	(Note 6)
997	Any high priority alarm active	Active high priority alarms from the alarm message area.	(Note 6)
998	Any technical alarm active	TE xxx	(Note 6)
999	Any alarm active	Active alarms from the alarm message area.	(Note 6)

Note 1: Not applicable to Servo-c/Servo-air.
Note 2: Not applicable to Servo-air.
Note 3: Not applicable to Servo-u/Servo-u MR/Servo-c/Servo-air.
Note 4: Not applicable to Servo-u/Servo-u MR/Servo-n/Servo-c.
Note 5: Channel supported for backward compatibility.
Note 6: Priority is not defined in the output for this alarm.

4 APPENDIX B – CHANNEL APPLICABILITY TABLES

4.1 Breath data

SCI channel	1	2-3	4	5-6	7	8-9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
	PC	AUTOMODE PC-PS	VC	AUTOMODE VC-VS	PRVC	AUTOMODE PRVC-VS	VS	PS	SIMV VC	SIMV PC	SIMV PRVC	BI-VENT	NIV PC	NIV PS	NASAL CPAP	NAVA	NIV NAVA	HFT	HFO PC	HFO VT	NPS	NIV NPS
100	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1
101	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	1	1
102	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	1	1
103	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	1	1
104	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	1	1
105	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1
106	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1
107	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
108	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	1	1
109	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
110	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
111	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
112	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
113	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	1	0
114	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	1	1
115	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	1	1
116	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	1	1
117	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	1	0
118	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	1	0
119	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	1	0
120	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0	1	0
121	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
122	1	1	1	1	1	1	1	1	0	0	0	0	1	1	0	1	1	0	0	0	1	1
123	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	0	0	0	0	1	0
124	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
125	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0	1	0
126	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1
127	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	1	0
128	0	1	0	1	0	1	1	1	1	1	1	1	0	1	0	1	1	0	0	0	1	1
129	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	1	0
130	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	1	1
131	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	1	1
132	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0

SCI channel	1	2-3	4	5-6	7	8-9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
	PC	AUTOMODE PC-PS	VC	AUTOMODE VC-VS	PRVC	AUTOMODE PRVC-VS	VS	PS	SIMV VC	SIMV PC	SIMV PRVC	BI-VENT	NIV PC	NIV PS	NASAL CPAP	NAVA	NIV NAVA	HFT	HFO PC	HFO VT	NPS	NIV NPS
133	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	1	0
134	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0	1	0
135	0	1	0	1	0	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0	1	0
136	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
137	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	1	0
138	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
139	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
140	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	1	1
141	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	1	1
142	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	1	1
143	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0	1	0
144	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
145	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1
146	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
147	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
148	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0	1	0
149	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
150	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
151	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
152	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
153	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
154	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0	1	0
155	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0	1	0
156	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0	1	0
157	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	1	0
158	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0
159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0
160	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

4.2 Parameter settings

SCI channel	1	2-3	4	5-6	7	8-9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
	PC	AUTOMODE PC-PS	VC	AUTOMODE VC-VS	PRVC	AUTOMODE PRVC-VS	VS	PS	SIMV VC	SIMV PC	SIMV PRVC	BI-VENT	NIV PC	NIV PS	NASAL CPAP	NAVA	NIV NAVA	HFT	HFO PC	HFO VT	NPS	NIV NPS
400	1	1	1	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
401	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
402	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
403	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0
404	1	1	1	1	1	1	0	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0
405	0	0	1	1	1	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
406	1	1	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0
407	0	1	0	0	0	0	0	1	1	1	1	0	0	1	0	0	0	0	0	0	1	1
408	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	1	1
409	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
410	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
411	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1
412	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
413	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
414	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
415	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	1	0
416	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	1	0
417	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
418	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
419	1	1	1	1	1	1	0	0	1	1	1	0	1	0	0	0	0	0	1	1	0	0
420	0	0	1	1	1	1	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
421	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	1	1	0	0	0	1	1
422	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	1	1	0	0	0	1	1
423	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
424	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
425	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
426	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
427	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
428	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
429	1	1	1	1	1	1	0	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0
430	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
431	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1	1
432	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0
433	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1	1	0	0	0	1	1

