Installation, Operation & Maintenance Instructions; Technical Information

Model VHL
Vibrating Fork Point Level Sensor for Liquids

Thank you for purchasing the Model VHL Vibrating Fork Point Level Sensor for Liquids from BlueLevel Technologies. We sincerely appreciate your business and strive to make your experience with us and our products uniquely positive.

⚠ This document contains information necessary to ensure a safe and successful installation. **PLEASE READ ALL INSTRUCTIONS CAREFULLY BEFORE PROCEEDING** and comply with the section on page 3 of this document pertaining to SAFETY to ensure proper operation of the equipment and personnel safety.

STOP Before discarding the shipping container, please inspect it thoroughly and verify that all parts are accounted for. If you have any questions please do not hesitate to contact us on our website at www.blueleveltechnologies.com, by email bluelevel@blueleveltechnologies.com or by phone at 330-523-5215 or by fax at 330-523-5212.

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Safety Terms & Symbols

WARNING: Warning statements identify conditions or practices that could result in injury or loss of life. Risk of electrical shock exists.

CAUTION: Caution statements identify conditions or practices that could result in damage to this product or other property.

Safety Summary

General Safety

CAUTION: It is important that all instructions within this manual be followed to ensure proper operation of the equipment and safety of operating personnel. The product should be installed, commissioned and maintained by qualified and authorized personnel only. Install according to installation instructions and comply with all National and Local codes. Use electrical wire that is sized and rated for the maximum voltage and current of the application.

Electrical Shock Caution

Model VHL Vibrating Fork Point Level Sensors for Liquids can be powered with HIGH VOLTAGE. No operator serviceable parts are inside. All servicing is to be performed by qualified personnel. Each Model VHL sensor is provided with a "protective conductor terminal" ⏚ which shall be connected to earth ground potential (see Electrical Installation section beginning on page 11).

Maintenance – Power to all circuits must be disconnected before conducting any investigation, setup or maintenance of the unit.

Safety Summary Cont'd.

Electromagnetic Compatibility (EMC):
The Model VHL vibrating fork point level sensor for liquids was tested and found to comply with standards for electric shock and electromagnetic compatibility for CE marking.

The Model VHL vibrating fork level sensor complies with the following regulations of the EC:

Directive 93/68/EEC (CE Mark)
Directive 2006/95/EC (LVD)
Directive 2004/108/EC (EMC)
Directive 2002/95/EC (RoHS)
Directive 2002/96/EC (WEEE)

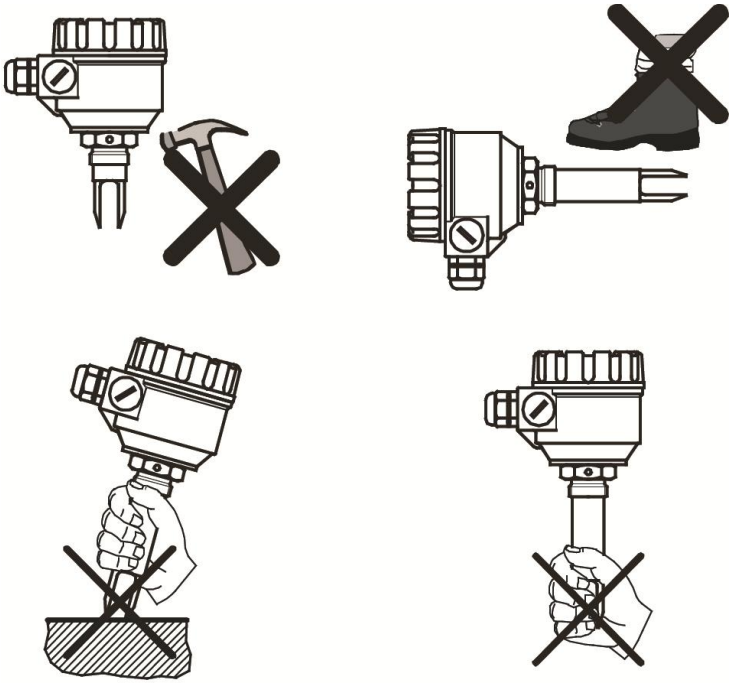
The product has been tested according to the following standards:

IEC 61010-1:2010
IEC 61326-1:2005

All test reports and documentation can be obtained from BlueLevel Technologies, Inc.

