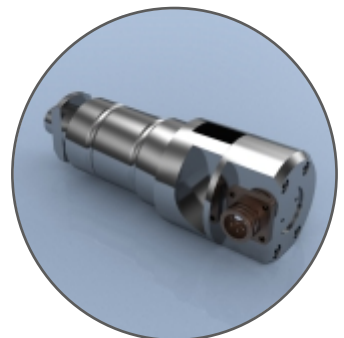
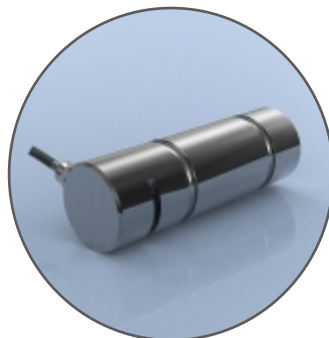




Operator Instructions for Load Measuring Pins

Types: LMP, LPB, LPC & LPM



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OPERATING INSTRUCTIONS

1.1 Introduction

This instruction manual refers to the LCM Systems range of load pins and includes instructions for both cabled and telemetry options. Before installing or operating any LCM Systems load pin, this and any reference documents should be read and understood.

In compliance with the Machinery Directive, LCM Systems load pins will be supplied with the following documents: Instruction Manual, Calibration Certificate and a Declaration of Conformity.

These load measuring devices were designed and manufactured to be installed as partly completed machinery into a machine or partly completed machine.

These instructions must be retained and incorporated in the technical documentation for the machine or partly completed machinery into which the load pin is installed.

All LCM Systems load pins are designed and manufactured to LCM Systems Quality Management System which is written in accordance with ISO 9001:2008

LCM Systems load pins affixed with the **CE** mark, are manufactured in compliance with the Machinery Directive 2006/42/EC and the following harmonised standards:

- BS EN ISO 13849-1:2015 Safety of machinery - Safety-related parts of control systems
Part 1: General principles for design
- BS EN ISO 13849-2:2015 Safety of machinery - Safety-related parts of control systems
Part 2: Validation

1.2 Markings CE

Each load pin will be marked with an individual serial number, CE label and the SWL (safe working load) of the load pin. The load pin will also be marked with an arrow depicting the direction of load acting on the center of the pin.

1.3 Electromagnetic Compatibility (EMC)

The electromagnetic compatibility of the load cell device can only be assessed in conjunction with the entire installation, including its control systems. The machine builder who installs this partly completed machinery into a machine is responsible for compliance with the EMC directive.

1.4 Load Pin Type/Model Number

Load Pin: LMP, LPB, LPC, LPM and LCMXXXX (custom design)

All LCM Systems load pin designs are allocated a unique LCM number/model number. LCM Number = LCMXXXX (where X= 0-9, i.e. LCM4203) or a model number (i.e. LMP-20-49). LCM Systems send a drawing to the customer for approval prior to the manufacture of any custom designed load pin.

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Service: (REPAIR, SUPPORT)

LCM Systems Ltd (address as above)

1.5 Installation and Operation

To ensure safe and trouble free installation of the load pin measuring device, the load pin must be properly transported and stored, professionally installed and commissioned.

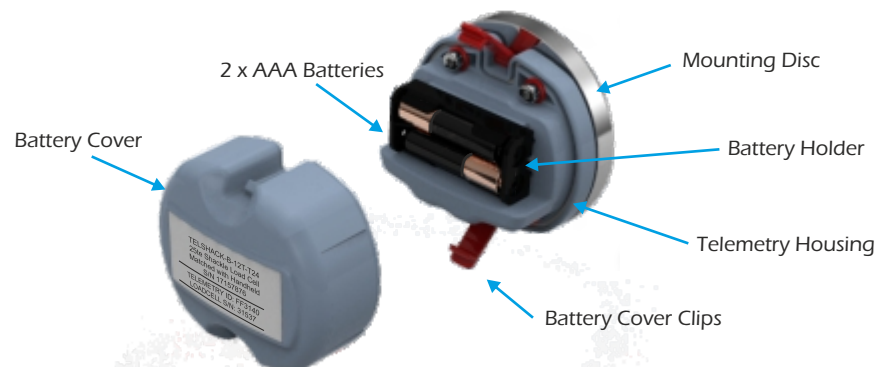
Unpacking

Before removing the load pin, inspect the packaging for signs of damage and immediately inform the supplier if any damage is found. Unpack the load pin carefully, taking special care with cables and be aware to the possibility of damaging low range devices by mishandling. Ensure that calibration and instruction information is not inadvertently discarded.