SCI channel	1	2-3	4	5-6	7	8-9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
	PC	AUTOMODE PC-PS	VC	AUTOMODE VC-VS	PRVC	AUTOMODE PRVC-VS	VS	PS	SIMV VC	SIMV PC	SIMV PRVC	BI-VENT	NIV PC	NIV PS	NASAL CPAP	NAVA	NIV NAVA	HFT	HFO PC	HFO VT	NPS	NIV NPS
434	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
435	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	1	0
436	0	1	0	1	0	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	1	1
437	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1
438	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
439	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
440	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1
441	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0
442	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
443	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
444	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	1	1	0	0	0	1	1
445	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1
446	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
447	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
448	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	1	1	0	0	0	1	1
449	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	1	1	0	0	0	1	1
450	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	1	1	0	0	1	1	1
451	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1
452	1	1	0	0	1	1	1	1	0	1	1	0	0	0	0	1	0	0	0	0	1	0
453	1	1	0	0	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	1	0
454	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	1	1
455	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	1	1
456	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
457	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
458	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
459	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
460	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
461	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
462	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
463	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
464	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
465	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0	1	0
466	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0

4.3 Alarm limit settings

SCI channel	1	2-3	4	5-6	7	8-9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
	PC	AUTOMODE PC-PS	VC	AUTOMODE VC-VS	PRVC	AUTOMODE PRVC-VS	VS	PS	SIMV VC	SIMV PC	SIMV PRVC	BI-VENT	NIV PC	NIV PS	NASAL CPAP	NAVA	NIV NAVA	HFT	HFO PC	HFO VT	NPS	NIV NPS
600	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1
601	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
602	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
603	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	1	1
604	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	1	1
605	0	0	0	0	0	0	1	1	1	1	1	0	0	1	0	1	1	0	0	0	1	1
606	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	1	1
607	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	1	1
608	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
609	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
610	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	1	1
611	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	1	1
612	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	1	1
613	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	1	1
614	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	1	1
615	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	1	1
616	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	1	1
617	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	1	1
618	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	1	1	0	0	0	1	1
619	1	1	0	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	1	0
620	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
621	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
622	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
623	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
624	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0	1	0
625	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0

5 REVISION HISTORY

5.1 Protocol version 0001 – Reference Manual revision 00

Draft version – For internal use only.

5.2 Protocol version 0001 – Reference Manual revision 01

In the table below, the following keywords are used in 'Comment' column:

- Added. New functionality added in Reference Manual revision 01.
- Changed. Changed functionality in Reference Manual revision 01.
- Corrected. Corrections made due to printing errors or lack of information in the previous version of the Reference Manual.

Page	Section	Comment
–	Throughout the whole manual	Device name Servo-X/Servo-Y corrected, replaced by Servo-u/Servo-n.
–	Throughout the whole manual	Mode name Bi-Vent changed to Bi-Vent/APRV.
23	2.3.5 Channel 800-999 – Alarms	Channel 807: 'Missing battery' alarm added.
33	2.4.6 Read Channel Configuration RCCO	Unit 16 corrected.
40–47	3 Appendix A – Display Range	Appendix A was not included in the previous version of the Reference Manual.

5.3 Protocol version 0002 – Reference Manual revision 02

In the table below, the following keywords are used in 'Comment' column:

- Added. New functionality added in Reference Manual revision 02.
- Changed. Changed functionality in Reference Manual revision 02.
- Corrected. Corrections made due to printing errors or lack of information in the previous version of the Reference Manual.

Added	Changed	Corrected	Page	Section	Comment
	X		5	General information	Text changed due to Protocol version 0002/ System version 1.1.
		X	6	1.4.1 Definitions	Bi-Vent/APRV included in definition of Control Modes.
	X			2.3 Channels	Information about availability in Protocol version 0002 introduced in the channel tables.
		X	17	2.3.3 Channel 400-599 – Settings	Channel 445: Parameter name corrected.
X			17	2.3.3 Channel 400-599 – Settings	Channels 452 – 455 introduced.
		X	21	2.3.3.1 Switch Parameters for channels 400-599	Channel 445: Parameter name corrected.
X			22	2.3.3.1 Switch Parameters for channels 400-599	Switch Parameters for channels 452 – 455 introduced.
		X	24	2.3.5 Channel 800-999 – Alarms	Channel 805: Parameter name corrected.

Added	Changed	Corrected	Page	Section	Comment
	X		31	2.4.4 Read Aquired Data Continuously RADC	Information about breath data transmission in Nasal CPAP introduced.
	X		35	2.4.9 Read Highest Protocol Version RHVE	Highest Protocol version 0002.
		X	36	2.4.14 Read Software Version RSWV	Output example corrected.
		X	44	3.3 Parameter settings	Channel 445: Parameter name corrected.
X			45	3.3 Parameter settings	Channels 452 – 455 introduced.
		X	46	3.5 Alarm texts	Channel 805: Description and Display alarm text corrected.

