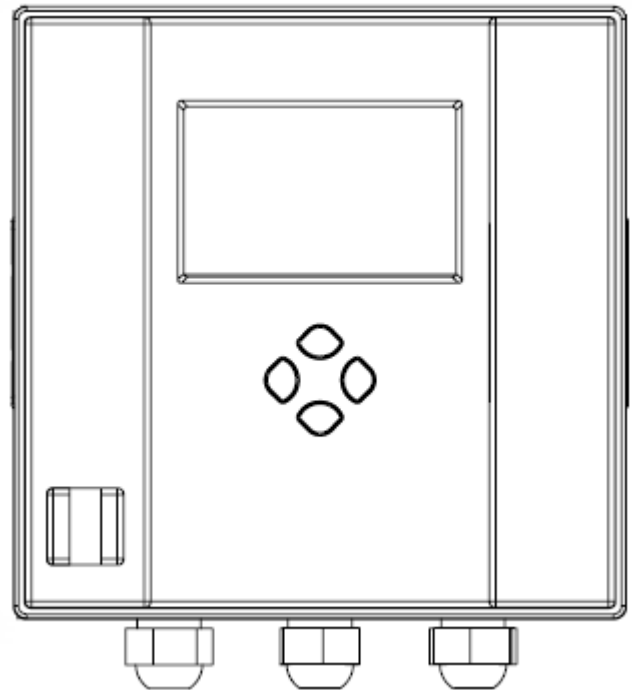




Real time Pump/ Hydro-Turbine/ Blower Performance Monitoring with  
**Censeo**



**User Manual**  
BGX501-806-R02

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## 1 Important

1. As a result of our continuous efforts to improve our products, the specifications mentioned in this manual may be subject to change. Therefore the availability of features may depend on the product variant.
2. The specifications and features listed in this manual were correct when this document was released but may be subject to change and should be considered to be definitive. Please refer any queries to our sales team.
3. No part of this manual or its contents may be published, distributed, scanned or copied, in electronic form or otherwise, without prior written consent of Secure Meters Ltd.
4. While we have made every effort to minimise errors, some may exist. We request feedback from users in this regard and undertake to correct such errors wherever possible.
5. Secure Meters Ltd. reserves the right to alter the features or specifications mentioned in this document without prior notice.
6. Please direct queries on our products or services to our sales team.
7. In most countries, electrical installations must comply with one or more sets of regulations issued by national authorities or by recognized local or international bodies. Such regulations must be adhered to, even if they are not referred to directly in this document.
8. We conduct rigorous testing during the design and manufacture of our products to ensure that they comply with appropriate standards.
9. Secure Meters Ltd. assumes no responsibility for damage arising from misuse of our products such as, but not limited to, the following:
  - Incomplete or incorrect installation or maintenance
  - Connection to incorrect voltage sources
  - Damaged insulation on connecting cables
  - Contact with hazardous substances
  - Immersion in water or any other liquid
  - Handling by unauthorized persons
  - Handling by inebriated, intoxicated or mentally unbalanced persons

## 2 Precautions and Safety Practices

1. Censeo needs mains supply to function, and may need to be installed in electrically live surroundings. To minimise the risk of electrical shock, stay away from loose or exposed electrical connections. If there is loose or exposed electrical wiring near the installation site, initiate appropriate preventive measures.
2. Ensure proper protection from abnormal power supply with the help of fuse/ relay/ circuit breaker is provided.
3. Keep the meter away from fire, corrosive chemicals, and fumes thereof, rain and direct, prolonged exposure to water.
4. The product may be damaged, either in part or otherwise, if it falls from a height or subjected to a heavy weight.
5. It is recommended to immediately cut off the power supply upon occurrence of any fault within the product.
6. Secure Meters System recommends carrying out regular installation checks, especially when the product is installed at locations posing higher risk of degradation or corrosion – such as under direct, strong sunlight, areas with high ambient temperature and little ventilation, areas near heat sources like a furnace, areas near sea or a water body, areas where the meter is regularly exposed to chemical fumes, etc.
7. The electrical and mechanical installation of electronic equipments at a site requires an adequate understanding of all governing rules and regulations.

### 3 Introduction

Censeo product family is the latest offering from Secure Meters aimed towards measuring and monitoring critical pump/ hydro-turbine/ blower performance parameters with high accuracy in commercial and industrial pump/ hydro-turbine/ blower installations.

Censeo –

- Monitors and displays pump/ hydro-turbine/ blower operating parameters in real time with the help of temperature and pressure sensors and a power meter.

It measures suction/ inlet pressure, discharge/ outlet pressure, suction/ inlet temperature and differential temperature; and reads motor/ generator parameters such as voltage, current, drive power/ generated power, power factor and frequency through interfaced power meter to calculate the pump/ hydro-turbine/ blower performance parameters such as efficiency, flow rate and total head. These parameters can also be read by a computer over RS485.