Checks Prior to Installation

- ⦿ If the load pin is fitted with a cable and gland, check that the cable is held securely by the gland.
- ⦿ If the load pin is fitted with a connector, check the connector is secure to the pin, check the plug and socket for any damage and check that the connector mates correctly.
- ⦿ Check the cable for damage, such as cuts or abrasions, especially where the cable enters the gland or connector assembly.
- ⦿ Check that the load pin has been suitably selected for the environment it is being placed into. Any adverse temperature, corrosive or potentially explosive environments may affect the operational life and the safety of the product.
- ⦿ If the load pin is fitted with a telemetry module, check that the 2 off AAA batteries are correctly installed, that the two RED clips on the telemetry housing are closed and that the battery cover is secure. See Figure 1 for details.

Figure 1



Installation

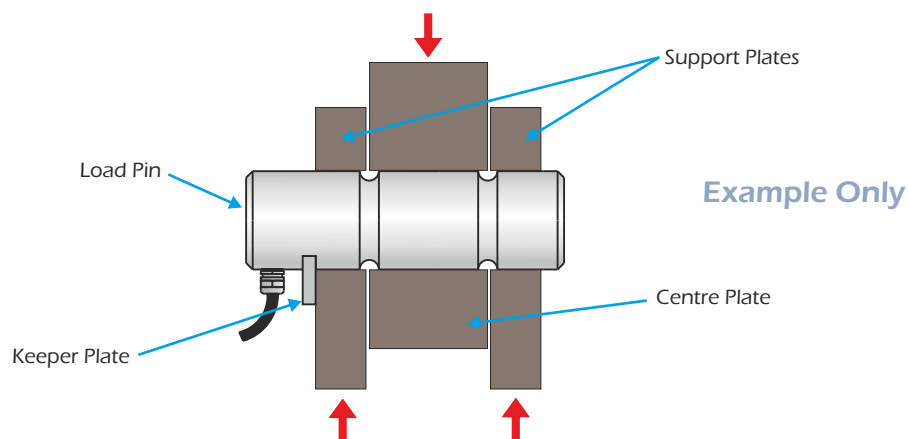
When installing a load pin various factors need to be considered which can influence the performance or accuracy of the load pin. The fit of the pin within a structure is important to the overall performance of the load pin. For an optimal performance, an H7/g6 clearance would normally be recommended, however this is not always achievable in the field and some slight loss of repeatability and linearity can normally be tolerated to achieve an "easy to fit" requirement.

To avoid loss of accuracy during installation the following points should be followed:

- ⦿ Ensure the load direction arrow on the load pin (usually on the head of the pin) is aligned with the direction of load.
- ⦿ Ensure the pin is held captive to prevent movement in use by using a keeper plate/locking system. A load measuring pin needs to be securely locked into position in order to fix its orientation with respect to its associated assembly. This needs to be fixed in both the axial and rotation modes to ensure that accurate and repeatable results are obtained from the system. See section 2.3 for examples of how a load pin can be secured in position.

- ⦿ If the load pin is fitted with a telemetry unit then ensure that a clear line-of-sight between the transmitter and receiver is maintained, and that objects or structures are kept at least one metre away from antennae wherever possible.
- ⦿ If the load pin is fitted with a telemetry module, the installer should first read the T24 Telemetry User Manual which can be found at the following web address: <http://www.lcmsystems.com/T24>.
- ⦿ Ensure that both the support plates and the centered plate (or sheave) do not bridge the grooves on the load pin. See Figure 2 for example of correct positioning.

Figure 2



- ⦿ Ensure that the support plates are not miss-aligned as this will induce bending moments on the load pin which will adversely affect performance.

Wiring and Electrical Checks

The correct connection of a load pin to an instrument is critical to achieving and maintaining the performance and reliability of the load pin.

