

## The Special Operation Key Activates a Direct Opening Mechanism to Open the Contacts and Shut Off Control Circuits when Protective Doors Are Opened on Machine Tools or Other Equipment



For the most recent information on models that have been certified for safety standards, refer to your OMRON website.

Be sure to read the "Safety Precautions" on page 7.

- Conforms to EN (TÜV) standards corresponding to the CE marking.
- Certified by UL and CSA standards.
- The Switch contact is opened by a direct opening mechanism (NC contacts only) when the protective cover is opened. The EN-certified direct opening mechanism is indicated by on the Switch.
- Malfunctions and false operation prevented by special Operation Key.
- Wide temperature range specifications: -40 to 80°C.
- Degree of protection of the switch box: IP67 (EN60947-5-1).

## Model Number Structure

### Model Number Legend

#### Switch

D4BS -    S  
           1    2    3

##### 1. Conduit outlet

- 1: PG13.5 (1 conduit type)
- 2: G1/2 (1 conduit type)
- 4: M20 (1 conduit type)

##### 2. Built-in Switch

- 5: 1NC/1NO (slow-action)
- A: 2NC (slow-action)

##### 3. Head Mounting Direction

- F: Four mounting directions possible (front-side mounting at shipping)

#### Operation Key

D4BS - K   
                   1

##### 1. Operation Key Type

- 1: Horizontal mounting
- 2: Vertical mounting
- 3: Adjustable mounting (Horizontal)

**Note:** An order for the head part or the switch part alone cannot be accepted. (The Operation Key is sold separately.)

## Ordering Information

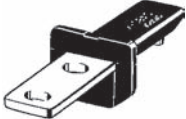
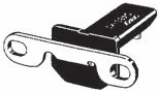
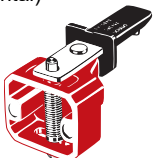
### List of Models

Switches (Operation Keys are sold separately.)

Consult with your OMRON representative when ordering any models that are not listed in this table.

Type	Mounting direction		Conduit outlet	1NC/1NO (Slow-action)	2NC (Slow-action)
1-conduit type	Front-side mounting		Pg13.5	D4BS-15FS	D4BS-1AFS
			G1/2	D4BS-25FS	D4BS-2AFS
			M20	D4BS-45FS	D4BS-4AFS

## Operation Keys

Type	Model
Horizontal mounting 	D4BS-K1
Vertical mounting 	D4BS-K2
Adjustable mounting (Horizontal) 	D4BS-K3

## Specifications

### Standards and EC Directives

Conforms to the following EC Directives:

- Machinery Directive
- EN50041
- EN ISO 14119
- EN 60204-1

### Certified Standards

Certification body	Standard	File No.
TÜV Rheinland	EN60947-5-1 (certified direct opening) GS-ET-15	Consult your OMRON representative for details.
UL	UL508	E76675
CSA	CSA C22.2 No. 14	LR45746
CQC (CCC)	GB/T 14048.5	Consult your OMRON representative for details.

### Certified Standard Ratings

TÜV (EN60947-5-1), CCC (GB/T 14048.5)

Item	Utilization category	AC-15
Rated operating current (I <sub>e</sub> )		2 A
Rated operating voltage (U <sub>e</sub> )		400 V

**Note:** Use a 10 A fuse type a gI or gG that conforms to IEC60269 as a short-circuit protection device.

### UL/CSA (UL508, CSA C22.2 No. 14) (A600)

Rated voltage	Carry current	Current (A)		Volt-amperes (VA)	
		Make	Break	Make	Break
120 VAC	10 A	60	6	7,200	720
240 VAC		30	3		
480 VAC		15	1.5		
600 VAC		12	1.2		