- Is run time configurable through a software tool called Pump Test 9. This software is used to configure essential information and parameters such as Censeo time, communication, displays, historical data, analogue outputs, alarms and relays. Besides configuring Censeo, Pump Test 9 is also used for viewing online data, reading historical data, alarms logged and transactions from Censeo. (refer to Pump Test 9 help for details)

### 4 About Censeo

#### 4.1 General Specifications

##### 4.1.1 Electrical

Product type	Single phase, three wire with inputs for MODBUS signals	
Product Class	Class A	
SMPS	110-230 V AC/DC	
Frequency	50/60 Hz	
Tolerable frequency variation	± 5%	
Internal relays	Contact rating 230 V AC, 2 A	
Sensor inputs*	Suction/ Inlet and Discharge/ Outlet pressure	3 wire Analogue 4-20 mA / 4 wire Analogue 1-5 V probe as specified by manufacturer
	Suction/ Inlet and Discharge/ Outlet temperature	3 wire Analogue probe as specified by manufacturer
*According to variant		

##### 4.1.2 Communication with PC and Power Meter

Meter configuration through PC	RS232 communication through PACT port using Pump Test 9
Pump/ Hydro-Turbine/ Blower monitoring on PC	Two wire RS485 based communication with PC using MPM-Watch
Power meter	Power meter supporting 32 bit floating Modbus protocol on RS-485
Input / Output terminals*	Four fixed Analogue Inputs 1-5 V / 4-20 mA Four configurable Analogue input / output 1-5 V / 4-20 mA
*According to variant	

#### 4.1.3 Pump/ Hydro-Turbine Flow Measurement (Variant dependent)

Accuracy class	Differential temperature	2 mK*
	Fluid temperature	0.2 °C
	Pressure	0.25% of full scale pressure
	Efficiency	0.5 %
	Flow	1 %
Max. pressure head	300 bar	
Max. fluid outlet temperature	80 °C, with a maximum variation of 8 °C between suction/ inlet and discharge/ outlet.	

#### 4.1.4 Blower Flow Measurement (Variant dependent)

Accuracy class	Differential temperature	150 mK
	Air temperature	0.2 °C
	Pressure	0.25% of full scale pressure
	Efficiency	1 %
	Flow	1 %
Max. pressure head	5 bar	
Max. air outlet temperature	150 °C, with a maximum variation of 120 °C between inlet and outlet.	

#### 4.1.5 Mechanical

Dimensions (mm)	144 (H) x 144 (W) x 172 (D)
Weight	~1.200 kg
Mounting type	Projection and Panel type
Housing material	Fire Retardant Poly-Carbonate (FR-PC)
Front & back cover	Fire Retardant Poly-Carbonate (FR-PC)
Glands for wire insertion	Six (three PG9 and three PG13.5) glands provided at the bottom
Wall Mounting holes	Four (2 oblong and 2 circular)
Wall Mounting clamp	Available on the rear cover
Display	81 x 53 mm, 128 x 80 pixels LCD display with green backlight
Keys	4 – left, right, up and down

#### 4.1.6 Environmental

Operating temperature	0 °C to 70 °C
Storage temperature	-10 °C to 70 °C
Ingress protection	IP54
Max. tolerable humidity	Up to 95% non-condensing

#### 4.1.7 Compliances

Electrical	IEC61326-1, CISPR22, BS:EN 61010-1
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## 4.2 Basic System Block Diagram for Pump Flow Measurement

