172-65598MA-04 (C1CM(-EX)/C1CF(-EX) /C1SM(-EX)/C1SF(-EX)) 7 April 2021

Instruction Manual

Cycle Counter

C1CM / C1CF
C1SM / C1SF
(Standard Model)

C1CM-EX / C1CF-EX
C1SM-EX / C1SF-EX
(cULus Intrinsically Safe Model)

NOTE: This instruction manual has been edited for use with both standard and intrinsically safe models.

Contents

Introduction

Thank you for purchasing the TLV cycle counter.

This product has been thoroughly inspected before being shipped from the factory. When the product is delivered, before doing anything else, check the specifications and external appearance to make sure nothing is out of the ordinary. Also be sure to read this manual carefully before use and follow the instructions to be sure of using the product properly.

For products with special order specifications or options, if detailed instructions for the special order specifications or options are not contained in this manual, please contact TLV for full details.

This instruction manual is intended for use with the model(s) listed on the front cover. It is necessary not only for installation but for subsequent maintenance, disassembly/reassembly and troubleshooting. Please keep it in a safe place for future reference.

Safety Considerations

- Read this section carefully before use and be sure to follow the instructions.
- Installation, inspection, maintenance, repairs, disassembly, adjustment and valve opening/closing should be carried out only by trained maintenance personnel.
- The precautions listed in this manual are designed to ensure safety and prevent equipment damage and personal injury. For situations that may occur as a result of erroneous handling, three different types of cautionary items are used to indicate the degree of urgency and the scale of potential damage and danger: DANGER, WARNING and CAUTION.
- The three types of cautionary items above are very important for safety: be sure to observe all of them as they relate to installation, use, maintenance, and repair. Furthermore, TLV accepts no responsibility for any accidents or damage occurring as a result of failure to observe these precautions.

Symbols

	Indicates a DANGER, WARNING or CAUTION item.
DANGER	Indicates an urgent situation which poses a threat of death or serious injury
WARNING	Indicates that there is a potential threat of death or serious injury
CAUTION	Indicates that there is a possibility of injury or equipment/product damage

WARNING	**C1CM, C1SM, C1CF, and C1SF have not been evaluated by UL LLC.** Use only the intrinsically safe C1CM-EX, C1SM-EX, C1CF-EX, and C1SF-EX in hazardous areas. Product markings are provided on the nameplate attached on the product. The C1CM-EX, C1SM-EX, C1CF-EX, and C1SF-EX meet the following standards for intrinsic safety: C1CM-EX, C1CF-EX **Class I, Zone1, AEx ib IIB T3/T2** **Class I, Zone1, Ex ib IIB T3/T2** C1SM-EX, C1SF-EX **Class I, Zone1, AEx ib IIC T3/T2** **Class I, Zone1, Ex ib IIC T3/T2** For hazardous areas, the product should be selected and installed by trained personnel with knowledge of the hazardous locations/classifications. When using the product in hazardous area, please connect it to the earth in order to avoid the ignition from electrostatic charge. Models GP10, GP10L, GP10M, GP14, GP14L, GP14M, GP10F and GP21F and usage of the Cycle Counters with these PowerTrap models have not been evaluated by UL LLC.

Continued on the next page

⚠CAUTION	**Install properly and DO NOT use this product outside the recommended operating pressure, temperature and other specification ranges.** Improper use may result in such hazards as damage to the product or malfunctions that may lead to serious accidents. Local regulations may restrict the use of this product to below the conditions quoted.
	Make sure that the sensor body is properly tightened. Insufficient tightening may allow steam to blow out, resulting in burns.
	When disassembling or removing the product, wait until the internal pressure of the PowerTrap equals atmospheric pressure and the surface of the PowerTrap has cooled to room temperature. Disassembling or removing the product when it is hot or under pressure may lead to discharge of fluids, causing burns, other injuries or damage.
	NEVER attempt to modify the product in any way. Failure to observe these precautions may result in damage to the product and burns or other injury due to malfunction or the discharge or fluids.
	Use only under conditions in which no water hammer will occur. The impact of water hammer may damage the product, leading to fluid discharge, which may cause burns or other injury.
	When installing the product, use the appropriate tool such as an adjustable wrench. Using the improper tool may lead to injury or damage to the product.
	DO NOT disassemble/modify the product. This could damage the product and/or the built-in battery, or cause leakage of battery fluid, leading to burns or other injury. Battery cells are not user replaceable.