5.4 Protocol version 0003 – Reference Manual revision 04

Note: Reference Manual revision 03 was not published.

In the table below, the following keywords are used in 'Comment' column:

- Added. New functionality added with Protocol version 0003.
- Changed. Changed functionality with Protocol version 0003.
- Corrected. Corrections made due to printing errors or lack of information in the previous version of the Reference Manual.

Added	Changed	Corrected	Page	Section	Comment
	X		5	General information	Text changed due to Protocol version 0003 and Servo-air.
X			7	1.6 Protocol version/System version matrix	Information on the relationship between Protocol versions and Products/System versions.
X			12-26	2.3 Channels	Information about availability in Protocol version 0003 introduced in the channel tables.
	X		13-14	2.3.2 Channel 100-399 – Breath data	Channel 115: Configuration changed. Channel 124: Fixed value. Note 2 introduced.
		X	16-18	2.3.3 Channel 100-399 – Settings	Channel 411, 418: Changed parameter name.
		X	19-23	2.3.3.1 Switch Parameters for channels 400-599	Channel 411, 448: Changed parameter name.
	X		24	2.3.4 Channel 600-799 – Alarm settings	Channel 614, 615: Configuration changed.
X	X		25-26	2.3.5 Channel 800-999 – Alarms	Channel 806, 807: Alarms added Channel 808: Fixed value. Channel 835: Added channel. Note 1 introduced.
X			35	2.4.7 Read CI Type RCTY	Servo-air added as device name.
	X		36	2.4.9 Read Highest Protocol Version RHVE	Highest Protocol version 0003.

Added	Changed	Corrected	Page	Section	Comment
X			37	2.4.14 Read Software Version RSWV	Servo-air added as device name.
	X		41	3.1 Waveforms	Note 1 introduced.
	X	X	42-44	3.2 Breath data	Channels 101, 102: Display range corrected. Channel 124: Fixed value. Channels 140-142: Display range described in separate tables. Note 1 introduced. Note 2 introduced.
X	X	X	45-51	3.3 Parameter settings	Channel 401, 411, 418, 437, 439, 445, 452, 453, 454, 455: Corrected. Channels 405, 406, 407, 420, 427, 428, 433, 443: Display range for Servo-air added. Channel 409, 448: Display range changed. Channels 410, 413, 417, 423, 435, 442, 446, 449, 450: Display range described in separate tables. Note 1 introduced. Note 2 introduced.
X		X	52	3.4 Alarm limits setting	Channel 600: Display range for Servo-air added. Channels 603, 604: Display range corrected. Note 1 introduced.
X	X	X	53-54	3.5 Alarm texts	Channel 806, 807: Alarms added Channel 808: Fixed value. Channel 835: Added channel. Channel 994-999: Introduced in table. Note 1 introduced. Note 2 introduced. Note 3 introduced.

5.5 Protocol version 0004 – Reference Manual revision 05

In the table below, the following keywords are used in 'Comment' column:

- Added. New functionality added with Protocol version 0004.
- Changed. Changed functionality with Protocol version 0004.
- Corrected. Corrections made due to printing errors or lack of information in the previous version of the Reference Manual.