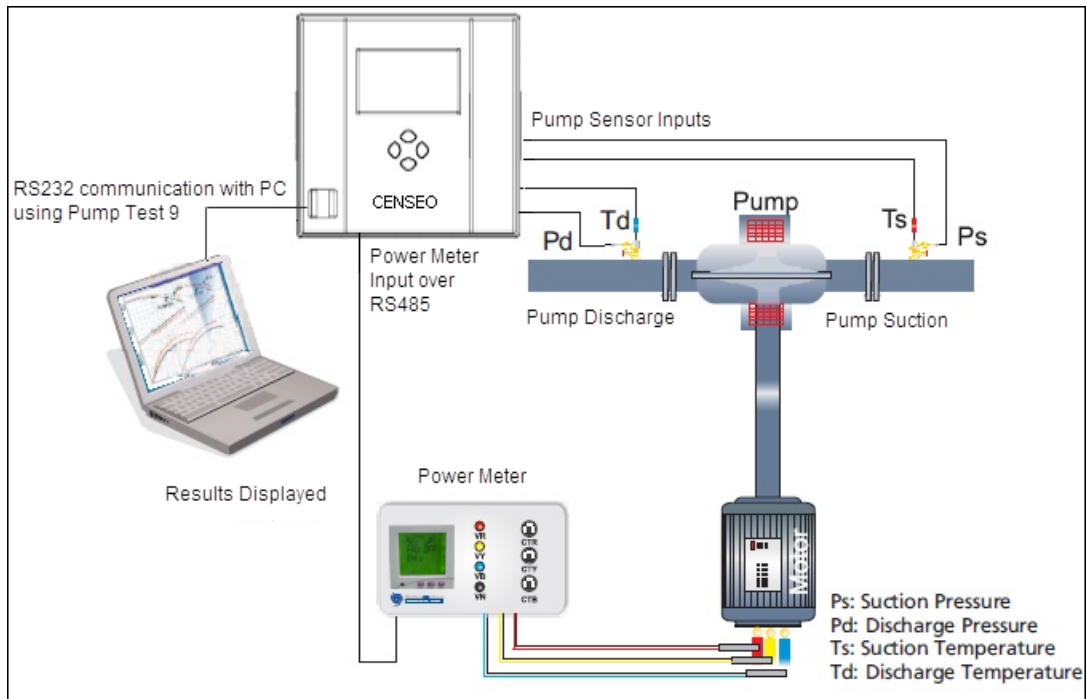


Figure 1: Performance monitoring system

## 4.3 Connection Diagram

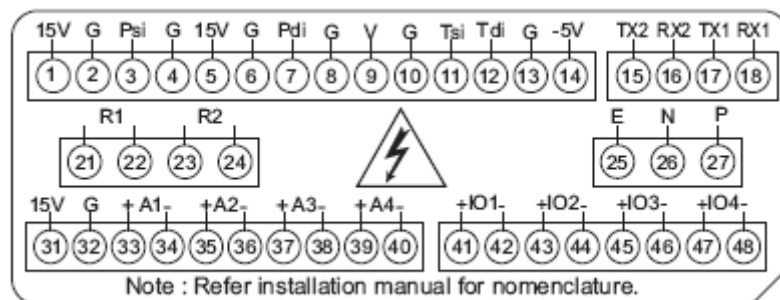
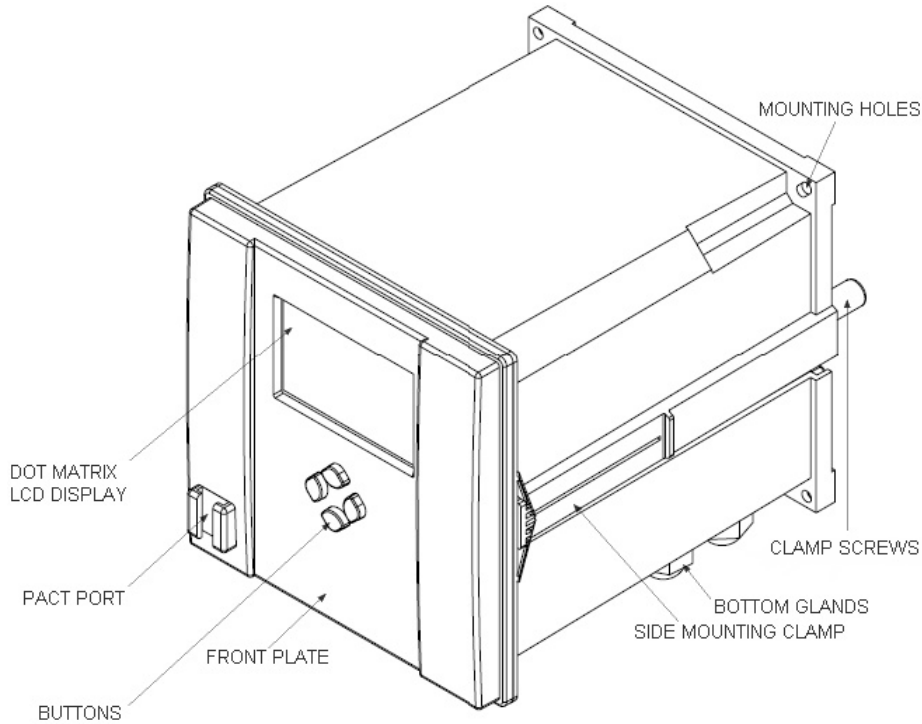


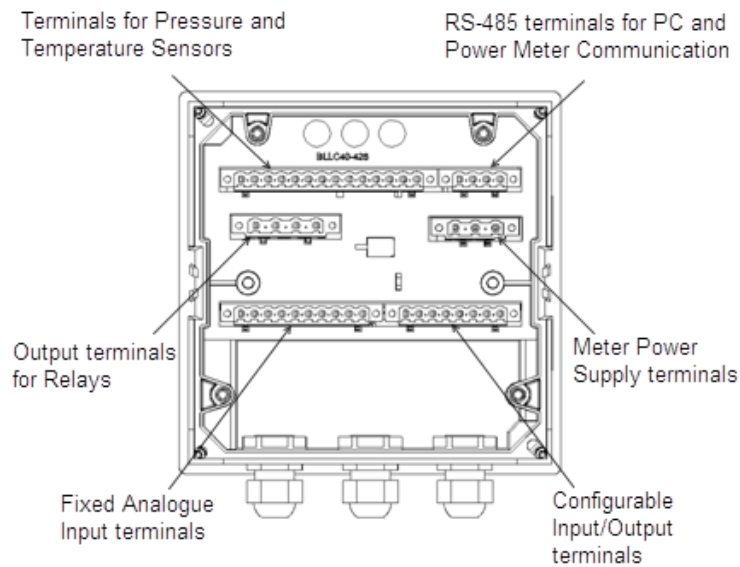
Figure 2: Connection Diagram (as pasted on the underside of rear cover of Censeo)

INDEX			
R1, R2	Two wire outputs for relays	Tdi	Discharge/ Outlet Temperature Sensor (Red)
Psi	Suction/ Inlet Pressure Sensor	TX1, RX1	Transmit and Receive lines for PC over RS485
Pdi	Discharge/ Outlet Pressure Sensor	TX2, RX2	Transmit and Receive lines for Power Meters over RS485
Tsi	Suction/ Inlet Temperature Sensor (Blue)	IO1-4	Analogue two-wire Input / Output terminals
E	Earth for shielding	A1-4	Fixed analogue inputs
G	Ground	15V	Input 15 V DC supply to sensors
N	Neutral/ Negative	V	5 V DC supply to Tsi
P	Phase/ Positive	-5 V	- 5 V DC supply to Tdi
Note: Pin details may vary with variants. Interpret the diagram and table above for the right variant.			