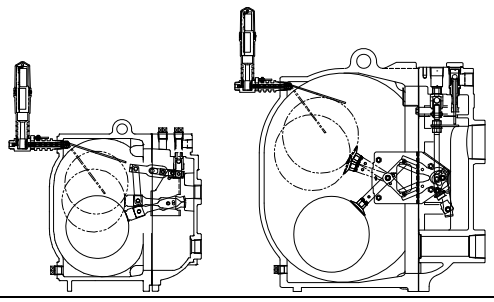
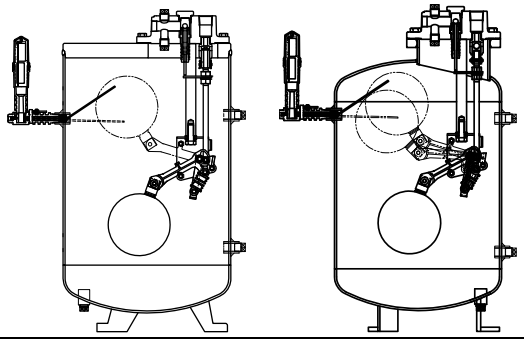
Operation

Cycle counter is a counter designed for use with GP series TLV PowerTraps. Cycle counter registers each cycling of the PowerTrap by using its sensor arm to detect the vertical movement of the PowerTrap's internal float. When the contact points of the reed switch inside the counter body (or the switch unit) connect, each cycling of the PowerTrap is counted.
There are two different types of cycle counter available.

Counter Unit Type (with a built-in LCD display) (C1CM/C1CM-EX, C1CF/C1CF-EX)

This type includes a built-in LCD display to display the number of pump cycles of the PowerTrap. Install the cycle counter using the installation hole on the PowerTrap.

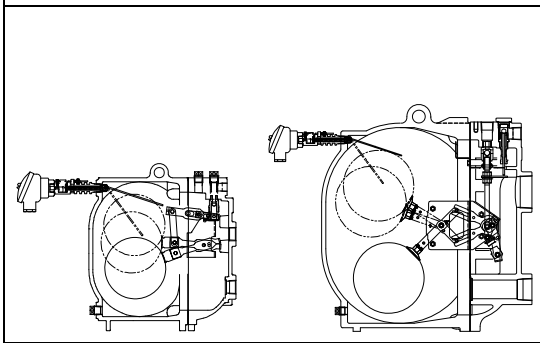
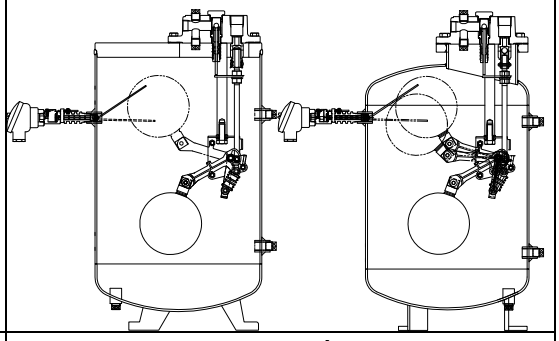
- Installation location

C1CM/C1CM-EX	C1CF/C1CF-EX
	
GP10, GP10L, GP10M GP14, GP14L, GP14M	GP10F***** GP21F*****

Terminal Box Type (no display) (C1SM/C1SM-EX, C1SF/C1SF-EX)

There is no display on this type. Use the product with a separately prepared self-powered counter, etc.

- Installation location

C1SM/C1SM-EX	C1SF/C1SF-EX
	
GP10, GP10L, GP10M GP14, GP14L, GP14M	GP10F***** GP21F*****

NOTE	Cycle counter protrudes from the PowerTrap body when installed on the PowerTrap. Make sure to maintain sufficient installation space as described in the instruction manual for the PowerTrap. Do not put extra force onto the cycle counter when lifting the PowerTrap up (for disassembly or maintenance, etc.).

*****Only available in some countries.

Specifications

CAUTION

Install properly and DO NOT use this product outside the recommended operating pressure, temperature and other specification ranges. Improper use may result in such hazards as damage to the product or malfunctions which may lead to serious accidents. Local regulations may restrict the use of this product to below the conditions quoted.