Added	Changed	Corrected	Page	Section	Comment
	X		5	General information	Text changed due to Protocol version 0004.
	X		7	1.6 Protocol version/System version matrix	Changed due to Protocol version 0004.
X			12-26	2.3 Channels	Information about availability in Protocol version 0004 introduced in the channel tables.
X			14	2.3.2 Channel 100-399 – Breath data	Channels 146 – 149 introduced.
X			18	2.3.3 Channel 400-599 – Settings	Channels 456 – 458 introduced.
X			19	2.3.3.1 Switch Parameters for channel 400-599	Channel 410: Value for High Flow Therapy introduced.
		X	20	2.3.3.1 Switch Parameters for channel 400-599	Channel 413: Value description corrected.
X			24	2.3.3.1 Switch Parameters for channel 400-599	Channel 456: Switch parameter introduced.
	X		25	2.3.5 Channel 800-999 – Alarms	Channel 807: Parameter name changed.
	X		26	2.3.5 Channel 800-999 – Alarms	Channel 825 – 827: Fixed value.
X			26	2.3.5 Channel 800-999 – Alarms	Channels 836 – 837 introduced.
	X		28	2.4 Commands	RADAB allowed in Standby mode.
X			30	2.4.3.1 Curve Data	High Flow Therapy added in Parameters.
	X		30	2.4.3.2 Breath data	RADAB allowed in Standby mode.
X			32	2.4.4 Read Acquired Data Continuously RADC	Information regarding data transmission in Nasal CPAP and High Flow Therapy.
X			32	2.4.4 Read Acquired Data Continuously RADC	High Flow Therapy added in Parameters.
	X		36	2.4.9 Read Highest Protocol Version RHVE	Highest Protocol version 0004.
	X		37	2.4.14 Read Software Version RSWV	Output example changed.
		X	42	3.2 Breath data	SCI channel 120: SCI unit corrected.
X			44	3.2 Breath data	SCI channels 146-149 introduced.
		X	45	3.3 Parameter settings	SCI channel 413: Display name corrected.
X			48-49	3.3 Parameter settings	SCI channels 456 – 458 introduced.
X			49	3.3.1 Switch parameters for channel 410	Switch parameter for High Flow Therapy introduced.
		X	50	3.3.2 Switch parameters for channel 413	SCI Description and Display range corrected.
	X		52	3.4 Alarm limits setting	SCI channel 605: Display range changed.
	X		53	3.5 Alarm data	SCI channel 807: Display alarms text and Displayed alarm priority changed.

Added	Changed	Corrected	Page	Section	Comment
	X		54	3.5 Alarm data	SCI channels: 825 – 827: Fixed value.
X			54	3.5 Alarm data	SCI channels: 836 – 837 introduced.

5.6 Protocol version 0004 – Reference Manual revision 06

In the table below, the following keywords are used in 'Comment' column:

- Added. New functionality added with Protocol version 0004.
- Changed. Changed functionality with Protocol version 0004.
- Corrected. Corrections made due to printing errors or lack of information in the previous version of the Reference Manual.

Added	Changed	Corrected	Page	Section	Comment
		x	5	1.1 General and throughout the document	Corrections related to the new Getinge brand identity.
		X	7	1.4.3 Abbreviations and terms used in this document	Explanation of abbreviations and terms used in this document introduced.
	X		8	1.6 Protocol version/System version matrix	The matrix showing relation between Protocol versions and System versions changed due to System version 2.1.
		x	9	2.2.2 RS-232 connectors	Information regarding the RS-232 connectors introduced.
		X	19	2.3.3.1 Switch Parameters for channel 400 – 599	SCI channel 410; Ventilation Mode names corrected.
	X		44	3.2 Breath data	SCI channel 145; Changed function due to System version 2.1.
		x	44	3.2.1 – 3.2.3 Display values for channels 140, 141 and 142	SCI value introduced in the tables.
	X		48	3.3 Parameter settings	SCI channel 451; Changed function due to System version 2.1.
		x	49-50	3.3.1 Display values for Channel 410 – Ventilation mode	SCI Descriptions corrected. Modes not applicable to Servo-air clarified.
		X	49-51	3.3.1 – 3.3.9 Display values for channels 410, 413, 417, 423, 435, 442, 446, 449 and 450	SCI value introduced in the tables.
	X		50	3.3.3 Display values for Channel 417 – Language	Languages added in Servo-air System ersion 2.1.

5.7 Protocol version 0005 – Reference Manual revision 07

The following keywords are used in the table below:

- Added. New functionality added with Protocol version 0005.
- Changed. Changed functionality with Protocol version 0005.
- Corrected. Corrections made due to printing errors or lack of information in the previous version of the Reference Manual.