- ⦿ Wiring connections are given on the calibration certificate supplied with each load pin.
- ⦿ Where a screened cable is fitted, that screen should be connected as indicated in the manual for the instrument the load pin is connected to.
- ⦿ Cable length should not be added or removed from the load pin, as this could alter the calibration figures.
- ⦿ Where junction boxes are used, check the connections are good quality and securely connected. Clean the enclosure and check that it is free from moisture.
- ⦿ Load pin cabling must be kept away from high power cables and equipment, high output RF equipment and inductive loads and generators. **Cables must not be run alongside power cables.**

Load Pin Output

The electrical output of the load pin should be connected only to instrumentation with a high enough input impedance, preferably 1Mohm or greater, in order to prevent loading effects on the output sensitivity of the load pin. LCM Systems offers a wide range of digital and analogue instruments ensuring compatibility.

When setting up your load pin the following points should be acknowledged:

- ⦿ The zero load output given on the calibration certificate is the output of the load pin when no load is applied. This includes the removal of the load caused by any lifting accessories.

- ⦿ The load on an installed load pin will comprise of the weight of your assembly (including sheaves, ropes, hook block, drums etc.) and the active load. Therefore, the output with no active load will be greater than the zero output indicated on the calibration certificate.
- ⦿ The output from the load pin can be in various forms, 4-20mA, 0-10V, mV/V etc. See the calibration certificate for details.

Checks After Installation

- ⦿ With the load pin installed check the pin output is not negative, as this may indicate the pin is incorrectly mounted or subject to miss-alignment forces. Refer back to Installation section for details on correct positioning. Use the calibration certificate for reference of correct output at certain loads.
- ⦿ When applying load to the pin, the output should increase. If this is not the case then check the following:
 - a. The grooves are not being bridged by either the support plates or the loaded plate, sheave, etc.
 - b. Check all electrical connections are correct i.e. to an instrument or a junction box etc.
 - c. Check that the load arrow shown on the pin is aligned in the direction of the load acting on the center of the pin.

1.6 Calibration

All LCM Systems load pins are calibrated in UKAS traceable test machines to best simulate normal loading conditions. When a load pin is supplied as the sensing member of a shackle, then that load pin will be calibrated in tension where possible.

We endeavour to match the loading conditions that would be experienced in service but it is not possible to totally simulate the on-site structure for every load pin manufactured. It is for this reason that for optimum system accuracy, a calibration in the final assembly is recommended. On-site calibration should be performed in accordance with the manual for the instrument the load pin is connected to.

1.7 Warnings/Hazards

Load pins are highly stressed devices and commonly have safety factors between three and five times the rated capacity under static conditions. Fatigue applications and environmental factors can contribute to reducing this margin. The user should determine media effects on the exposed load pin materials. Where a corrosive environment is present load pins can often be manufactured from corrosion resistant materials or alternatively, isolation barriers can be employed between the corrosive environment and the load pin.

The following points should be followed to avoid potentially hazardous situations:

- ⦿ Do not weld near to installed load pins, as leakage currents may destroy the load pin electric circuits.
- ⦿ Load pins are sealed units which must not be dismantled. Damaged load pins should be returned to LCM Systems for repair and re-calibration.
- ⦿ The accuracy of the system is dependent upon correct installation of the load pin.
- ⦿ Load pins should not be handled or carried by means of the cable.
- ⦿ Large pins incorporate special lifting accessories. These should only be used as directed in the manufacturer's instructions.
- ⦿ Load pins must not be subjected to shock loads, such as using a hammer to force the pin into position.
- ⦿ The load pin should never be placed in a potential explosive environment unless the product is suitably certified (ATEX or IECEx).

- ⦿ Fixing methods – keeper plates, split pins, washer and nuts must always be correctly installed. Pin material and any applied treatments (heat treatments etc.) should be verified as suitable for the environment before the load pin is installed. **If in doubt about the suitability of a product, please contact LCM Systems for advice.**

1.8 Inspection and Repair

Repair

Only LCM Systems personnel are authorised to carry out a repair to or service their products. All repairs or servicing will be carried out in the premises of LCM Systems. The unit is not serviceable outside of LCM Systems premises.