C1C Series

Model	Counter Unit Type*4			
	Standard Model		Intrinsically Safe Model	
	C1CM	C1CF	C1CM-EX	C1CF-EX
Installable PowerTrap Models	GP10, GP14, GP10L, GP14L, GP10M, GP14M	GP10F GP21F	GP10, GP14, GP10L, GP14L, GP10M, GP14M	GP10F GP21F
Connection	Screwed R(PT) or NPT			
Size	15 mm ($^1/_2$ in)			
Maximum Operating Pressure (PMO)*1/ Maximum Operating Temp. (TMO)*1	2.1 MPaG / 220 °C (300 psig / 428 °F)			
Maximum Allowable Pressure (PMA)*2/ Maximum Allowable Temp. (TMA)*2	2.1 MPaG/ 260 °C (300 psig / 500 °F)			
Applicable Fluids*3	Steam Condensate, Water, Steam, Air, Nitrogen			
Protection Class	IP 65			
Ambient Pressure / Temperature	Atmospheric / -10 to 55 °C (14 to 131 °F)			
Process Temperature	—		T3: 185 °C (365 °F) T2: 220 °C (428 °F)	
Intrinsically Safe: Certified to meet all of these standards	—		UL CERTIFIED SAFETY US·CA E360402 Class I, Zone1, AEx ib IIB T3/T2 Class I, Zone1, Ex ib IIB T3/T2	
Display	8-digit display LCD (can be reset*5)			
Power Supply	Special built-in lithium battery (3.6 V) Battery life: Approx. 10 years (Battery not replaceable*4)			
Weight	Approx. 660 g (1.45 lbs)			
Accessories	Counter Resetter			

*1 Maximum Operating Pressure (PMO) and Maximum Operating Temperature (TMO) are operating conditions for the inserted portion only.

*2 Maximum allowable pressure (PMA) and maximum allowable temperature (TMA) are DESIGN CONDITIONS FOR THE INSERTED PORTION, **NOT** OPERATING CONDITIONS.

*3 Do not use with toxic, flammable or otherwise hazardous fluids.

*4 Repair parts are not supplied. Once the battery is depleted the entire unit must be replaced as the battery for the counter unit cannot be taken out or replaced. In addition, as a used counter unit still contains its built-in battery, please return the unit to TLV or follow local regulations for disposal.

*5 Once the counter is reset, the previous value is lost and cannot be recovered.

GP10, GP10L, GP10M, GP14, GP14L and GP14M cannot be equipped with a cycle counter and a liquid level gauge simultaneously but GP10F and GP21F can. GP10F and GP21F are only available in some countries.

C1S Series

Model	Terminal Box Type*4			
	Standard Model		Intrinsically Safe Model	
	C1SM	C1SF	C1SM-EX	C1SF-EX
Installable PowerTrap Models	GP10, GP14, GP10L, GP14L, GP10M, GP14M	GP10F GP21F	GP10, GP14, GP10L, GP14L, GP10M, GP14M	GP10F GP21F
Connection	Screwed R(PT) or NPT			
Size	15 mm (1/2 in)			
Maximum Operating Pressure (PMO)*1/ Maximum Operating Temp. (TMO)*1	2.1 MPaG / 220 °C (300 psig / 428 °F)			
Maximum Allowable Pressure (PMA)*2/ Maximum Allowable Temp. (TMA)*2	2.1 MPaG/ 260 °C (300 psig / 500 °F)			
Applicable Fluids*3	Steam Condensate, Water, Steam, Air, Nitrogen			
Protection Class	IP 65*5			
Ambient Pressure / Temperature	Atmospheric/ -45 to 90 °C (-49 to 194 °F)		Atmospheric/ -20 to 80 °C (-4 to 176 °F)	
Process Temperature	—		T3: 185 °C (365 °F) T2: 220 °C (428 °F)	
Intrinsically Safe: Certified to meet all of these standards	—		UL CERTIFIED SAFETY US·CA E360402 Class I, Zone1, AEx ib IIC T3/T2 Class I, Zone1, Ex ib IIC T3/T2	
Display	—			
Power Supply	Max. incoming voltage (Ui): 28V Max. incoming current (Ii): 120 mA Max. input power (Pi): 1W Max. internal capacitance (Ci): 3nF Max. internal inductance (Li): 0			
Weight	Approx. 700 g (1.54 lbs)			
Accessories	—			

*1 Maximum Operating Pressure (PMO) and Maximum Operating Temperature (TMO) are operating conditions for the inserted portion only.

*2 Maximum allowable pressure (PMA) and maximum allowable temperature (TMA) are DESIGN CONDITIONS FOR THE INSERTED PORTION, **NOT** OPERATING CONDITIONS.

*3 Do not use with toxic, flammable or otherwise hazardous fluids.

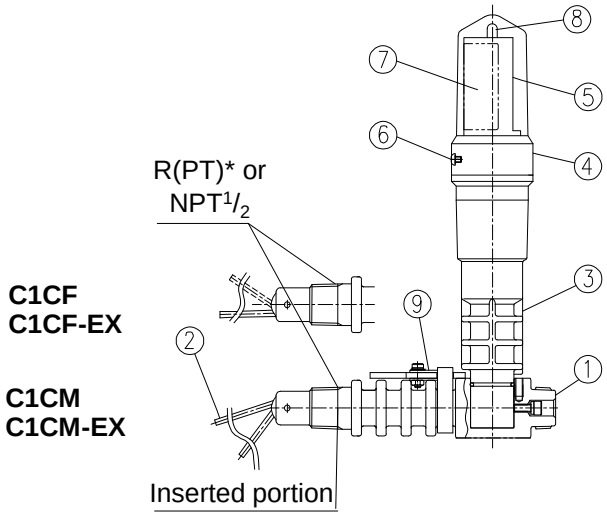
*4 Repair parts are not supplied.