Added	Changed	Corrected	Page	Section	Comment
	x		5	General information	Text changed due to Protocol version 0005.
	x		8	1.6 Protocol version/System version matrix	Changed due to Protocol version 0005.
		x	9	2.2.2 Command/Response format	Information about RS-232 communication settings introduced.
X			12-28	2.3 Channels	Information about availability in Protocol version 0005 introduced in the channel tables.
X			14	2.3.2 Channel 100-399 – Breath data	Channel 150 introduced.
		X	26	2.3.5 Channel 800-999 – Alarms	Parameter Name for channels 806-807 clarified.
		X	30-31	2.4.3.1 Curve Data	Curve data information clarified.
	X	x	33	2.4.3.2 Breath Data	Breath data information changed and clarified.
		X	33	2.4.3.3 Settings Data	Settings data information clarified.
		X	34	2.4.3.4 Alarm Settings Data	Alarm settings data information clarified.
		X	34	2.4.3.5 Alarm Data	Alarm data information clarified.
	X	x	35-36	2.4.4 Read Acquired Data Continuously RADC	Read acquired data continuously information changed and clarified.
		X	37	2.4.6 Read Channel Configuration RCCO	Read channel configuration information clarified.
	X		38	2.4.8 Read Data Acquisition Definition RDAD	Read data acquisition definition information changed.
	X		39	2.4.9 Read Highest Protocol Version RHVE	Read highest protocol version information changed.
		X	40	2.4.10 Read Patient Info RPAI	Note regarding personal health data introduced.
		X	40	2.4.12 Read Serial Number RSEN	Read serial number information clarified.
	X		42	2.4.17 Set Data Acquisition Definition SDAD	Set data acquisition definition information changed.
X			48	3.2 Breath data	SCI channel 150 introduced.
		X	49-57	3.3 Parameter settings	Channels 401, 409, 411, 418, 437, 439, 445, 448, 452, 453, 454, 455 and 456 clarified. Display range described in separate tables.
		X	59	2.3.5 Channel 800-999 – Alarms	Alarm text for channels 806-807 clarified.

5.8 Protocol version 0006 – Reference Manual revision 08

The following keywords are used in the table below:

- Added. New functionality added with Protocol version 0006.
- Changed. Changed functionality with Protocol version 0006.
- Corrected. Corrections made due to printing errors or lack of information in the previous version of the Reference Manual.

Added	Changed	Corrected	Page	Section	Comment
	x		5	General information	Text changed due to Protocol version 0006.
x			6	1.4.2 Common acronyms	New ventilation modes added.
X			7	1.4.3 Abbreviations and terms used in this document	Servo-xyz added.
	X		8	1.6 Protocol version/System version matrix	Changed due to Protocol version 0006 and System software 3.0.
x			12-28	2.3 Channels	Information about availability in Protocol version 0006 introduced in the channel tables.
	X		14	2.3.2 Channel 100-399 – Breath data	Channel 145 changed.
X			14	2.3.2 Channel 100-399 – Breath data	Channels 151-153 added.
	X		16	2.3.3 Channel 400-599 – Settings	Channel 419 changed.
X			18	2.3.3 Channel 400-599 – Settings	Channels 459-463 added.
	X		19-21	2.3.3.1 Switch Parameters for channel 400 – 599	Channels 410, 411 and 417 changed.
X			25	2.3.4 Channel 600-799 – Alarm settings	Channels 620-623 added.
X			27-28	2.3.5 Channel 800-999 – Alarms	Channels 838-846 added.
X		x	29	2.4 Commands	Commands RCFG and RPTY added. Command RCTY clarified.
X			32	2.4.3.1 Curve Data	HFOV added. Note regarding curve sampling time added.
X		x	35-37	2.4.4 Read Acquired Data Continuously RADC	Output syntax corrected with <end_flag>. HFOV added. Note regarding curve sampling time added.
	X		38	2.4.6 Read Channel Configuration RCCO	Changed due to new unit codes.
X			38	2.4.7 Read Configuration RCFG	Command added.
		X	39	2.4.8 Read CI Type RCTY	Command clarified.
	X		39	2.4.10 Read Highest Protocol Version RHVE	Command changed due to Protocol version 0006.
	x		40	2.4.11 Read Patient Info RPAI	Command changed.
X			40	2.4.12 Read Protocol Type RPTY	Command added.
	X		40	2.4.13 Read Protocol Version RPVE	Command changed.
		X	41	2.4.16 Read Software Version RSWV	Command clarified.
	X		46-48	3.2 Breath data	Channel 106, 119, 125 and 145 changed.

Added	Changed	Corrected	Page	Section	Comment
Added	Changed	Corrected	Page	Section	Comment
x			48	3.2 Breath data	Channels 151-153 added.
	X		51	3.3 Parameter settings	Channels 411and 419 changed.
	X		54	3.3 Parameter settings	Channels 446 and 447 changed.
X			55-56	3.3 Parameter settings	Channels 459-463 added.
	X		57	3.3.3 Display range for channel 410 – Ventilation mode	Channel 410 changed.
	X		57	3.3.4 Display range for channel 411 – Status of current user request	Channel 411 changed.
	X		58	3.3.6 Display range for channel 417 – Language	Channel 417 changed.
X			62	3.4 Alarm limit settings	Channels 620-623 added.
X			64-65	3.5 Alarms	Channels 838-846 added.