## Characteristics

<b>Interlock type</b>		Type 2 (EN ISO 14119)
<b>Coding level</b>		Low level coded (EN ISO 14119)
<b>Degree of protection *1</b>		IP67 (EN60947-5-1)
<b>Durability *2</b>	<b>Mechanical</b>	1,000,000 operations min.
	<b>Electrical</b>	500,000 operations min. (10 A resistive load at 250 VAC)
<b>Operating speed</b>		0.1 m/s to 0.5 m/s
<b>Operating frequency</b>		30 operations/minute max.
<b>Direct opening force *3</b>		19.61 N min. (EN60947-5-1)
<b>Direct opening travel *3</b>		20 mm min. (EN60947-5-1)
<b>Contact resistance</b>		25 mΩ max.
<b>Rated insulation voltage (U<sub>i</sub>)</b>		600 V (EN60947-5-1)
<b>Rated frequency</b>		50/60 Hz
<b>Protection against electric shock</b>		Class I (with ground terminal)
<b>Pollution degree (operating environment)</b>		3 (EN60947-5-1)
<b>Impulse withstand voltage (U<sub>imp</sub>) (EN60947-5-1)</b>	<b>Between terminals of same polarity</b>	4 kV
	<b>Between terminals of different polarity</b>	
	<b>Between each terminal and ground</b>	
<b>Insulation resistance</b>		100 MΩ min. (at 500 VDC) between terminals of same or different polarity, between each terminal and ground, and between each terminal and non-current-carrying metal part
<b>Contact gap</b>		2 × 2 mm min.
<b>Vibration resistance</b>	<b>Malfunction</b>	10 to 55 Hz, 0.65 mm single amplitude
	<b>Destruction</b>	1,000 m/s <sup>2</sup> min. (IEC68-2-27)
<b>Shock resistance</b>	<b>Malfunction</b>	300 m/s <sup>2</sup> min. (IEC68-2-27)
	<b>Destruction</b>	1,000 m/s <sup>2</sup> min. (IEC68-2-27)
<b>Conditional short-circuit current</b>		100 A (EN60947-5-1)
<b>Conventional enclosed thermal current (I<sub>the</sub>)</b>		20 A (EN60947-5-1)
<b>Ambient operating temperature</b>		-40 to 80°C (with no icing)
<b>Ambient operating humidity</b>		95% max.
<b>Weight</b>		Approx. 285 g (D4BS-15FS)

**Note:** The above values are initial values.

- \*1. The degree of protection is tested using the method specified by the standard (EN60947-5-1). Confirm that sealing properties are sufficient for the operating conditions and environment beforehand. Although the switch box is protected from dust, oil, or water penetration, do not use the D4BS in places where dust, oil, water, or chemicals may enter through the key hole on the head, otherwise Switch damage or malfunctioning may occur.
- \*2. The durability is for an ambient temperature of 5 to 35°C and an ambient humidity of 40% to 70%. Contact your OMRON sales representative for more detailed information on other operating environments.
- \*3. These figures are minimum requirements for safe operation.

# Structure and Nomenclature

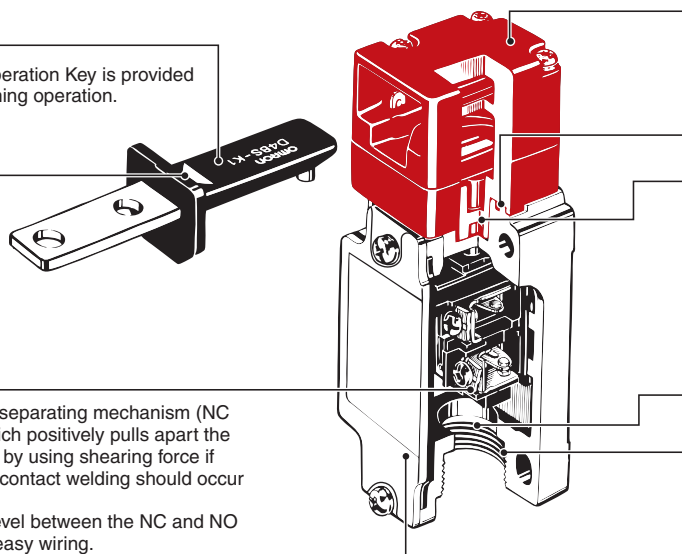
## Structure

**Operation Key**  
D4BS's exclusive-use Operation Key is provided to assure accurate switching operation.

**Set Zone Mark**  
A triangular Set Zone Mark makes it easy to adjust the operating position when inserting the Operation Key.

**Built-in Switch**  
A shearing force contact separating mechanism (NC contact) is employed, which positively pulls apart the contacts from each other by using shearing force if any abnormality such as contact welding should occur in the contact area.  
There is a difference in level between the NC and NO terminal, which assures easy wiring.