**4.4 Parts Description**



**Figure 3: Censeo Parts**



**Figure 4: Censeo Connections**

The various parts as shown in the diagrams above are described as under –

1. *Dot matrix LCD display:* Censeo display is a 128 x 80 pixels dot matrix LCD type display with backlight.
2. *PACT port:* Available at the bottom left corner of the front plate, the PACT port is used to configure the meter on demand through RS232 communication from a computer with the help of appropriate software.
3. *Front plate:* Made of fire resistant poly carbonate material, the front plate is opaque and is covered with an additional transparent plate. It accommodates a four button keypad and a PACT port. The front plate also accommodates the rating plate as shown here.



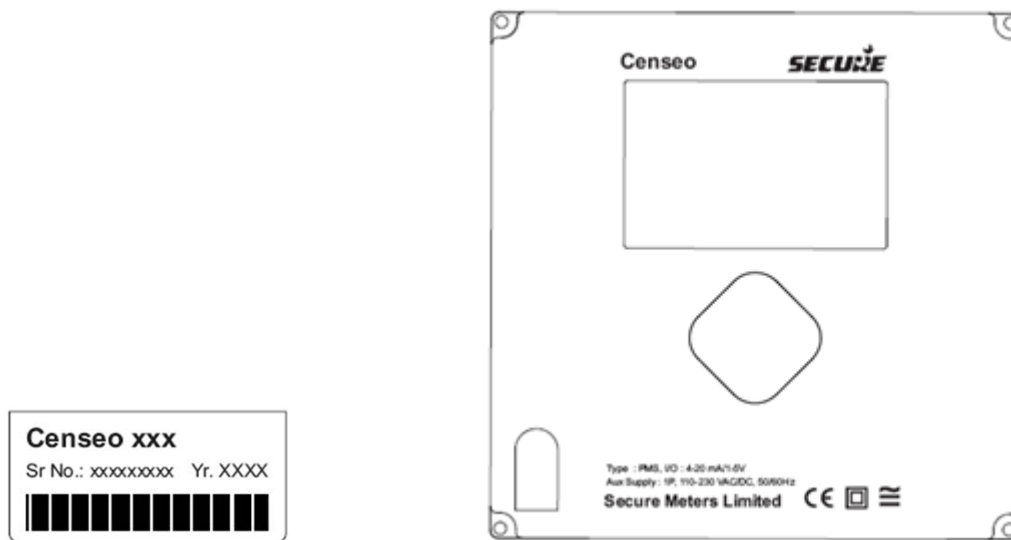


Figure 5: Decal and Front Plate of Censeo

4. *Buttons*: A keypad containing four orthogonal buttons is available for various functions.
5. *Mounting Holes*: Four mounting holes are available at the rear corners of the meter casing to mount the Censeo on a wall.
6. *Clamp screw*: These screws are used to fasten side mounting clamps for panel installation. This will arrest the horizontal movement of Censeo through the panel while installation.
7. *Bottom glands*: These glands are basically an entry for the supply and communication cables at the bottom of the Censeo.
8. *Side mounting clamp*: A couple of side mounting clamps are available to mount the Censeo on a panel.
9. *Pressure and temperature sensor terminals*: These terminals are used to connect four types of sensor inputs – suction/ inlet pressure, discharge/ outlet pressure, suction/ inlet temperature and discharge/ outlet temperature.
10. *RS485 PC communication terminals*: These terminals are used for communicating continuously with a computer for real-time pump/ hydro-turbine/ blower monitoring, flow and efficiency calculations.
11. *Relay terminals*: These outputs from relays inside Censeo are used to drive external alarm / control circuits towards various purposes. The relays retain their state until driven again by Censeo, or the next power cycle.
12. *Power supply terminals*: These terminals are used to power up the Censeo with a single phase AC or DC supply.
13. *RS485 power meter communication terminals*: These terminals are used to feed real-time RS485 inputs from external electronic wattmeters or power meters which measure the power drawn/ generated by the pump/ hydro-turbine/ blower in real time.
14. *Terminals for analogue inputs / outputs*: If available, these terminals are used to either feed extra signals from sensors or to transmit extra signals outside from the Censeo.

## 5 Firmware Features

### 5.1 Principle of Operation

Censeo employs the thermodynamic method of calculating work done on the pumped fluid by measuring differences between temperature and pressure at suction/ inlet and discharge/ outlet ends through highly precise temperature probes and pressure transducers. The efficiency calculation done by this method is based on calculating losses. In a typical pump/ hydro-turbine system the main losses occur are temperature rise, noise, vibration. Almost 98% of losses constitute the temperature rise.