5.9 Protocol version 0007 – Reference Manual revision 09

The following keywords are used in the table below:

- Added. New functionality added with Protocol version 0007.
- Changed. Changed functionality with Protocol version 0007.
- Corrected. Corrections made due to printing errors or lack of information in the previous version of the Reference Manual.

Added	Changed	Corrected	Page	Section	Comment
	x		6	General information	Text changed due to Protocol version 0007.
x			7	1.4.2 Common acronyms	Recruitment Maneuver added.
X			8	1.4.3 Abbreviations and terms used in this document	SE added.
	X		9	1.6 Protocol version/System version matrix	Changed due to Protocol version 0007 and System version 4.0.
	x		11	2.2.5 Error handling	ASCII and binary error messages changed.
X			13-29	2.3 Channels	Information about availability in Protocol version 0007 introduced in the channel tables.
X			13	2.3.1 Channel 0-99 – Real time curves	Channels 7-8 added.
X			15	2.3.2 Channel 100-399 – Breath data	Channels 154-157 added.
X			19	2.3.3 Channel 400-599 – Settings	Channel 464 added.

Added	Changed	Corrected	Page	Section	Comment
X			25	2.3.3.1 Switch Parameters for channel 400 – 599	Switch parameters for channel 464 added.
X			28	2.3.5 Channel 800-999 – Alarms	Channel 817. Check tubing alarm added.
X			30	2.4 Commands	RCFG error codes added
Added	**Changed**	**Corrected**	**Page**	**Section**	**Comment**
x			31	2.4 Commands	RADA Event data including error codes added
x			36	2.4.3.6 Event Data	RADA Event data added.
X	x		40-41	2.4.7 Read Configuration RCFG	RCFG command changed. Applicable channels added.
	X		42	2.4.10 Read Highest Protocol Version RHVE	Command changed due to Protocol version 0007.
	x		48	3.1 Waveforms	Channel 1. Name changed.
X			48	3.1 Waveforms	Channels 7-8 added.
		X	49-52	3.2 Breath data	Note 3 introduced.
X		x	49	3.2 Breath data	Channels111-112. Name added, range corrected.
		X	50	3.2 Breath data	Channel 120. Range corrected.
	X		51	3.2 Breath data	Channel 149 applicable to Servo-air.
X			51-52	3.2 Breath data	Channels 154-157 added.
		X	58-59	3.3 Parameter settings	Note 2 introduced.
	X		58	3.3 Parameter settings	Channel 458 applicable to Servo-air.
X			59	3.3 Parameter settings	Channel 464 added.
	X		60	3.3.3 Display range for channel 410 – Ventilation mode	High Flow Therapy applicable to Servo-air.
		X	60	3.3.3 Display range for channel 410 – Ventilation mode	Note 2 introduced.
		X	60	3.3.4 Display range for channel 411 – Status of current user request	Note 2 introduced.
X			63	3.3.23 Display range for channel 464 – Auto RM Status	Display range for channel 464 added.
		X	65	3.4 Alarm limit settings	Note 2 introduced.
X			67	3.5 Alarms	Channel 817. Check tubing alarm added.
		X	67-68	3.5 Alarms	Note 4 introduced.
X			69-73	4 Appendix B – Channel applicability tables	Channel applicability tables for Breath data, Parameter settings and Alarm limit settings added.

5.10 Protocol version 0008 – Reference Manual revision 10

The following keywords are used in the table below:

- Added. New functionality added with Protocol version 0008.
- Changed. Changed functionality with Protocol version 0008.
- Corrected. Corrections made due to printing errors or lack of information in the previous version of the Reference Manual.