**Ground Terminal Screw**  
A ground terminal is provided to improve safety. (Built into the Unit.)



**Head**  
The switch head is coated with easy-to-see red paint. The mounting direction of the switch head can be varied to any of the four directions.

**Seal Ring (NBR)**

**Oil Seal (NBR)**  
The operation plunger employs an oil seal, with which the switch box meets the requirements of IP67.

**Seal Packing (NBR)**

**Conduit Outlet**  
Refer to the following list.

Size	Box	1-conduit type
Pg13.5		Yes
G1/2		Yes
M20		Yes

## Model and Contact Configuration (Diagrams Show State with Key Inserted)

Model	Contact	Contact form	Operating pattern	Remarks
D4BS-□5FS	1NC/1NO			<p>Only NC contact 11-12 has a certified direct opening mechanism. (→)</p> <p>Terminals 11-12 and 23-24 can be used as unlike poles.</p>
D4BS-□AFS	2NC			<p>NC contacts 11-12 and 21-22 have a certified direct opening mechanism. (→)</p> <p>Terminals 11-12 and 21-22 can be used as unlike poles.</p>

# Dimensions and Operating Characteristics

(Unit: mm)

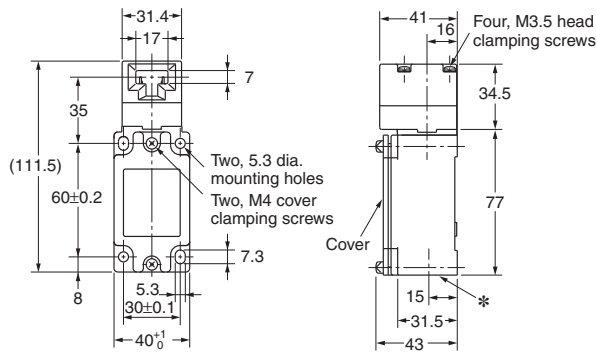
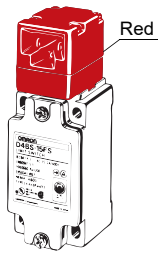
## Switches

### 1-conduit type

D4BS-1□FS

D4BS-2□FS

D4BS-4□FS



Operating characteristics	Model	D4BS-1□FS D4BS-2□FS D4BS-4□FS
Key insertion force		19.61 N max.
Key extraction force		19.61 N max.
Pretravel (PT)		10±5 mm
Total travel		23 mm min.