*5 Waterproofing of the wiring inlet should be carried out by the user using a waterproof cable gland, etc.

GP10, GP10L, GP10M, GP14, GP14L and GP14M cannot be equipped with a cycle counter and a liquid level gauge simultaneously but GP10F and GP21F can. GP10F and GP21F are only available in some countries.

Configuration

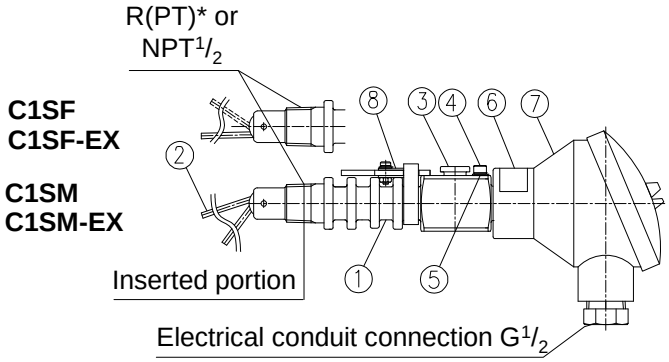
Counter Unit Type: C1CM/C1CM-EX, C1CF/C1CF-EX



No.	Name
1	Sensor Body
2	Sensor Arm
3	Counter Body
4	Cap
5	Display (LCD)
6	Hex Socket Head Bolt
7	Nameplate
8	LED
9	Magnet Booster Kit

Cycle Counter cannot be installed on GP series PowerTraps insulated with an insulation thickness exceeding 40 mm (1½ in).

Terminal Box Type: C1SM/C1SM-EX, C1SF/C1SF-EX



No.	Name
1	Sensor Body
2	Sensor Arm
3	Switch Unit
4	Hex Socket Head Bolt
5	Washer
6	Nameplate
7	Terminal Box
8	Magnet Booster Kit

Cycle Counter cannot be installed on GP series PowerTraps insulated with an insulation thickness exceeding 40 mm (1½ in).

*R(PT) is equivalent to BSPT

Installation

⚠WARNING **C1CM, C1SM, C1CF, and C1SF have not been evaluated by UL LLC. Use only the intrinsically safe C1CM-EX, C1SM-EX, C1CF-EX and C1SF-EX in hazardous areas. For hazardous areas, the product should be selected and installed by trained personnel with knowledge of the hazardous locations/classifications.**

⚠CAUTION **Install properly and DO NOT use this product outside the recommended operating pressure, temperature and other specification ranges. Improper use may result in such hazards as damage to the product or malfunctions which may lead to serious accidents. Local regulations may restrict the use of this product to below the conditions quoted.**

⚠CAUTION **Use only under conditions in which no water hammer will occur. The impact of water hammer may damage the product, leading to fluid discharge, which may cause burns or other injury.**

⚠CAUTION **NEVER attempt to modify the product in any way. Failure to observe these precautions may result in damage to the product and burns or other injury due to malfunction or the discharge or fluids.**

⚠CAUTION **Make sure that the sensor body is properly tightened. Insufficient tightening may allow steam to blow out, resulting in burns.**

⚠CAUTION **When disassembling or removing the product, wait until the internal pressure of the PowerTrap equals atmospheric pressure and the surface of the PowerTrap has cooled to room temperature. Disassembling or removing the product when it is hot or under pressure may lead to discharge of fluids, causing burns, other injuries or damage.**

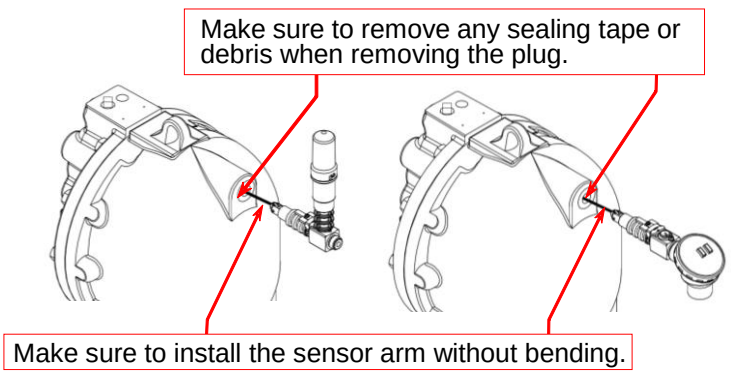
Installation, inspection, maintenance, repairs, disassembly, adjustment and valve opening/closing should be carried out only by trained maintenance personnel.