Added	Changed	Corrected	Page	Section	Comment
	x		6	1.1 General information and throughout the document	Text changed due to Protocol version 0008.
		x	6	1.1 General information and throughout the document	Servo-u MR clarifications.
X			7	1.4.2 Common acronyms	NPS and ZAM added.
	x		9	1.6 Protocol version/System version matrix	Changed due to Protocol version 0008 and System version 4.1.
x			13-32	2.3 Channels	Information about availability in Protocol version 0008 introduced in the channel tables.
X			15-16	2.3.2 Channel 100-399 – Breath data	Channels 158-160 added.
x			21	2.3.3.1 Switch Parameters for channel 400-599	Switch parameters for channel 410 added.
x			22	2.3.3.1 Switch Parameters for channel 400-599	Switch parameters for channel 411 added.
x			31	2.3.5 Channel 800-999 – Alarms	Channels 847-851 added.
x			43	2.4.6 Read Channel Configuration RCCO	Unit 30 (ml/µV) added.
	X		45	2.4.10 Read Highest Protocol Version RHVE	Highest version changed to 0008.
x			55	3.2 Breath data	Channels 158-160 added.
	x		56	3.3 Parameter settings	Channel 408. Range changed.
x			57	3.3 Parameter settings	Channel 411. Zero Assist Maneuver added.
		x	61	3.3 Parameter settings	Channel 458. Applicable to Servo-air.
		x	62	3.3 Parameter settings	Channel 464. Not applicable to Servo-air.
x			63	3.3.3 Display range for channel 410 – Ventilation mode	Display range for new ventilation modes added.
x			63	3.3.4 Display range for channel 411 – Status of current user request	Display range for ZAM added.
	x		65	3.3.12 Display range for channel 442 – Gas Type Setting	Now applicable for Heliox.
x			71	3.5 Alarms	Channels 847-851 added.
x			73-77	4 Appendix B – Channel applicability tables	Columns 24 NPS and 25 NIV NPS introduced.
		x	73	4 Appendix B – Channel applicability tables	Channel 122 corrected. Applicable for NIV-PS

5.11 Protocol version 0009 – Reference Manual revision 11

The following keywords are used in the table below:

- Added. New functionality added with Protocol version 0009.
- Changed. Changed functionality with Protocol version 0009.
- Corrected. Corrections made due to printing errors or lack of information in the previous version of the Reference Manual.

Added	Changed	Corrected	Page	Section	Comment
	x		5	1.1 General information and throughout the document	Text changed due to Protocol version 0009.
x			5	1.1 General information and throughout the document	Servo-c added.
	x		8	1.6 Protocol version/System version matrix	Changed due to Protocol version 0009, System version 4.3 and Servo-c.
	x		11	2.2.5 Error handling	ER21/BER21 modified.
x			13-32	2.3 Channels	Information about availability in Protocol version 0009 introduced in the channel tables.
x			13	2.3.1 Channel 0-99 – Real time curves	Cannel 009 added.
		x	14	2.3.2 Channel 100-399 – Breath data	Note about Heliox supply pressure added to channel 111.
		x	29	2.3.5 Channel 800-999 – Alarms	Info about Heliox supply pressure alarm added to channel 806.
x			33	2.4 Commands	PING command added.
	x		34	2.4 Commands	RADAA now available in Standby.
x			35	2.4.3 Ping request PING	PING command added.
	x		37	2.4.4 Read Acquired Data RADA	Info about PING command added to Curve Data (RADUC).
	x		39	2.4.4 Read Acquired Data RADA	RADAA now available in Standby.
	x		41-43	2.4.5 Read Acquired Data Continuously RADC	Info about PING command added.
	x		47	2.4.11 Read Highest Protocol Version RHVE	Highest version changed to 0009.
	x		53-75	3 APPENDIX A – Servo User Interface presentation	Removed Note 1 (Not applicable to Servo-air) from channels 4-6, 113-117, 418, 612-617 and 802-803.
	x		53-75	3 APPENDIX A – Servo User Interface presentation	Applicability and ranges updated to comply with Servo-c. Changes to channels: 3, 7-8, 106, 111, 136, 138-141, 145-147, 150-160, 405-407, 409-412, 419-420, 427-428, 433, 439-441, 443, 445, 448, 452-455, 458-464, 600, 608-609, 618-623, 806-807, 812, 823-824, 833-835, 838-851.
x			53	3.1 Waveforms	Channel 009 added.
		x	54	3.2 Breath data	Note about Heliox supply pressure added to channel 111.
		X	56-57	3.2 Breath data	Resolution corrected (channel 154 - 157)
		x	72	3.5 Alarms	Info about Heliox supply pressure alarm added to channel 806.
		x	75	3.5 Alarms	Note about priority added for channels 995-999.

5.12 Protocol version 0010 – Reference Manual revision 12

The following keywords are used in the table below:

- Added. New functionality added with Protocol version 0010.
- Changed. Changed functionality with Protocol version 0010.
- Corrected. Corrections made due to printing errors or lack of information in the previous version of the Reference Manual.