While pumping/ rotating any fluid, mechanical work is done on the liquid which raises its temperature measurably. Moreover, because of the significant mechanical effort applied on the fluid, discharge/ outlet pressure is always slightly higher than the suction/ inlet pressure (this is inverse for hydro-turbine however). Thus, a little energy is dissipated as heat which gets absorbed by the fluid and mechanical vibrations of the pump/ hydro-turbine setup.

Through highly precise electronic probes and transducers, it is possible to measure such differential changes in temperature and pressure. Once accurate numerical data is available, actual losses in the system can be calculated using thermodynamic equations. When input/ output electrical power to/ from the motor/ generator



and all losses for the pump/ hydro-turbine setup are known, pump/ hydro-turbine efficiency and flow rate can be easily determined using fluid constants such as specific gravity, isothermal coefficients, specific heat, etc.

Censeo employs the polytropic method for calculating the blower efficiency.

## 5.2 Benefits

The thermodynamic method works well for pumps, with heads as low as 10 metres, as well as hydro turbines. Not only is the achieved accuracy of measurement better than those obtained by conventional methods, it easily exceeds 99%.

Availability of accurate, real time numerical data can be read by a computer and used to plot performance graphs for a pump. Arriving at the most optimum point of operation thus becomes possible.

Because pump/ hydro-turbine graphs are available to the operator, it is possible to schedule the daily operation as well as pump/ hydro-turbine service and repair. Real time condition monitoring of the pump/ hydro-turbine helps in its correct operation and enhancing its life. Correct operation of the pump/ hydro-turbine leads to lesser maintenance and pump/ hydro-turbine down time.

Because of electronic measurements and digital data, it becomes easy to generate reports with a computer and communicate the same over various communication technologies and to interface with complex Control And Data Acquisition (CADA) systems.

## 5.3 What does Censeo Measure

Censeo accepts inputs from two temperature probes, two pressure transducers and a power meter to calculate pump/ hydro-turbine/ blower flow performance parameters and flow rate.

While temperature and pressure analogue inputs are fed through individual probes, the power meter input is always on RS485.

Censeo measurements are available in real time for effective monitoring and generating highly accurate pump/ hydro-turbine/ blower performance graphs. (Refer section Basic System Block Diagram for Pump Flow Measurement)

## 5.4 Input and output

In addition to temperature, pressure and power inputs, Censeo can also accept eight analogue software configurable inputs, either 4-20 mA or 1-5 V, which can be used towards various computational purposes.

The possible parameter assignments to these inputs, with their available units, are as follows:

S.No.	Description	Units	S. No.	Description	Units
1	Temperature	Celsius (°C)	4	Level	centimetre
		Fahrenheit (F)			Inch
		milli-Kelvin (mK)			metre
			5	Voltage	Volts
2	Pressure	Pascal (Pa)	6	Current	Amperes
		kiloPascal (kPa)			milliAmpere (mA)
		MegaPascal (MPa)	7	Power	Watt (W)
		bar			kiloWatt (kW)
		millibar	8	Frequency	Hertz (Hz)
		pounds per square inch (psi)	9	Vibration	Hertz (Hz)
		centimetre	10	Speed	rpm
		inch	11	Efficiency	percentage
		metre	12	Absolute humidity	Percentage

3	Volumetric flow rate	cubic metres per second (m <sup>3</sup> /sec)	13	Density	gram per cubic metre (g/m <sup>3</sup> )
		litre per second (l/sec)			kilogram per cubic metre (kg/m <sup>3</sup> )
		cubic metres per hour (m <sup>3</sup> /hr)	14	Other	NA
		gallons per day (gal/day)			
		million litres per day (MI/day)			

Table 1: Available software configurable parameters in Censeo for analogue inputs with units






The possible parameter assignments for Censeo outputs are as follows:

S. No.	Description	S. No.	Description
1.	Efficiency (Pump / Hydro-Turbine / Blower)	2.	Flow Rate
3.	Total Head	4.	Drive Power/ Generated Power
5.	Overall Efficiency	6.	Discharge Pressure/ Outlet Pressure
7.	Suction Pressure/ Inlet Pressure	8.	Velocity Head
9.	Suction Temperature/ Inlet Temperature	10.	Differential Temperature
11.	Voltage R-Phase	12.	Voltage Y-Phase
13.	Voltage B-Phase	14.	Current R-Phase
15.	Current Y-Phase	16.	Current B-Phase
17.	Frequency	18.	Average Power Factor
19.	Analogue Input 1	20.	Analogue Input 2
21.	Analogue Input 3	22.	Analogue Input 4
23.	Analogue Input 5	24.	Analogue Input 6
25.	Analogue Input 7	26.	Analogue Input 8

Table 2: Available software configurable parameters in Censeo for analogue outputs

## 5.5 Keys

The four keys available on Censeo are used for the following functions:

Key	Function	Description	Key press
	next	When pressed once, the display scrolls to the next one available in the sequence.	Short
	previous	When pressed once, the display scrolls to the previous one available in the sequence.	Short
	up	When pressed once, the display scrolls to the next display page available in the sequence.	Short
	down	When pressed once, the display scrolls to the previous display page available in the sequence.	Short
	Reset display	When these buttons are pressed simultaneously for 5 seconds, Censeo reset the display page to show first-page, first-display.	Long (5 sec)

	scroll lock	When these buttons are pressed simultaneously for 5 seconds, Censeo locks the current display shown and stops scrolling the display.	Long (5 sec)
	Meter Info	When these buttons are pressed simultaneously for 5 seconds, Censeo displays meter information.	Long (5 sec)

Table 3: Available key functions in Censeo

## 5.6 Display

Censeo supports a maximum of 4 display pages and page 1 can show a maximum of 10 displays; each page 2 and page 3 can show a maximum of 4 parameters; page 4 can show a maximum of 2 alarm information.