**Note: 1.** Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

**2.** There are fluctuations in the contact ON/OFF timing for 2NC contacts. Confirm performance before application.

\* Conduit outlet

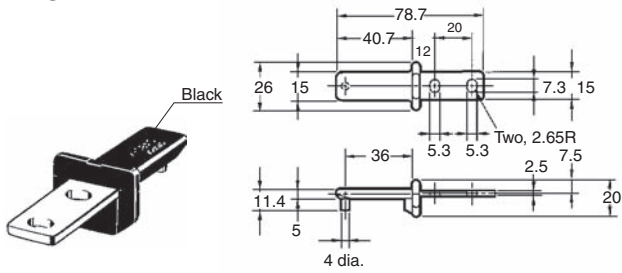
D4BS-1□FS : Pg 13.5

D4BS-2□FS : G1/2

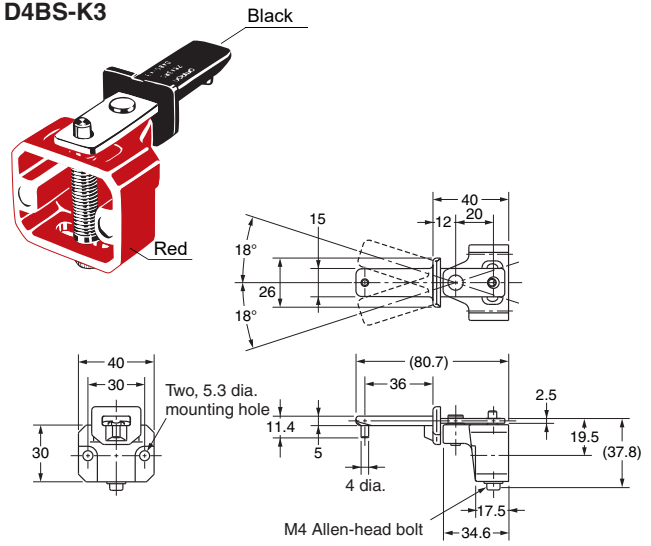
D4BS-4□FS: M20

Operation Keys

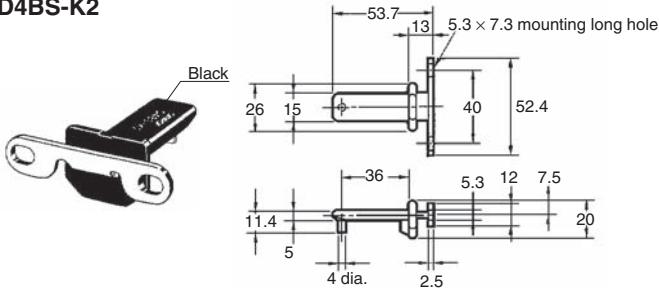
D4BS-K1



D4BS-K3

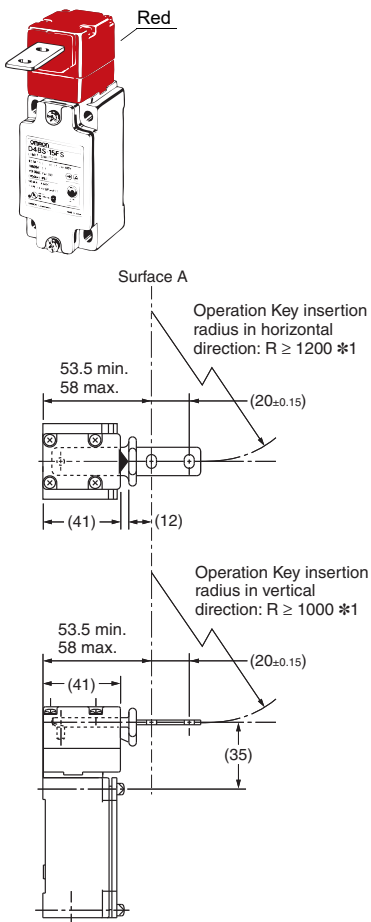


D4BS-K2

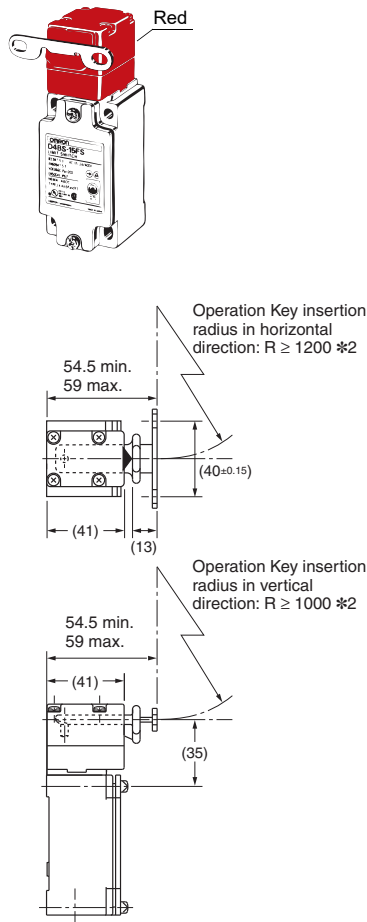


With Operation Key Inserted

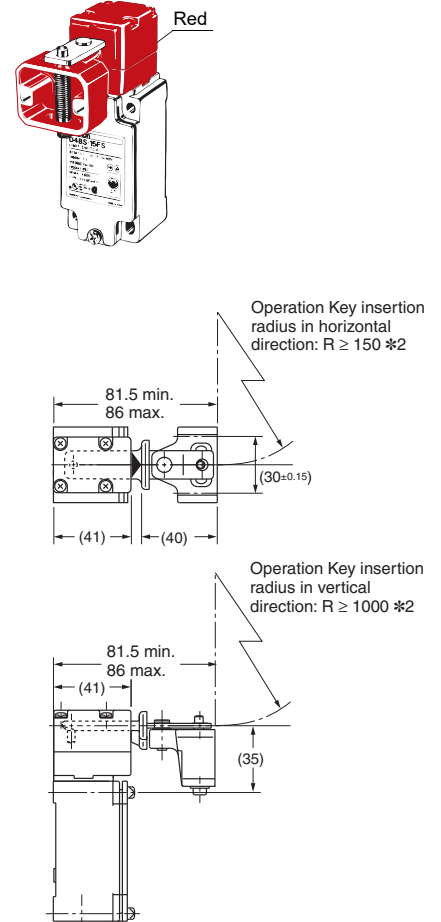
D4BS + D4BS-K1



D4BS + D4BS-K2



D4BS + D4BS-K3



Note: Unless otherwise specified, a tolerance of  $\pm 0.4$  mm applies to all dimensions.