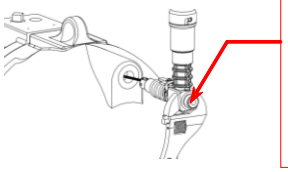
An explanation for installing cycle counter onto the GP14M PowerTrap is given as an example. The same procedure should be followed for other models.

1. Remove the plug from the PowerTrap in reference with the installation position in the “Operation” section. Screw the cycle counter into the place where the plug has been removed on the PowerTrap by turning it clockwise 4 to 5 times.

NOTE	- Wrap the threaded portion of the sensor body with sealing tape for screwing into the PowerTrap. Ensure not to wrap the tape around any part of the sensor body other than the threaded portion. The cycle counter may not operate properly if tape is wrapped around a moving part such as the sensor arm. - Do not use sealant. If sealant adheres to the moving part of the sensor arm it may interfere with the arm’s movement.

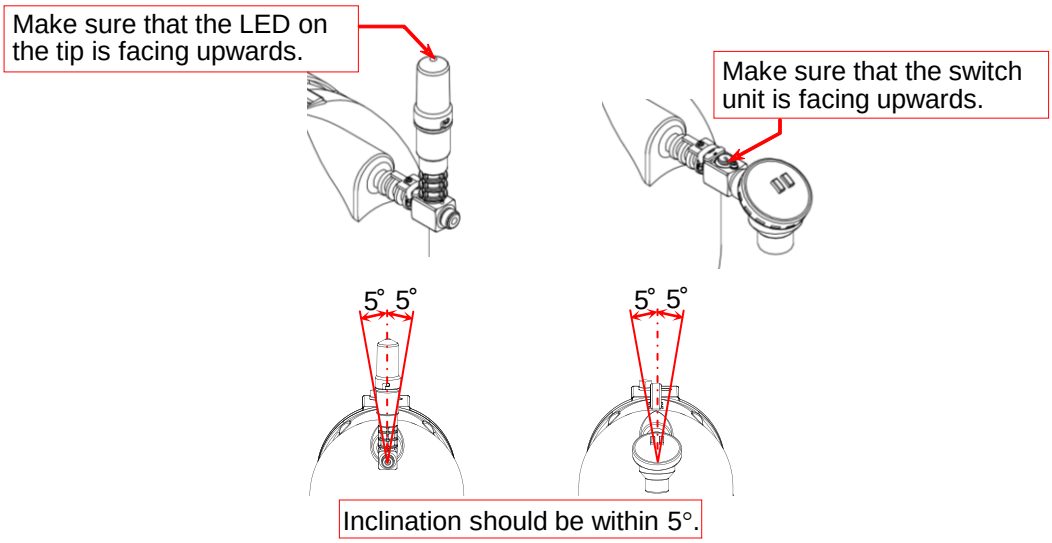
NOTE	Sometimes the display on the counter unit type does not show “0” when delivered. The number can be reset after installation. Reset as needed. (Refer to the “Resetting the counter on the LCD display of the counter unit type” section described later in this manual.)



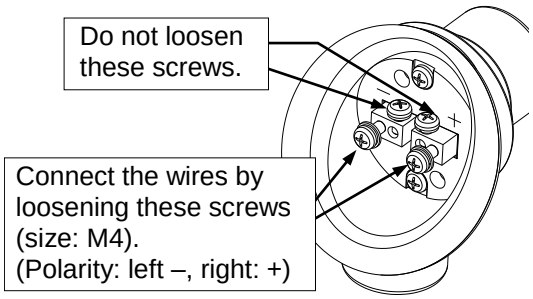


For both the counter unit and terminal box types, use a tool such as an adjustable wrench to grip the square portion of the sensor body (distance across flats: 30 mm ($1^{3}/_{16}$ in)) and screw the product in.
Applying a force to any part of the product other than the square portion may deform or damage the product.

2. The following figure shows the product once installation is complete. Make sure to screw in the product with the body centered and facing upwards.



3. Before use, the wiring needs to be carried out for the terminal box type. Follow the figure shown below for the location of the wiring connections.



For the terminal box type, wiring is necessary to the terminal box. Before wiring, refer to the “Specifications” section to make sure that the supply power voltage meets these specifications. Make sure that the wires are securely connected to the terminal box using the ring or the spade terminals.
Waterproofing of the wiring inlet should be carried out using a waterproof cable gland, etc.