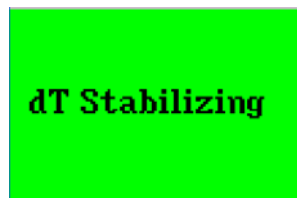
Displays for Censeo are software configurable through Pump Test 9. Each key press turns the backlight on for 10 seconds, and the display reverts to the first page if no key is pressed for 30 seconds.

Each page has a defined type of displays as under –

Page	Remarks
1	This page is set up for auto scroll by default. While only one parameter is displayed at a time, the maximum configurable auto-scroll time is 240 seconds. Up to 10 displays can be configured for this page, and auto scroll can be stopped at desired display as shown in the Table 3.
2, 3	These pages are not set up for auto scroll by default. Up to 4 parameters can be defined for pages 2 and 3.
4	This page is used only for alarm displays. Up to 8 alarms can be configured for parameters shown in Table 2 out of which only 2 can be shown.

Table 4: Available display pages in Censeo

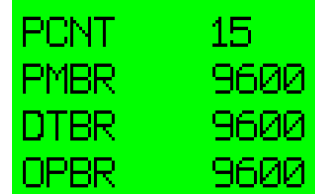
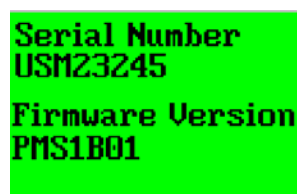
Upon every power up or pump/ hydro-turbine/ blower start, 'dT stabilizing' display is shown when the efficiency calculation method is Thermodynamic, Thermodynamic method in combination of any other method or polytropic, until dT gets stabilized. This display lasts for approximately 2 minutes if the Censeo and pump/ hydro-turbine/ blower are powered on.



If the efficiency calculation method is Lookup, Conventional or combination of Lookup and Conventional method, then display will show 'Stabilizing'.

### 5.6.1 Meter Information displays

Meter information displays last only for 5 seconds and can be activated as shown in Table 3. First page in meter information displays shows the serial number and firmware version; second page in meter information displays shows the power on-off count, baud rate of power meter communication port, baud rate of RS485 communication port and baud rate of the optical port.



### 5.6.2 Page 1 displays

Page 1 displays show the name, value and unit of a single parameter at a time as shown here for reference.

Total head	<b>Total Head</b> 85.35 m	Velocity head (for pump/ hydro-turbine)	<b>Velocity Head</b> 0.0254 m
Pump/ Hydro-Turbine efficiency (using Thermodynamic efficiency calculation method)	<b>Efficiency - T</b> 86.25 %	Blower efficiency (using Polytropic efficiency calculation method)	<b>Efficiency - P</b> 81.56 %
Flow rate (for pump/ hydro-turbine)	<b>Flow Rate</b> 54.66 l/s	Flow rate (for blower)	<b>Flow Rate</b> 2.65 m <sup>3</sup> /s
Suction pressure (for pump)	<b>Suction Pressure</b> 9.56 bar	Inlet pressure (for hydro-turbine/ blower)	<b>Inlet Pressure</b> 1.34 bar
Discharge pressure (for pump)	<b>Discharge Pressure</b> 16.56 bar	Outlet pressure (for hydro-turbine/ blower)	<b>Outlet Pressure</b> 59.33 bar
Suction temperature (for pump)	<b>Suction Temperature</b> 34.66 C	Inlet temperature (for hydro-turbine/ blower)	<b>Inlet Temperature</b> 15.20 C
Discharge temperature (for pump)	<b>Discharge Temperature</b> 35.52 C	Outlet temperature (for hydro-turbine/ blower)	<b>Outlet Temperature</b> 25.20 C
Differential temperature (for pump/ hydro-turbine)	<b>Differential Temperature</b> 62.52 mK	Differential temperature (for blower)	<b>Differential Temperature</b> 42.56 C