\*1. The insertion radii apply when the rotational center of the Operation Key is on surface A in the figures.

\*2. The insertion radii apply when the rotational center of the Operation Key is on the Operation Key installation surface.

## Safety Precautions

Be sure to read the precautions for **All Safety Door Switches** in the website at: <http://www.ia.omron.com/>.

### Precautions for Safe Use

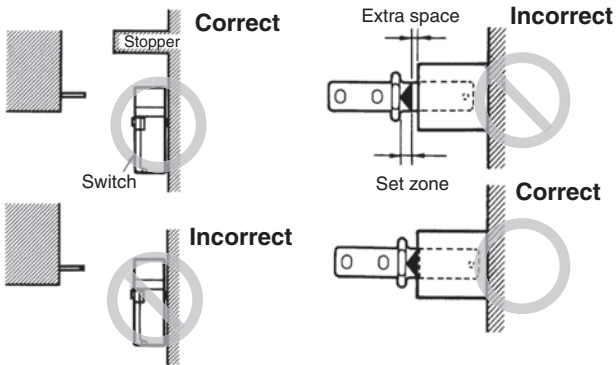
- Do not use the Switch submerged in oil or water or in locations continuously subject to splashes of oil or water. Doing so may result in oil or water entering the Switch. (The IP67 degree of protection of the Switch specifies the amount of water penetration after the Switch is submerged in water for a certain period of time.)
- Always attach the cover after completing wiring and before using the Switch. Also, do not turn ON the Switch with the cover open. Doing so may result in electric shock.

### Stopper Installation

Do not use a Switch as a stopper.

Be sure to install a stopper as shown in the following illustration when mounting the Switch and adjust the stopper so that the Operation Key is within the setting zone.

Do not subject the Switch to a shock that exceeds the Switch's shock resistance of 1,000 m/s<sup>2</sup>.



### Precautions for Correct Use

#### Appropriate Tightening Torque

Loose screws may result in malfunction.

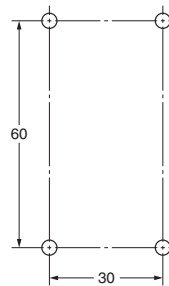
Be sure to tighten each screw of the Switch properly.

Type	Appropriate tightening torque
M3.5 terminal screw (including ground terminal screw)	0.59 to 0.78 N·m
Cover mounting screw	1.18 to 1.37 N·m
Head mounting screw	0.78 to 0.98 N·m
M5 body mounting screw *	4.90 to 5.88 N·m
Operation Key mounting screw	2.35 to 2.75 N·m
Connector	1.77 to 2.16 N·m
Cap screw	1.27 to 1.67 N·m

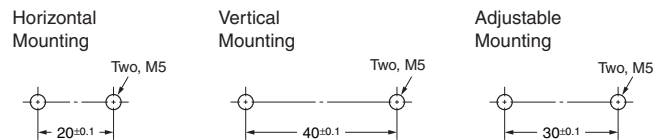
\* Apply a torque of 4.90 to 5.88 N·m for an Allen-head bolt. For a pan head screw, apply a torque of 2.35 to 2.75 N·m.

#### Mounting Dimensions (M5)

##### Standard Model



#### Mounting Hole Dimensions for Operation Keys



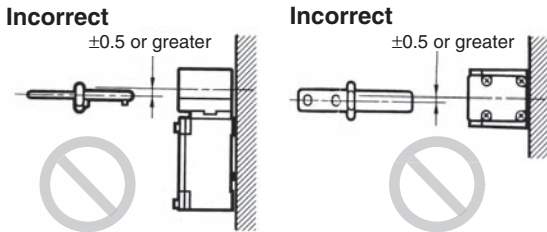
Use spring washers to mount the Switch and Operation key, and tighten the screws to a suitable torque.