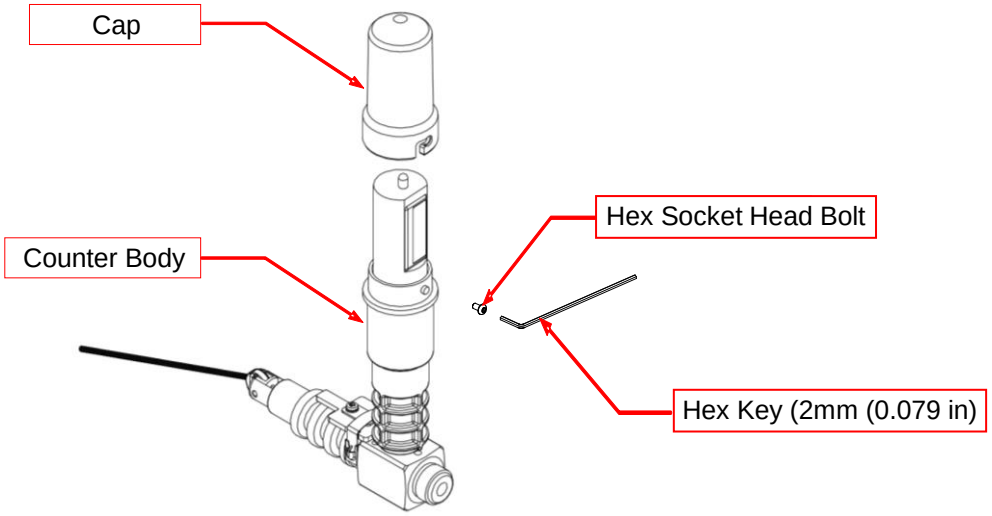
4. Make sure that the product is properly tightened before proceeding with the test operation.
For performing a test operation after the product has been installed, follow the procedure in the PowerTrap instruction manual.
Check motive medium supply piping and other piping connections before operation.
Operation should be carried out by trained personnel.
If the display needs to be reset on the counter unit after the test operation, refer to the “Resetting the counter on the LCD display of the counter unit” section described later in this manual.

Adjusting the angle of the LCD display on the counter unit

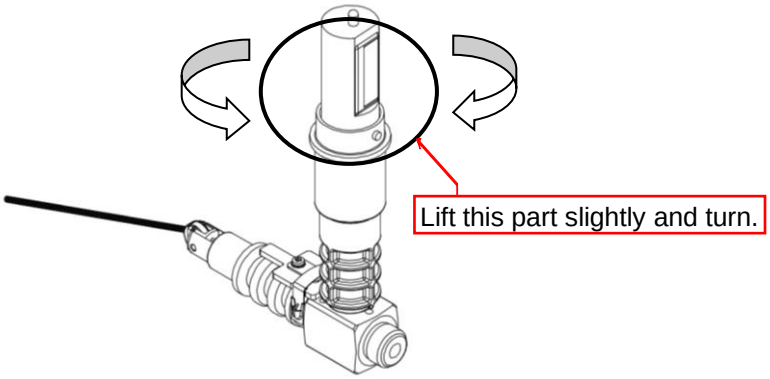
The angle of the LCD display on the counter unit can be changed.

NOTE	In order to prevent burns, make sure the product is removed from the PowerTrap before starting to work.

1. Remove the hex socket head bolt on the counter body.
   Turn the cap counterclockwise, then pull up to remove it from the counter body.



2. Once the cap is removed, turn the silicon-molded LCD display so that the LCD display is readable. After the adjustment is made, put the transparent cap back on and retighten the hex socket head bolt (tightening torque: 0.5 N·m (0.4 lbf·ft)).



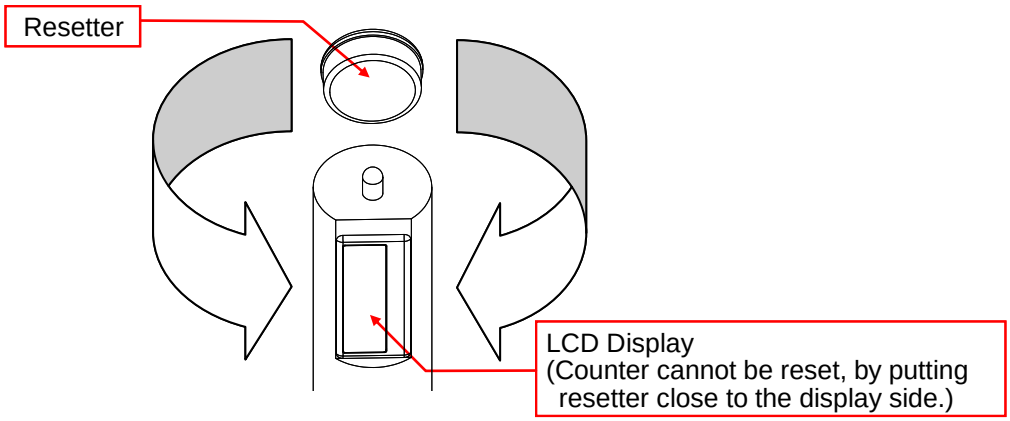
NOTE	Do not turn the LCD display part more than 360° to the left or right. Turning the display more than one rotation in either direction could cause disconnection of internal wiring or other malfunctions.