Drive power (for pump/ blower)	<b>Drive Power</b> 45.23 kW	Generated Power (for hydro-turbine)	<b>Generated Power</b> 356.54 kW
Shaft Power	<b>Shaft Power</b> 12.77 kW	Overall efficiency	<b>Overall Efficiency</b> 65.33 %
Voltage R-Phase	<b>Voltage - R</b> 239.45 Volts	Current R-Phase	<b>Current - R</b> 1.36 A
Voltage Y-Phase	<b>Voltage - Y</b> 238.36 Volts	Current Y-Phase	<b>Current - Y</b> 3.36 A
Voltage B-Phase	<b>Voltage - B</b> 238.36 Volts	Current B-Phase	<b>Current - B</b> 3.36 A
Frequency	<b>Frequency</b> 49.35 Hz	Average Power Factor	<b>Average Power Factor</b> 0.92
Motor Efficiency (for pump/ blower)	<b>Motor Efficiency</b> 63.55 %	Generator Efficiency (for hydro-turbine)	<b>Generator Efficiency</b> 63.55 %
Drive Efficiency (for blower)	<b>Drive Efficiency</b> 76.94 %	Mass Flow Rate (for blower)	<b>Mass Flow</b> 14.27 kg/s

Analogue inputs (Sample displays with units)			
Analogue input 1	Input 1 45.66 kW	Analogue input 2	Input 2 20.35 A
General Parameters			
Current Date	Current Date 20-09-2011	Current Time	Current Time 15:23:19
Hours Run	Hours Run 5.00 hrs	Key Performance Index	Key Performance Index 0.22 kWh/Ml

### 5.6.3 Page 2 display – pump/ hydro-turbine/ blower parameters

Page 2 is used to show the values of pump/ hydro-turbine/ blower parameters. Up to 4 parameters can be configured through software and these are shown as mentioned.

EF	78.88 %
QP	969.65 l/s
TH	145.32 m
DT	53.54 mK

The available pump parameters for Page 2 display are as follows:

Pump Parameter Name	Display
Efficiency	EF
Flow Rate	QP
Total Head	TH
Overall Efficiency	OE
Discharge Pressure	PD
Suction Pressure	PS
Velocity Head	VH
Suction Temperature	TW
Differential Temperature	DT
Discharge Temperature	DW

Table 5: Available Pump Parameters for Page 2 display in Censeo

The available hydro-turbine parameters for Page 2 display are as follows:

Hydro-Turbine Parameter Name	Display
Efficiency	EF
Flow Rate	QP

Total Head	TH
Overall Efficiency	OE
Inlet Pressure	PI
Outlet Pressure	PO
Velocity Head	VH
Inlet Temperature	TI
Differential Temperature	DT
Outlet Temperature	TO

Table 6: Available Hydro-Turbine Parameters for Page 2 display in Censeo

The available blower parameters for Page 2 display are as follows:

Blower Parameter Name	Display
Polytropic Efficiency	EF
Volumetric Flow Rate	QP
Mass Flow Rate	QM
Overall Efficiency	OE
Inlet Pressure	PI
Outlet Pressure	PO
Inlet Temperature	TI
Differential Temperature	DT
Total Head	TH

Table 7: Available Blower Parameters for Page 2 display in Censeo

#### 5.6.4 Page 3 display – motor/ generator parameters

Page 3 is used to show the values of motor/ generator parameters. Up to 4 parameters can be configured through software and these are shown as mentioned.

PWR	478.23 KW
VR	239.44 Volts
VY	239.50 Volts
IB	23.56 A

The available parameters for Page 3 display are as follows:

Parameter Name	Display
Voltage R phase	VR
Voltage Y phase	VY
Voltage B phase	VB
Current R phase	IR
Current Y phase	IY
Current B phase	IB
Drive Power/ Generated Power	PWR
Average Power Factor	PF

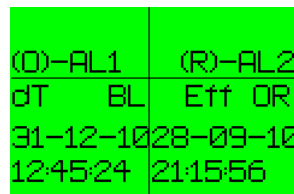


Frequency	FQ
Motor Efficiency (for pump/ blower)	EFm
Generator Efficiency (for hydro-turbine)	EFg
Shaft Power	SP
Drive Efficiency (for blower)	Efd

Table 8: Available Parameters for Page 3 display in Censeo

### 5.6.5 Page 4 displays – alarm parameters

Page 4 is used to show alarm parameters. Up to 2 alarms can be configured through software for display and in case the defined parameter limits are crossed, these are shown as mentioned. Otherwise the display remains blank.



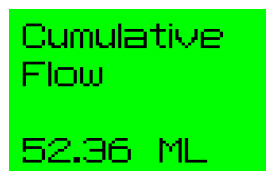
Besides date and time, this display is interpreted as follows:

O, R	Occurrence & restoration with date and time
AL1, AL2	Alarm 1, Alarm 2
dT, Eff	Parameters for which alarms are configured
BL	Below limit
AL	Above limit
OR	Out of range
IR	In range

Table 9: Index for Alarm page in Censeo

## 5.7 Cumulative Flow

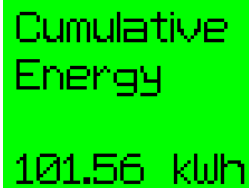
Cumulative flow for pump/ hydro-turbine/ blower is calculated by the connected Censeo which can be read and displayed (in ML) on page 1 display as shown below.



In case of any exceptional conditions such as communication failure with the power meter, sensors disconnected, Censeo will not be able to calculate the Cumulative Flow and hence will display the last correct value as calculated by Censeo. The time stamps are not logged for the duration in which Censeo is unable to calculate cumulative flow.