Inspection

All LCM Systems load pins should be subject to periodic inspection, which should include, but is not exclusive to the following checks:

- ⦿ Completion of the checks after installation, see section 1.5.
- ⦿ Check output at zero load (shift in zero offset). Verify against calibration certificate.
- ⦿ Inspect to see if the load pin has been damaged/worn or chemically attacked (from a corrosive environment or lubricants etc.).
- ⦿ For cabled versions, verify the integrity of the cable.
- ⦿ After any serious operating incident, repeat first four checks above.
- ⦿ For load pins fitted with a telemetry module, check that the batteries are correctly installed. The battery holder shows pictorially the correct orientation.
- ⦿ For load pins fitted with a telemetry module, check for any signs of water ingress to the battery compartment and for any battery corrosion.
- ⦿ In the unlikely event of this device failing, fit new batteries (if applicable) and re-test. Only when this has been done should you report the fault. When reporting the fault, give a full description of the problem and the type of application the device is being used for.

DRAWINGS AND SPECIFICATION

Load measuring pins are designed for many diverse applications, and as direct replacements for clevis or pivot pins already in service. The following range of LCM Systems load pins can be supplied with various cable gland and connector configurations, locking systems and signal conditioning boards.

2.1 Load Pin Specification

LCM Systems load pins are split into 4 different types, all of which have datasheets which can be found at the following website address: http://www.lcmsystems.com/load_pins.html

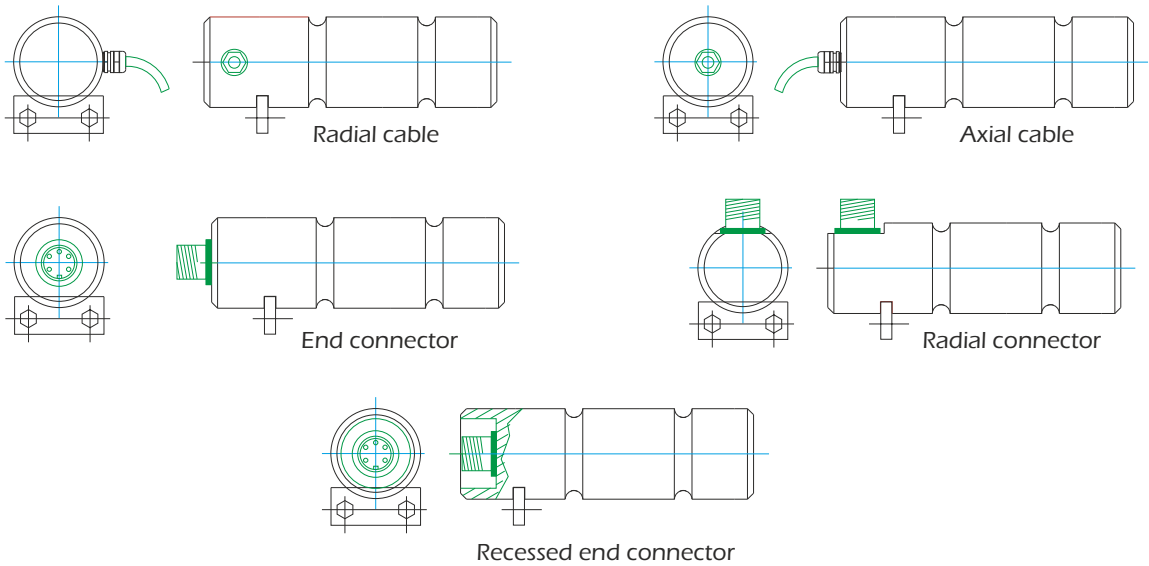
LMP	Standard design load pins - LCM standard range
LPB	Custom design load pins - Dimensions specified by the customer
LPC	Shackle/clevis load pins - Dimensions dependant on the shackle or clevis specified
LPM	Magtrol type load pins - Direct replacement for the Magtrol standard range

2.2 Cable Gland and Connector Configurations

All cable gland wiring colours or connector pin details are shown on the calibration certificate supplied.

The removal or replacement of the cable gland or bulkhead connector or any adjustment or repair must either be performed by LCM Systems or by a suitably qualified and approved engineer.