Resetting the counter on the LCD display of the counter unit

The numeric value displayed on the LCD of the counter unit can be reset.

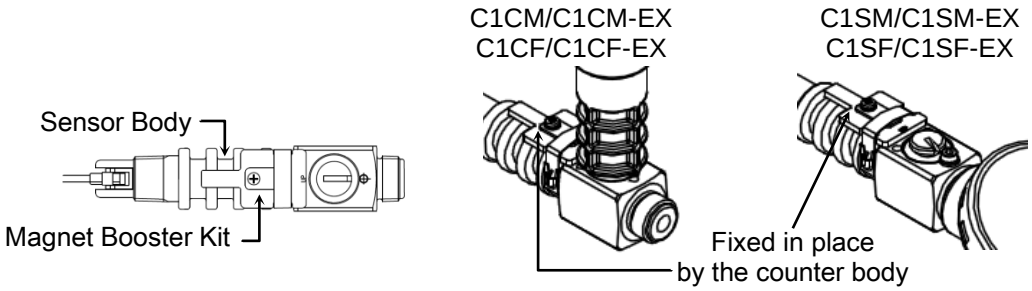
NOTE	Once the counter is reset, the previous value is lost and cannot be recovered. In addition, failures of the PowerTrap caused by resetting the counter will not be covered under warranty.

Put the counter resetter close to the back of the LCD display as shown below. (The cap is removed in the figure below. The counter can be reset without removing the cap.) After the display clears momentarily, “0” will be displayed. Do not put the counter resetter close to the cycle counter other than for the purpose of resetting the counter display. Once the counter is reset to zero, it cannot be returned to displaying the previous numeric value.



Magnetic booster kit

If the cycle counter has been used in a high-temperature environment for a long period of time, the magnetic force of the reed switch becomes weaker, resulting in operational failure (the counter does not count).
For this reason, the magnet booster kit is installed on the upper part of the sensor body to prevent operational failure.
This booster kit has a built-in magnet to restore the magnetic force of the reed switch, preventing operational failure.
Contact TLV in the event if the magnet booster kit falls from the cycle counter.



Troubleshooting

⚠CAUTION **When disassembling or removing the product, wait until the internal pressure of the PowerTrap equals atmospheric pressure and the surface of the PowerTrap has cooled to room temperature. Disassembling or removing the product when it is hot or under pressure may lead to discharge of fluids, causing burns, other injuries or damage.**

When the product fails to operate properly, use the following table to locate the cause and remedy.

	Problem	Cause	Remedy
Counter Unit Type	Nothing is displayed on the LCD display	Battery has been completely discharged	Replace with a new counter unit (The battery itself cannot be replaced)
	Cycle counter is not operating even though the PowerTrap is in operation (you can hear the snap action unit operating sound)	Sensitivity of the sensor is reduced	Adjust the sensitivity (See the “Adjusting the sensitivity for the counter unit type” section)
		Dirt or foreign matter has clogged the hinge part of the sensor arm, hindering its movement	Clean the moving area
Terminal Box Type	Cycle counter is not operating even though the PowerTrap is in operation (you can hear the snap action unit operating sound)	Sensitivity of the sensor is reduced	Adjust the sensitivity (See the “Adjusting the sensitivity for the terminal box type” section)
		Dirt or foreign matter has clogged the hinge part of the sensor arm, hindering its movement	Clean the moving area
		Improper wiring	Readjust the wiring

If problems do not improve even after applying the remedies listed in “Troubleshooting”, contact TLV.

Sensitivity adjustment for the counter unit type

When operating sounds can be heard from the PowerTrap however the cycle counter does not count or other symptoms appear, it is possible that the sensitivity of the sensor (the sensing accuracy of the reed switch) may have lowered due to aging of the product.