To ensure safety, use screws that cannot be easily removed or another means to prevent the Switch and Operation Key from easily being removed.

## Operation Key

Make sure that the Operation Key can be inserted properly with a tolerance of  $\pm 0.5$  mm in the upward, downward, left, or right direction. Otherwise the D4BS may soon become damaged due to misalignment.

Observe the specified insertion radius for the Operation Key and insert it in a direction perpendicular to the key hole. Do not use the D4BL operation key.



- Use only the designated Operation Key. The Head has been designed so that operation is not possible with a screwdriver or other tools. Using anything other than the designated Operation Key may damage the Switch or affect machine safety.
- Do not operate the Switch with anything other than the special OMRON Operation Key, otherwise the Switch may break or the safety of the system may not be maintained.
- Do not impose excessive force on the Operation Key while the Key is inserted into the Switch or drop the Switch with the Operation Key inserted. Doing either of these may deform the Key or break the Switch.

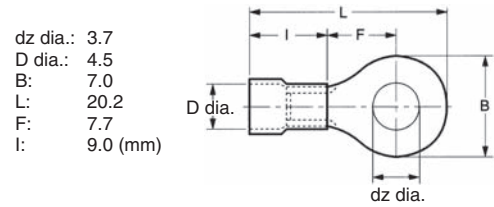
## Changes in Head Mounting Direction

By removing the screws on the four corners of the head, the head can be reset in any of four directions. The head direction can be changed with or without the Operation Key inserted in the head. Make sure that no foreign materials enter through the head and that the head is tightened securely within the proper torque range.

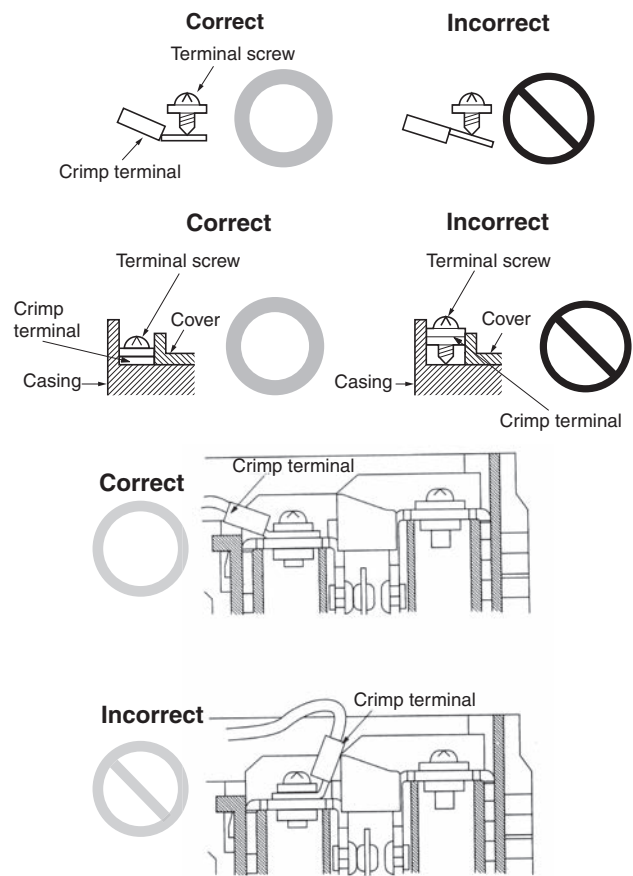
## Wiring

Do not connect the lead wires directly to the terminals. Connect the lead wires through insulation tubes and M3.5 round crimp terminals. Tighten each terminal screw within the proper torque range.

The proper lead wire is AWG20 to AWG14 (0.5 to 2.5 mm<sup>2</sup>) in size.



Wire using the methods shown below so that the crimp terminals are not caught on the case or cover. Otherwise it may not be possible to mount the cover completely and malfunctions may occur.



## Conduit Outlet

- Tighten the connector to a suitable torque.
- Excessive tightening torque may damage the casing.
- If using a Pg13.5 conduit, use an ABS-08 Pg13.5 connector or an ABS-12 Pg13.5 connector (manufactured by Nippon Flex).
- Use a connector (SC Series, sold separately) suitable for the outer diameter of the cable.



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