Added	Changed	Corrected	Page	Section	Comment
	x		6	1.1 General information and throughout the document	Text changed due to Protocol version 0010.
X			9	1.6 Protocol version/System version	Added version 4.4
X			25	2.3.3 channel 400-599 - Settings	Added alarms 465 och 466
X			33	2.3.3.1 Switch parameters for channel 400-599	Added alarms 465 and 466
X			35	2.3.4 Channel 600-799 – Alarm settings	Added alarms 624 and 625
X			39	2.3.5 Channel 800-999 – Alarms	Added alarm in alarm 818
X			41	2.3.5 Channel 800-999 – Alarms	Added alarms 852, 853, 854
X			74	3.3 Parameter settings	Added alarms 465 and 466
X			81	3.4 Alarm limit settings	Added alarms 624 and 625
X			89	4.2 Parameter settings	Added alarms 465 and 466
X			90	4.3 Alarm limit settings	Added alarms 624 and 625

5.13 Protocol version 0010 – Reference Manual revision 13

The following keywords are used in the table below:

- Added. New functionality added with Protocol version 0010.
- Changed. Changed functionality with Protocol version 0010.
- Corrected. Corrections made due to printing errors or lack of information in the previous version of the Reference Manual.

Added	Changed	Corrected	Page	Section	Comment
	X		74	3.3.2 Display range for channel 409 – Patient range selection	Neonatal applicable for Servo-c instead of not applicable.
	X		68	3.3 Parameter settings	Channel 420: Tidal volume range down to 2 ml from 10 for Servo-c
	X		70	3.3 Parameter settings	Channel 443: Tidal volume range down to 2 ml from 10 for Servo-c
	X		77	3.3.15 Display range for channel 448 – No patient effort alarm	Alarm off applicable for servo-c instead of not applicable.
	X		77	3.3.18 Display range for channel 452 – Leakage too high alarm	Alarm off applicable for servo-c instead of not applicable.
	X		77	3.3.19 Display range for channel 453 – Inspiratory tidal volume too high alarm	Alarm off applicable for servo-c instead of not applicable.
	X		77	3.3.20 Display range for channel 454 – Expiratory minute volume high alarm	Alarm off applicable for servo-c instead of not applicable.
	X		78	3.3.21 Display range for channel 45 – Expiratory minute volume low alarm	Alarm off applicable for servo-c instead of not applicable.
	X		79/80	3.4 Alarm limit settings	Channel 619: VTi alarm applicable for Servo- instead of not applicable.
	X		67	3.3 Parameter settings	Channel 404: Upper limit 30 % for neo.
	X		68/71	3.3 Parameter settings	Channel 419/444: I:E ratio down to 1:20.0.
	X		70	3.3 Parameter settings	Channel 431: Upper limit changed to 500 ms.
	X		73	3.3 Parameter settings	Channel 458: Servo-n upper limit changed to 50 l/min.
	X		80	3.4 Alarm limit settings	Channel 624: Servo-n upper limit changed to 450 ml.
	X		80	3.4 Alarm limit settings	Channel 625: Servo-n upper limit changed to 440 ml.

5.14 Protocol version 0010 – Reference Manual revision 14

The following keywords are used in the table below:

- Added. New functionality added with Protocol version 0010.
- Changed. Changed functionality with Protocol version 0010.
- Corrected. Corrections made due to printing errors or lack of information in the previous version of the Reference Manual.

Added	Changed	Corrected	Page	Section	Comment
		X	19	2.3.3 Channel 400-599 - Settings	Information on rounding of displayed parameter setting values added.
	X		67 and 73	Appendix A – Servo User Interface presentation 3.3 Parameter settings	Added Note 4 on channel 401 regarding leakage compensation.
		X	85-89	Appendix B – Channel applicability tables	Fixed typo. Automode VS-VS changed to Automode VC-VS.
	X		87	Appendix B – Channel applicability tables. 4.2 Parameter settings	Changed to 1 regarding 401 for HFT, HFO PC and HFO VT.

GETINGE

Getinge is a global provider of innovative solutions for operating rooms, intensive care units, sterilization departments and for life science companies and institutions. Based on our firsthand experience and close partnerships with clinical experts, healthcare professionals and medtech specialists, we are improving the everyday life for people, today and tomorrow.

Manufacturer:
Maquet Critical Care AB · Röntgenvägen 2 SE-171 54 Solna · Sweden

www.getinge.com

Order no. 68 80 036 · Printed in Sweden · Rev: 14 · 2024-11-04