Mechanical Installation

Prior to installation handle the Model VHL Mini in a careful manner to prevent any mechanical damage.



Prevent Damage

DO NOT USE THE HOUSING TO SCREW THE UNIT INTO THE PROCESS CONNECTION. USE THE HEXAGONAL NECK.

After screwing the unit tight into the process connection the housing can be rotated by hand (maximum 300º), to adjust the orientation of the conduit entrances (pointing down or horizontal so that any moisture in conduit does not drain into housing).

Mechanical Installation Cont'd.

If side mounting the VHL Mini vibrating fork point level sensor then positioning of the fork tines is required so that the forks are vertical. Use Teflon sealing tape on the threaded process connection to seal the threads and position the fork tines appropriately using the mark "O" on the hex nut above the process connection.

Low Viscosity Fluids
In applications where the fork tines are easily freed from the process medium any mounting shown in Figure 1 is possible.

High Viscosity Fluids
In applications where the tines are not easily freed from the process medium, side or horizontal mounting is recommended.

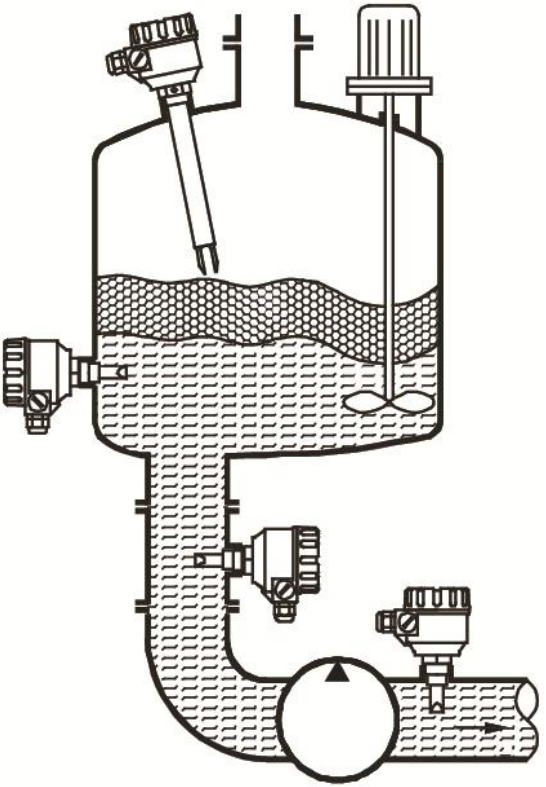
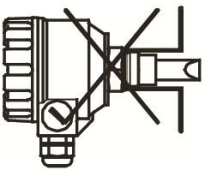
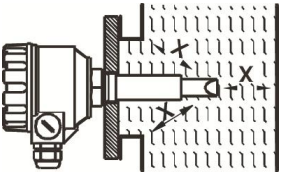


Figure 1: Mounting Arrangements



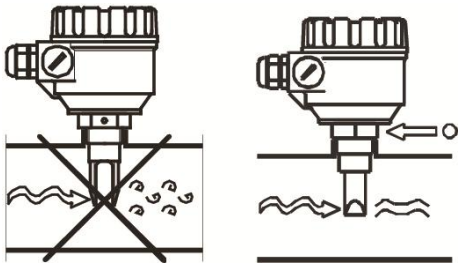
Mounting Threaded Connection



Critical Distances (X_{min} = 5mm)

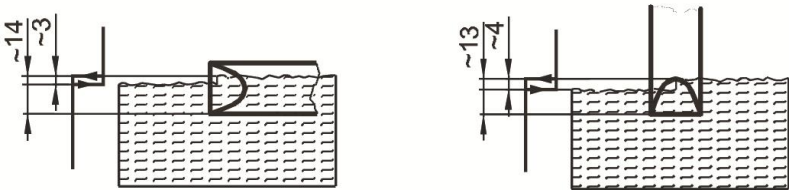
Mechanical Installation Cont'd.

For pipe mounting the fork tines must be parallel to the flow of the fluid.



Pipe Mounting

The switching point and the switch differential depends on the density of the liquid and the mounting orientation (side/horizontal or top/vertical).