Examples of cable gland and connector arrangements:

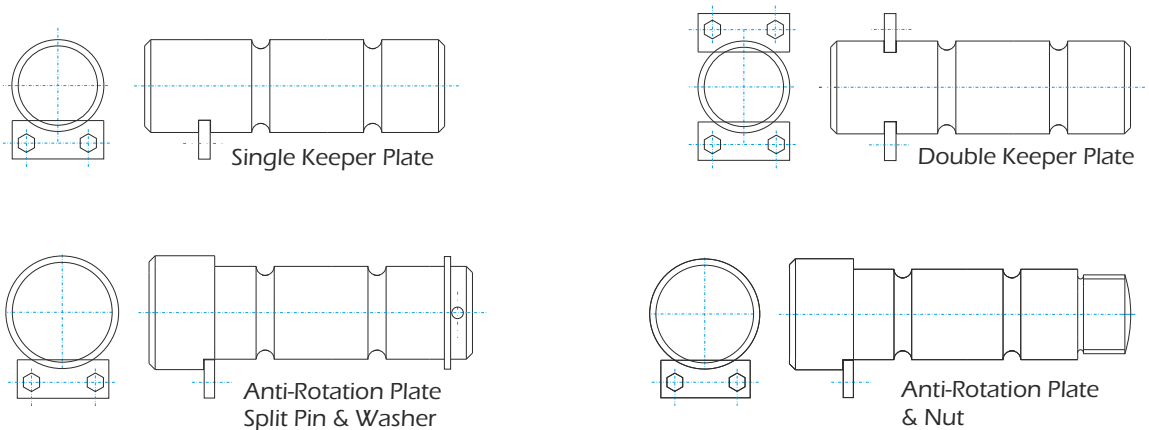


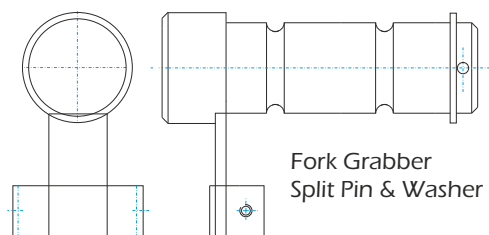
Mating and de-mating connector assembly

- ⦿ Check both halves of the connector for any damage or obstructions.
- ⦿ Align the connector assembly and mate the two halves. Press firmly to ensure they are fully engaged.
- ⦿ Tighten the locking sleeve. Finger tight is enough to complete the mating process.
- ⦿ Always fully disengage the locking sleeve before attempting to de-mate the connector.

2.3 Load Pin Locking System Configurations

Each load pin is supplied with a locking and anti-rotation system which secures the position and orientation of the load pin, which are critical to its correct operation.



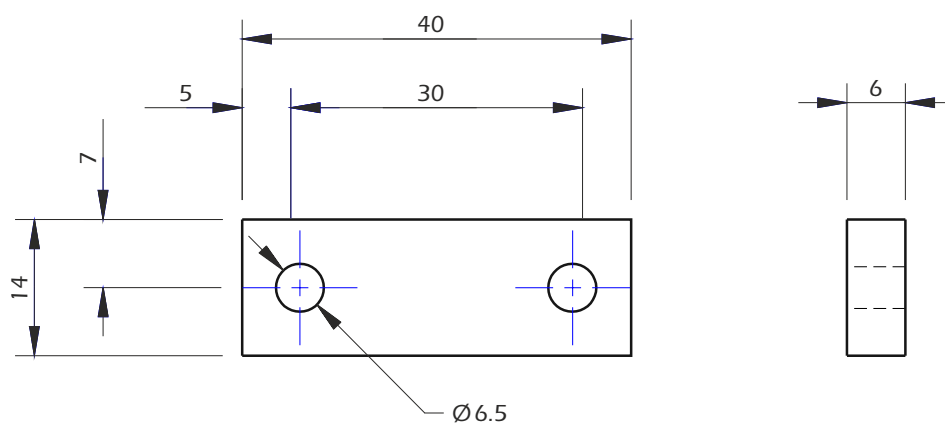


Installing a locking and anti rotation system

There are numerous variations of locking and anti-rotation methods for a load pin. The examples show the most common methods and show that locking and anti-rotation can be achieved using dual systems (anti-rotation plate, split pin and washer etc.).