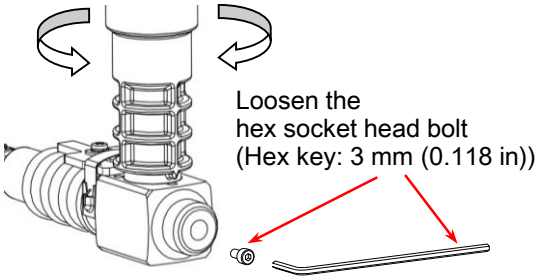
In such cases, the sensitivity of the sensor can be restored by readjusting the distance between the magnet built in to the sensor body and the built-in reed switch in the counter body (or the switch unit for the terminal box type).

In this section, this is called sensitivity adjustment.

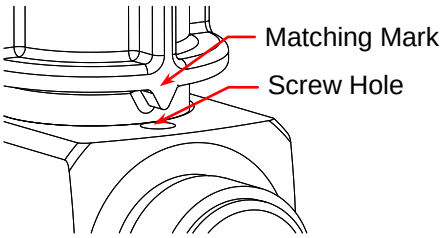
Make sure that the product is removed from the PowerTrap before you make sensitivity adjustments. Take precautions against burns, etc. when removing the unit.

1. Loosen the hex socket head bolt holding the counter body in place.
2. Then rotate the counter body as shown in the following figure on the next page while moving the sensor arm up and down. The counter body may be turned in either direction. Check the sensitivity by turning both ways (to the left and right). However do not turn more than 15° to the left or right.
3. Once the LED lights up in time with the movement of the sensor arm and has begun to count properly, the counter is considered to be operating normally.
4. Secure the counter by re-tightening the hex socket head bolt (tightening torque: 1.5 N·m (1.1 lbf·ft)).

Loosen the hex socket head bolt and turn the counter body slightly to make sure that the counter is functioning properly.



Adjust the counter body by twisting within 15° to the left or right. The angle should be adjusted based on the matching mark on the body.



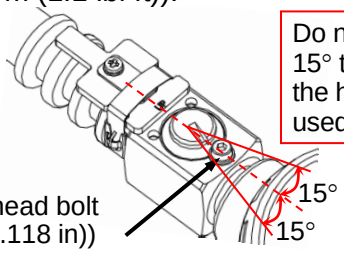
NOTE	DO NOT turn the body more than 15° to the left or right when adjusting the sensitivity.

NOTE	When removing/installing the hex socket head bolt, coat threaded portion with sealing agent to maintain waterproofing.

Sensitivity adjustment for the terminal box type

Make sure that the product is removed from the PowerTrap before you make sensitivity adjustments. Take precautions against burns, etc. when removing the unit. To adjust the sensitivity, you can use a circuit tester, or else rewiring will be necessary after removing the unit from the PowerTrap. In this section, we will describe the adjustment method using a circuit tester.
First, set the range of the circuit tester so that the resistance measurement can be carried out, then connect the leads to the plus and minus terminals on the terminal box (refer to the “Installation” section). Then move the sensor arm up and down and turn the switch unit little by little. The switch unit may be turned in either direction, however do not turn more than 15° to the left or right. When the resistance value of the circuit tester changes in time with the movement of the sensor arm, the unit is considered to be operating normally. After the adjustment is made, retighten the hex socket head bolt (tightening torque: 1.5 N·m (1.1 lbf·ft)).

Loosen the hex socket head bolt and turn the switch unit slightly with a coin, etc. to make sure that the counter is functioning properly.



Do not turn the switch unit more than 15° to the left or right. The position of the hex socket head bolt should be used to determine the angle.

NOTE	DO NOT turn the body more than 15° to the left or right when adjusting the sensitivity.

Product Warranty

1. Warranty Period
   One year following product delivery.

2. Warranty Coverage
   TLV CO., LTD. warrants this product to the original purchaser to be free from defective materials and workmanship. Under this warranty, the product will be repaired or replaced at our option, without charge for parts or labor.

3. This product warranty will not apply to cosmetic defects, nor to any product whose exterior has been damaged or defaced; nor does it apply in the following cases:

   1) Malfunctions due to improper installation, use, handling, etc., by other than TLV CO., LTD. authorized service representatives.

   2) Malfunctions due to dirt, scale, rust, etc.

   3) Malfunctions due to improper disassembly and reassembly, or inadequate inspection and maintenance by other than TLV CO., LTD. authorized service representatives.

   4) Malfunctions due to disasters or forces of nature.

   5) Accidents or malfunctions due to any other cause beyond the control of TLV CO., LTD.

4. Under no circumstances will TLV CO., LTD. be liable for consequential economic loss damage or consequential damage to property.

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For Service or Technical Assistance:

Contact your TLV representative or your regional TLV office.

Manufacturer

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