## 5.8 Cumulative Energy

Censeo reads the cumulative energy for pump/ hydro-turbine/ blower from the power meter connected over Modbus, which can be read and displayed (in kWh) on page 1 display as shown below. The refresh rate of cumulative energy value is 1 minute.



Cumulative  
Energy  
101.56 kWh

Cumulative energy will be displayed as 'NOT AVAILABLE' either on communication failure with the power meter or if power meter setting is set to 'Fixed' or 'Analogue'.

## 5.9 Communication

Censeo communicates through three channels – one is used for communicating with power meter while the remaining two are used to communicate with a PC. Of these two channels, one is used for configuring Censeo on PACT while the other is used to transfer real time pump/ hydro-turbine/ blower performance data on RS485 to the software on the computer.

Censeo communicates with the power meter on RS485 through wired connection. Communication with a power meter including the baud rate can be configured through Pump Test 9.

## 5.10 Alarms and Events

Up to eight alarms can be configured for parameters available in Table 2. For each alarm, a maximum of 20 events can be logged compartment-wise in a rollover mode – that makes a total of 160 events. Note that display and relay indication for alarms would only be configurable through respective display and relay sections in the software.

**Note:** The alarm persistence time for pump/ hydro-turbine/ blower parameters like differential temperature, flow rate, suction/ inlet temperature, efficiency etc. may vary from persistence time configured by Pump Test9 based on 'filter value' (i.e. averaging period) and the 'parameter value's difference with the defined limit at the time of event', this is in view of slow varying nature of thermal parameters like temperature in pump/ hydro-turbine/ blower and to avoid false alarms.

## 5.11 Relays

Censeo can drive two latching relays towards control applications. Relays can be used to either indicate occurrence of an alarm or to schedule the operation of a pump/ hydro-turbine/ blower.

## 5.12 Data Storage

Up to 600 parameter days of data with 15 minute DIP can be stored in Censeo memory. The parameters logged will be configurable, and a maximum of 15 parameters can be selected.

## 5.13 Time Management

Censeo maintains time with a resolution of one second. Time and date in Censeo can be configured through Pump Test 9.

## 5.14 Security

Information from, and transactions with, Censeo are secured with the help of keys.

Pump Test 9 needs to know information related to keys in order to communicate with Censeo. The customer specific add-on keys (if provided along with the product key) must be added into Pump Test 9 software. (refer to Pump Test 9 help for details)

## 5.15 Transactions

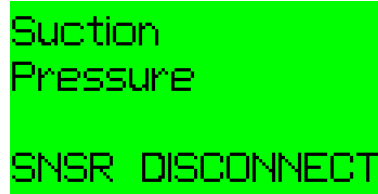
Besides collecting and sending out pump/ hydro-turbine/ blower performance data, Censeo also supports transactions such as time set, configuration download, reset transactions, clearing away historical data sets, reconfiguration of calibration constants, display configuration, etc.

Censeo maintains a record of last 100 transactions with time stamp in a rollover manner.

## 6 Frequently Asked Questions (FAQs)

**Q.** What indicates that a sensor is disconnected?

**Ans.** If a sensor is disconnected then the parameter value will be shown as “SENSOR DISCONNECT” on the display as shown below.



Suction  
Pressure  
  
SNSR DISCONNECT

**Q.** The value of Pump Efficiency, Flow Rate and Total Head is displayed as zero.

**Ans.** View the **Online Data** screen of Pump Test 9 and verify the following:

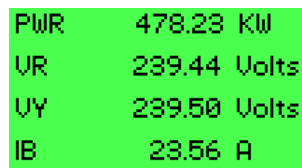
- Ensure that sensors are not disconnected.
- Ensure that the power meter is communicating with Censeo.

**Q.** What indicates that the communication cable between power meter and Censeo is disconnected?

**Ans.** If the communication cable between power meter and Censeo is disconnected, the values of motor/ generator parameters on Page 3 will be displayed as zero.

**Q.** How to verify that the power meter is ON and is responding?

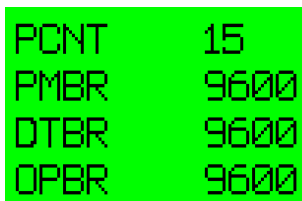
**Ans.** If the power meter is ON and is responding, the values of motor/ generator parameters displayed on Page 3 will be non-zero as shown below.



PWR	478.23 KW
UR	239.44 Volts
UY	239.50 Volts
IB	23.56 A

**Q.** How to verify the baud rates of the communication channels?

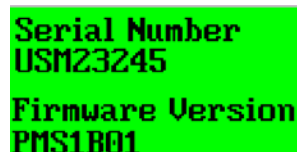
**Ans.** To verify the baud rates of the communication channels, press Up (▲) and Down (▼) buttons simultaneously for 5 seconds, Censeo displays meter information. The baud rate of power meter communication port, baud rate of RS485 communication port and baud rate of the optical port are shown on the second page of meter information displays.



PCNT	15
PMBR	9600
DTBR	9600
OPBR	9600

**Q.** How to verify the firmware version?

**Ans.** To verify the firmware version, press the Up (▲) and Down (▼) buttons simultaneously for 5 seconds. The firmware version is shown on the first page of meter information displays.



Serial Number  
USM23245  
  
Firmware Version  
PMS1B01

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