Switching Point and Differential for Water at +77ºF (+25ºC)
(dimensions shown in mm; divide by 25.4 to convert to inches)

Instrument Function

Introduction:

The Model VHL is a vibrating fork style point level sensor for liquids of high quality design and ergonomics, which provides reliable indication of the presence and absence of a wide range of liquid materials.

The Model VHL is an instrument that can be used for either High or Low level detection with a relay output suitable for switching moderate current loads or as input to a PLC or other type of control system.

Principle of Operation:

The Model VHL uses a mechanical resonance system. The mechanical element is excited and kept in resonance by the sensor's electronic circuitry. An electrical signal is applied to a piezoelectric crystal at the natural resonant frequency of the mechanical system. This electrical excitation causes physical deformation of the crystal, which in-turn creates the probe element vibration. When no fluid is present around the probe, the vibration exists. With fluid present and surrounding the probe element, the vibration is dampened and detected by the electronic circuitry. This results in a change in the output and local LED indication.

Application or Use:

Model VHL vibrating fork point level sensors are used to detect the presence and absence of a variety of fluids with a minimum density of 0.7 Specific Gravity or 0.7 g/cm^3.

Operating Conditions

Temperature and Pressure play a factor in the performance and operation of the Model VHL vibrating fork point level sensor for liquids. The charts shown in Figure 2 illustrate the relationship between the Pressure and medium Temperature for the Model VHL level sensor.

Instrument Function Cont'd.

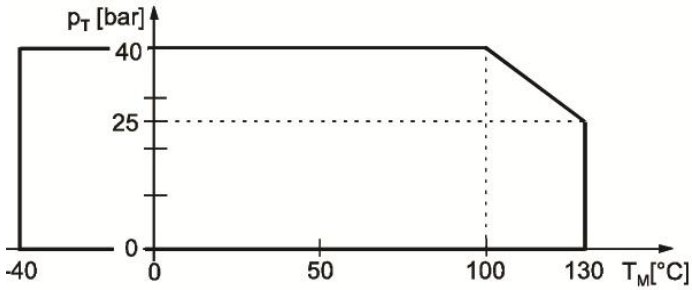


Figure 2: Pressure [P_T] as a Function of Temperature [T_M]

Response Time

It is important to understand the time it takes for the Model VHL Mini sensors to respond when immersed and when getting free from the process fluid. The time to respond when immersed is generally fixed to 0.5 seconds. However, the response time when getting free is a function of the viscosity of the fluid. Refer to the diagram in Figure 3.

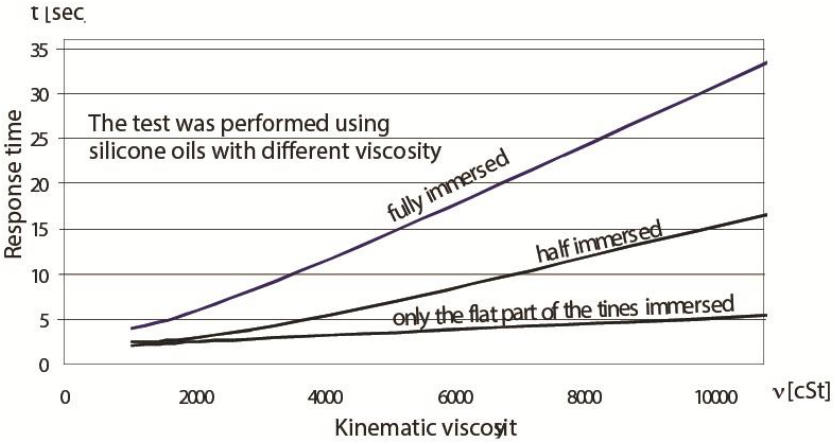


Figure 3: Response Time Diagram (when getting free); Response Time Vs. Viscosity

Instrument Function Cont'd.

Relay Output Action:

The Model VHL uses a Fail-Safe selection switch. There are two positions for this switch: High and Low as indicated in the labeling on the electronics module within the sensor enclosure (refer to Electrical Connections and Setup sections).

The relay coil is always energized in the "normal" state of the material level indicator (refer to Application or Use above; uncovered for High level application; covered for Low level application). Upon the occurrence of the material level alarm condition, or a power failure event, the relay will de-energize and the contacts will change state indicating that an alarm condition exists.