The example below shows a common anti-rotation/locking plate system (also known as a keeper plate). To correctly install a keeper plate, appropriately sized retaining bolts should be fitted through the holes provided and screwed into tapped holes in the mating assembly.

In the example below the holes have been drilled to accommodate M6 bolts. The use of the correct size bolts is critical to ensuring the correct orientation of the load pin.



When a load pin is supplied with a threaded end and retaining nut, the nut should only be finger tight. Over tightening of retaining nuts will impact on the functionality of the load pin. Retaining nuts should be secured in position using either a split pin, locking washer, lock nut or circlip.

2.4 Load Pin Output Options

The load pin can be fitted with a variety of built in (in-cell) signal conditioning boards, to offer either analogue, voltage, current signals or RS485 digital signals (in various protocols). When a wireless signal is required, the load pin can be fitted with a T24 Telemetry Module as shown in Figure 1 (page 2).

ICA

The ICA analogue signal conditioning (amplifier) board is available in six versions, offering a range of current and voltage outputs. All amplifiers have a wide operating voltage range.

- ⦿ ICA1 - 3 wire, 0.1 to 10.1V
- ⦿ ICA2 - 3 wire, 0.1 to 5.1V
- ⦿ ICA3 - 4 wire, $\pm 10V$
- ⦿ ICA4 - 3 wire, 4 to 20mA
- ⦿ ICA5 - 2 wire, 4 to 20mA
- ⦿ ICA6, 3 wire , $\pm 10V$

See the ICA Datasheet and Instruction Manual for further details:

http://www.lcm systems.com/ICA_In-Cell_Analogue_Strain_Gauge_Amplifier

DCELL

The DCELL Digital Signal Conditioning (amplifier) board offers high speed, RS485 and CANBus outputs in several protocols.

DCELL Communication:	RS485 Baud Rate	2400 Min to 230K Max
	Protocols	ASCII MANTRABUS II Modbus RTU MANTRACAN

See the DCELL Datasheet and Instruction Manual for further details:

http://www.lcm systems.com/DCELL_In-Cell_Digital_Strain_Gauge_to_Data_Converter

Telemetry

The T24 product range uses high performance two-way radio communication. Each load pin fitted with the telemetry module requires either a T24 handheld device, digital/analogue interface or a base station and PC to communicate with. See the T24 User Manual for further details on the T24 range of products:

<http://www.lcm systems.com/T24>

**IF IN DOUBT ABOUT ANY ASPECT OF THE SELECTION,
INSTALLATION OR USE OF A LOAD PIN,
CONTACT LCM SYSTEMS FOR ADVICE BEFORE INSTALLING**

DECLARATION OF CONFORMITY



SAFETY COMPONENTS PUT ON THE MARKET SEPARATELY

LCM Systems Ltd. certifies that the load cells described hereafter are in accordance with the essential requirements defined in the European Machinery Directive 2006/42/EC and the related harmonised standards:

BS EN ISO 13849-1:2015 - Safety of machinery - Safety-related parts of control systems
Part 1: General principles for design

BS EN ISO 13849-2:2015 - Safety of machinery - Safety-related parts of control systems
Part 2: Validation

Technical files regarding the conformity of the products detailed herein are at the disposal of an authorised body on request.

This declaration is only valid for use with product types as detailed herein. Products must be used strictly according to the specifications and instructions detailed in this manual. The load cells are defined by their product datasheets, which are to be used in conjunction with this manual and their Calibration Certificate to ensure the correct maintenance and repair of the product.

Load Cell Type: Load Pin - LMP, LPB, LPC, LPM and LCMXXXX (custom design)

Product Description: See corresponding product datasheets, calibration certificates and general arrangement drawings for full details.

To be in accordance with the CE requirements, the customer has to verify the compatibility between any electronics not supplied by LCM Systems (in accordance with referred directives in the industrial environment) and the LCM Systems load cells.

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NOTICE

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LCM Systems Ltd reserve the right to make changes to its products and specifications without notice.

4.2 About

LCM Systems is a specialist provider of standard and bespoke load cells, load pins, load shackles, load links and associated instrumentation, with over 30 years' experience in supplying innovative load measurement solutions to many different industries worldwide. Whatever the application and however demanding the environment, we can provide a system to meet your needs.

www.lcmsystems.com



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