

GX-Force Safety Requirement Specification & Test Specification

Document No.GX-Force_SW103

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Date 2020/11/27	Date 2020/11/27	Date 2020/11/26

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No.	Date	Version	Revised content	Remarks
Ex.	20XX/XX/XX	RevX.X	Create New	
1	2020/11/26	Rev1.0	Create New	
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Request number	Classification	Itemized request number	Requirements	Test items	Check
req[1]	Concentration measurement	req[1 - 1]	NC (combustible gas) concentration Calculation	Calculating concentration from sensor output Temperature correction for sensor output Humidity correction for sensor output Calculate concentration up to 120% of full scale . Set an "over" flag and make the concentration of F.S + 1 digit for concentration that exceeds full scale. In the case of the concentration of 0% to -5% of UpperLimit, set the density display to "0". For concentrations of -5% to -10% of UpperLimit, display the true concentration. If it is less than -10% of UpperLimit, the concentration display will be minus over. Intermittent measurement (1 second ON - 1 second ON - 3 seconds OFF control) using two combustible gas elements When exceeding the full scale, keep the concentration at "OVER" during measurement, turn off energization of sensor and perform combustible protection If an oxygen sensor is present during combustible protection, autoreset at 20 vol% or above If no oxygen sensor is present during combustible protection, autoreset with ENTER button	
		req[1 - 2]	EC (Oxygen/Toxic Gas) Concentration Calculation	Calculating concentration from sensor output Temperature correction for sensor output Calculate concentration up to 120% of full scale . Set an "over" flag and make the concentration of F.S + 1 digit for concentration that exceeds full scale. In the case of the concentration of 0% to -5% of UpperLimit, set the density display to "0". For concentrations of -5% to -10% of UpperLimit, display the true concentration. If it is less than -10% of UpperLimit, the concentration display will be minus over.	
		req[1 - 3]	Calibration curve processing	Calculate the percent input against the calibration curve (X - Y) and output as a percentage Calculate the percent input against the reverse calibration curve (Y - X) and output as a percentage Output any inputs of 0% and lower and 100% or higher without calibration curve processing Change the calibration curve to be applied depending on the sensor and gas type	
		req[1 - 9]	Average calculation	Calculate the average value per minute for each minute by integrating the numerical value for each concentration calculation (it is used only for calculations such as logger and STEL)	
		req[1 - 10]	STEL value calculation	During the measurement, monitor concentration of toxicity for each concentration calculation and update the STEL value Calculate the STEL value by summing 15 averages of 1 minute each and dividing the sum by 15	
		req[1 - 12]	TWA value calculation	During measurement, monitor the concentration of toxicity for each concentration calculation and update the TWA value Calculate the TWA value by summing the averages of every minute for 8 hours and dividing the sum by 480	
		req[1 - 14]	Cumulative (AVRG) value calculation	During measurement, monitor concentration of toxicity for each concentration calculation and update cumulative (AVRG) value Calculate the TWA value by summing the averages of every minute for 1 hour and dividing the sum by 60	
req[2]	Gas alarm	req[2 - 1]	Gas warning notification	Displays a fault message Buzzer, vibration motor, and LED work The LCD backlight should be on all the time. The priority order of the alarm points of the combustible sensors is 1st <2nd <3rd <OVER The alarm pattern of the combustible sensor is H-HH The priority order of the alarm points of the oxygen sensor is 1st <2nd <3rd <OVER The alarm pattern of the oxygen sensor is L - LL - H Priorities of alarm points of the toxicity sensor are 1st <2nd <3rd <OVER <TWA (AVRG) <STEL The alarm pattern of the toxicity sensor is H - HH Alarm reset available in case of latching alarm For automatic reset, there is no alarm reset but alarm should go away automatically according to gas concentration In case all gas alarms is set to OFF, do not perform gas alarm operation	
req[3]	Fault alarm	req[3 - 1]	Fault warning notification	Displays a fault message Buzzer, vibration motor, and LED work The LCD backlight should be on all the time. USB communication can be performed while a fault message is being displayed Faults that can be restored shall be restored by pressing the ENTER key for a short time Faults that can not be reset should require power to be turned off to perform reset Latching (without auto reset) operation	
		req[3 - 2]	Self-diagnosis	Perform system check (ROM, RAM, nonvolatile memory; check during initialization and every 24 hours during measurement) Perform internal clock check (check date/time validity; confirm during initialization) Perform circuit voltage check (confirm during initialization and during measurement) Perform thermistor error check (confirm during initialization and during measurement) Perform sensor error check (A/D value confirmation; check during initialization and every second during measurement) EC sensor connectivity check (confirm during initialization and every 15 min. during measurement) Low battery voltage check (A/D value check; check every second during start) Perform sensor circuit error check (check during initialization and during measurement) Perform flow error check (check during initialization and during measurement) Perform pump error check (check during initialization and during measurement)	
req[13]	Microcomputer	req[13 - 6]	A/D converter	Configurable as specified Capable of obtaining specified A/D value	
req[14]	Microcomputer connection device	req[14 - 8]	Buzzer	Configurable frequency	
		req[14 - 15]	NC (combustible) sensor	Capable of acquiring combustible gas sensor output	
		req[14 - 16]	EC (oxygen,toxicity) sensor	Capable of acquiring oxygen and toxicity gas sensor output	