FAIL-SAFE HIGH – Fail-Safe HIGH means that the relay will be energized when the Model VHL fork is free of the liquid medium and vibrating at its natural resonant frequency and will de-energize when the vibrating fork is dampened by the presence of the liquid medium. Failure of the power supply to the unit will cause the relay to de-energize indicating that a High level alarm exists, just as if the sensing element vibration were dampened by the material (liquid presence alarm).

FAIL-SAFE LOW – Fail-Safe LOW means that the relay will NOT be energized (alarm condition) when the vibrating fork is free of the liquid medium and vibrating at its natural resonant frequency, uncovered of liquid medium, and will energize when vibration is dampened by the presence of the liquid. A failure of the power supply to the unit will cause the relay to de-energize indicating a Low level alarm condition (liquid absence alarm).

Operation Mode LED Indication
The Model VHL vibrating fork point level sensor incorporates a bi-color LED for local indication of the alarm state. Red indicates the alarm condition exists while green indicates normal. Refer to the table in the Setup section for more information.

Electrical Connections

Electrical Precautions:

Refer to Safety Summary section on pages 3 and 4 of this manual before beginning electrical connections.

Observe all government regulations regarding equipment in hazardous locations.

For all models, ensure that the power source is disconnected before installing or servicing the unit.

Permanently Connected Equipment:

Disconnecting devices shall be included in the system installation. In installations where multiple circuits are used, individual disconnects are required.

Disconnects shall be within close proximity of the equipment, accessible to operators, and marked appropriately as being the disconnect for the associated circuit.

Assure all disconnect ratings are appropriately sized for the circuit protected (Refer to Technical Data section).

Protective Earth Ground:

Each Model VHL unit is provided with a “protective conductor terminal” ⏚ which shall be terminated to the local earth ground potential to eliminate shock hazard. Select a wire size that can carry in excess of the sum of the maximum amperage of all circuits.

Electrical Connections Cont'd.

Use 6-12mm outer diameter cables and tighten conduit or cable glands as well as housing cover after installation to ensure the IP 67.

Use outside or inside grounding screw terminal for grounding the unit. For specific wiring connections please refer to the Figure 4.

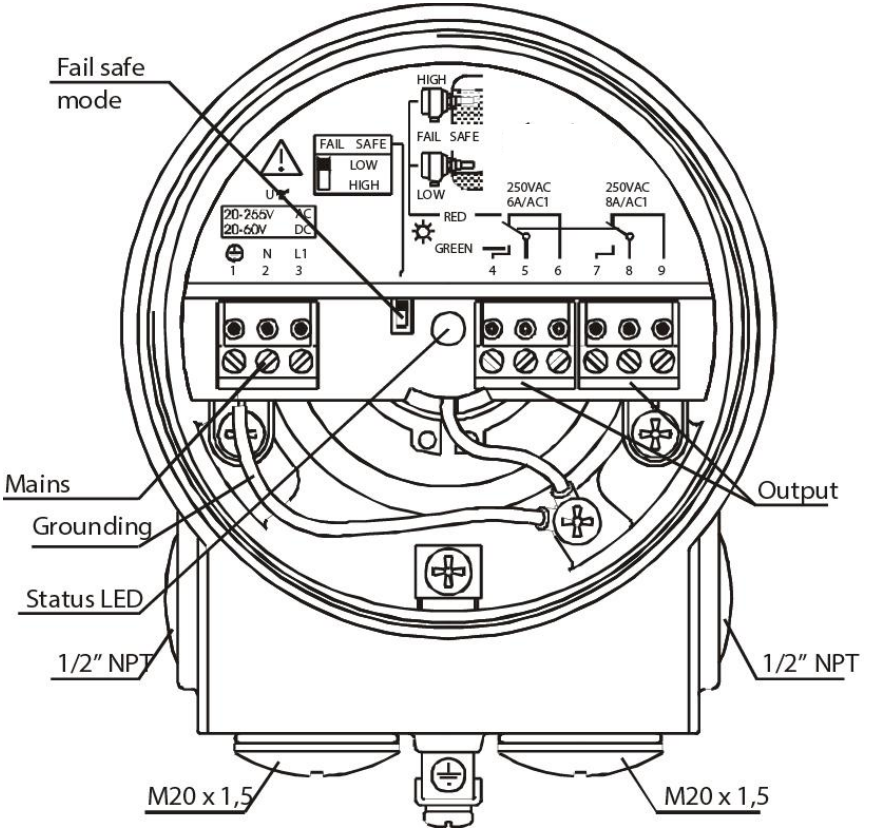
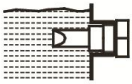
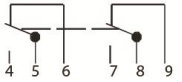
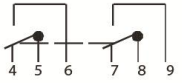
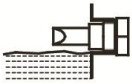
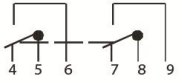
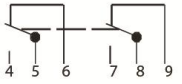
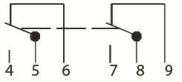


Figure 4: Model VHL Standard Wiring Diagram (High and Low Level) (NOTE: 1SPDT IS STANDARD, USES TEMRINALS 7, 8 AND 9)

Setup

Before placing the Model VHL level sensor in operation check and verify the connection of wiring and mechanical installation and understand the intended use (High or Low Level Limit Switch) and the output action that you require.

The operation of the Model VHL Mini vibrating fork point level sensor is summarized as follows in the below table:

Power supply	Fork	Switch pos.	Operation mode		Output	
			Fail safe	Status LED		
Yes	 Immersed		HIGH	RED		De-energised
			LOW	GREEN		Energised
	 Free		HIGH	GREEN		Energised
			LOW	RED		De-energised
No	Free or immersed	HIGH or LOW		NOT LIT		De-energised

(NOTE: 1SPDT IS STANDARD, USES TEMRINALS 7, 8 AND 9)

Maintenance

In some instances the sensor probe may require occasional cleaning to remove surface deposits. This should be carried out gently without damaging the vibrating section of the Model VHL Mini vibrating fork point level sensor.

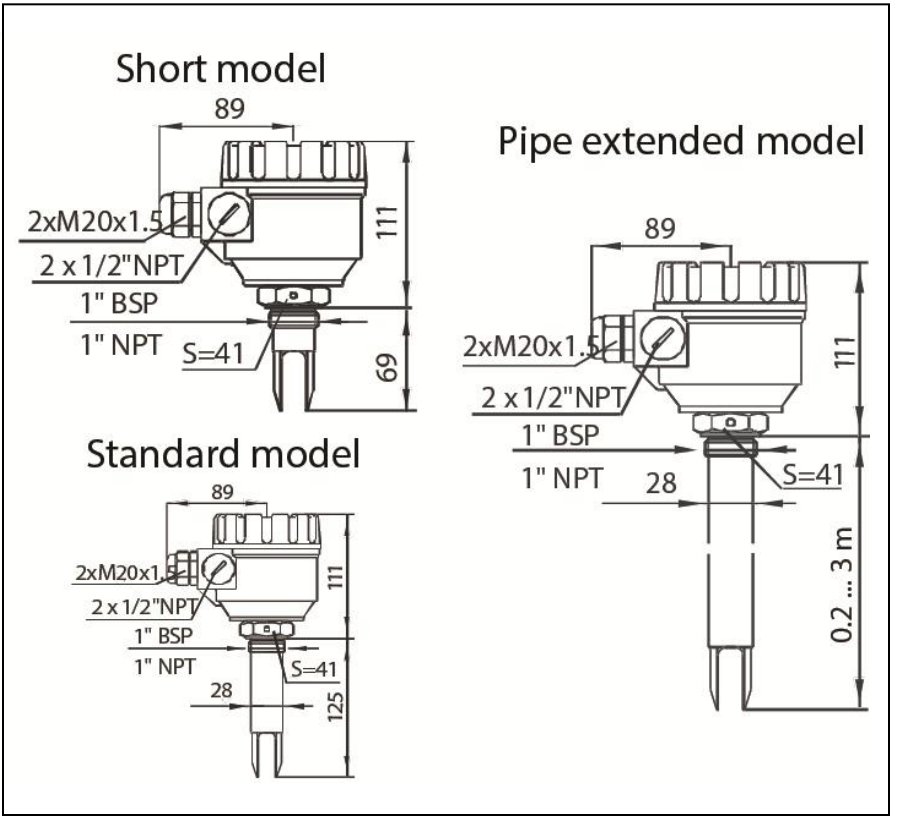
Do not hit the Model VHL sensor to remove material build-up.

Do not bang on the sensor to effect cleaning if ever necessary.

Technical Data

Power Supply:	20-255VAC 50/60Hz and 20-60VDC
Consumption:	AC: 1.2-17VA; DC: <3W
Electrical Protection:	Class I (appliance class)
Medium Pressure:	588psi (40bar) (see Figure 2 on page 9)
Probe Lengths:	Short – 2.72” (69mm) Standard – 4.92” (125mm) Long – 7.87” (200mm) Extended Lengths – >7.87” (200mm) up to 118” (3m)
Wetted Parts Materials:	316Ti (DIN 1.4571) Stainless Steel
Medium Temperature:	See diagrams on page 9
Ambient Temperature:	See diagrams on page 9
Liquid Density:	0.7 S.G. (0.7g.cm^3)
Liquid Viscosity:	≤ 10,000 cSt (mm^2/s)
Response Time:	
When Immersed	≤ 0.5sec
When Free	≤ 1.0sec (see Figure 3 on page 9)
Output:	1 SPDT Relay; 8A @250VAC AC 1 (IEC Utilization Category)
Fail-Safe:	Switch selection for HIGH or LOW
Operation Mode Indication:	Bi-Color LED (Red/Green)
Housing Protection:	IP67 (NEMA Type 6)

Dimensions



Notes:

1. Dimensions shown in “mm”, convert to inches by dividing by 25.4.

2. BSP Threaded connection not yet available. Consult factory.

Our Commitment Stands

Golden Parachute:

Each BlueLevel Technologies Model VHL vibrating fork point level sensor for liquids is backed by our **Golden Parachute** support program. If you are the initial purchaser and purchased the product directly from BlueLevel Technologies, this provides you added assurance.

The Golden Parachute support program gives the initial purchaser **90 days to evaluate the product**. Within this time frame if you are not satisfied for any reason, call us and request a “Golden RMA”, providing your order details and serial number on the unit, and then return the unit and request a replacement or a credit to your account for the cost of the equipment as shown on your invoice from BlueLevel Technologies. In addition, Model VHL products are covered by our industry-leading 2-year limited warranty. Consult our Warranty statement for details.

Standard Warranty

Each BlueLevel Technologies Model VHL vibrating fork point level sensor product is backed by our industry-leading 2-year limited warranty. Should you experience a problem with one of our products deemed by our factory to be a product failure covered by our warranty, for a period of 2-years from the date of shipment we will repair the unit at our factory or provide you with a replacement unit or sub-assembly at our discretion. A return authorization number must be obtained from a BlueLevel Technologies customer service technician BEFORE returning any unit. Refer to the below details for more information.

Details:
We warrant BlueLevel Technologies products to be free from defects in workmanship and materials when operated under normal conditions and in accordance with nameplate characteristic limits. Products must be installed and maintained in accordance with BlueLevel Technologies installation, operation and maintenance instructions. Users are responsible for the suitability of the products to their application. There is no warranty against damage resulting from misapplication, improper specifications, or other operating conditions beyond our control. Claims against carriers for damage in transit must be filed by the buyer.

This warranty shall be in effect for a period of twenty-four months from the date of shipment. THIS WARRANTY SHALL BE IN LIEU OF ANY OTHER WARRANTY, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. BlueLevel Technologies will repair or replace, at its option, any product which has been found to be defective and is within the warranty period, provided that the product is shipped, with previous factory authorization, freight prepaid, to the factory in Rock Falls, Illinois, U.S.A., or to the nearest service station. BlueLevel Technologies is not responsible for removal, installation, or any other incidental expenses incurred in shipping the products to or from BlueLevel Technologies.

BlueLevel Technologies' liability under this warranty shall be solely limited to repair or replacement of the products within the warranty period, and BlueLevel Technologies shall not be liable, under any circumstances, for consequential or incidental damages, including, but not limited to, personal injury or labor costs.

Under no circumstances will BlueLevel Technologies be responsible for any expense in connection with any repairs made by anyone other than the factory or an authorized service station, unless such repairs have been specifically authorized in writing.

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