

# User's Manual

## Model 701921 Differential Probe for the DL Series

Thank you for purchasing the Differential Probe (Model 701921) for the DL Series. To ensure correct use, please read this manual thoroughly before beginning operation. After reading the manual, keep it in a convenient location for quick reference whenever a question arises during operation.

Contact information of Yokogawa offices worldwide is provided on the following sheet.

- PIM113-01Z2 List of worldwide contacts

8th Edition: May 2018 (YMI)

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Printed in Japan

# YOKOGAWA

IM 701921-01E  
8th Edition

### The Following Symbols are Used in this Manual.



Improper handling or use can lead to injury to the user or damage to the instrument. This symbol appears on the instrument to indicate that the user must refer to the user's manual for special instructions. The same symbol appears in the corresponding place in the user's manual to identify those instructions. In the manual, the symbol is used in conjunction with the word "WARNING" or "CAUTION."

#### WARNING

Calls attention to actions or conditions that could cause serious or fatal injury to the user, and precautions that can be taken to prevent such occurrences.

#### CAUTION

Calls attentions to actions or conditions that could cause light injury to the user or damage to the instrument or the user's data, and precautions that can be taken to prevent such occurrences.

#### French

#### AVERTISSEMENT

Attire l'attention sur des gestes ou des conditions susceptibles de provoquer des blessures graves (voire mortelles), et sur les précautions de sécurité pouvant prévenir de tels accidents.

#### ATTENTION

Attire l'attention sur des gestes ou des conditions susceptibles de provoquer des blessures légères ou d'endommager l'instrument ou les données de l'utilisateur, et sur les précautions de sécurité susceptibles de prévenir de tels accidents.

#### Note

Calls attention to information that is important for proper operation of the instrument.

### Safety Precautions

This product is designed to be used by a person with specialized knowledge.

Make sure to comply with the safety precautions mentioned hereafter when handling the probe.

YOKOGAWA assumes no responsibility for any consequences resulting from failure to comply with these safety precautions. Also, read the User's Manual of the measuring instrument thoroughly so that you are fully aware of its specifications and handling, before starting to use the probe.

This manual is part of the product and contains important information. Store this manual in a safe place close to the instrument so that you can refer to it immediately. Keep this manual until you dispose of the instrument.

#### The following symbols are used on this instrument.



Handle with care. Refer to the user's manual or service manual. This symbol appears on dangerous locations on the instrument which require special instructions for proper handling or use. The same symbol appears in the corresponding place in the manual to identify those instructions.



Risk of electric shock

#### French



À manipuler délicatement. Toujours se reporter aux manuels d'utilisation et d'entretien. Ce symbole a été apposé aux endroits dangereux de l'instrument pour lesquels des consignes spéciales d'utilisation ou de manipulation ont été émises. Le même symbole apparaît à l'endroit correspondant du manuel pour identifier les consignes qui s'y rapportent.



Risque de choc électrique

**Make sure to comply with the following safety precautions in order to prevent accidents such as an electric shock which impose serious health risks to the user and damage to the instrument.**



#### WARNING

##### Grounding of the measuring instrument

The protective grounding terminal of the measuring instrument must be connected to ground.

##### Connecting the object of measurement

Make sure to avoid an electric shock when connecting the probe to the object of measurement. Do not remove the probe from the measuring instrument after the object of measurement is connected.

##### Do not operate with suspected failures

If you suspect that there is damage to this probe, have it inspect by a service personnel.

##### Observe maximum working voltage

To avoid any injury, do not use the probe above 1000 V<sub>peak</sub> between each input lead and earth or between the two inputs.

This voltage rating applies to both 1/10 and 1/100 settings.

##### Must be grounded

This probe must be grounded with the BNC shell and an auxiliary grounding terminal, through the grounding conductor of the power cord of the measuring instrument or other appropriate grounding conductor. Before making connections to the input terminals of the product, ensure that the output connector is attached to the BNC connector of the measuring instrument and the auxiliary grounding terminal is connected to a proper ground, while the measuring instrument is properly grounded.

##### Do not operate in wet/damp conditions

To avoid electric shock, do not operate this probe in wet or damp conditions.

##### Do not operate in explosive atmosphere

To avoid injury or fire hazard, do not operate this probe in an explosive atmosphere.

##### Avoid exposed circuitry

To avoid injury, remove jewelry such as rings, watches, and other metallic objects. Do not touch exposed connections and components when power is present.

##### Do not disassemble or modify

Do not disassemble or modify the product. YOKOGAWA assumes no liability if you disassemble or modify the product.

##### Damaged Signal Cable

If the signal cable is torn and the inner metal is exposed or if a color different from the outer sheath appears, stop using the cable immediately.



#### CAUTION

##### Maximum input voltage

Do not apply any voltages exceeding the maximum input voltage to the probe.

##### Correct use of the power supply

Power the probe with either 4 AA dry cells, a 6 VDC/200 mA or 9 VDC/150 mA external power supply, or by connecting the probe's power cable to a probe power supply terminal on a DL series measuring instrument or to the 700938 or 701934. Operating the probe under a power supply greater than the voltage specified above may cause damage to the instrument.

##### Connecting the external power supply to the probe

Always turn OFF the probe's power switch when connecting or disconnecting the external power supply. Also, do not install the dry cells when using an external power supply.

##### Conditions of use

This product has not been designed or manufactured for applications in which high reliability is required over a long time period.

##### Operating environment limitations

This product is a Class A (for industrial environments) product. Operation of this product in a residential area may cause radio interference in which case the user will be required to correct the interference.

#### French



#### AVERTISSEMENT

##### Mise à la terre de l'instrument de mesure

S'assurer de connecter la mise à la terre protectrice de l'instrument de mesure.

##### Connexion de l'objet de la mesure

S'assurer d'éviter un choc électrique lors de la connexion de la sonde à l'objet de la mesure. Ne pas retirer la sonde de l'instrument de mesure après avoir connecté l'objet de la mesure.

##### Ne pas utiliser en cas de défaillances suspectées

Si vous suspectez que la sonde est endommagée, contactez votre revendeur ou représentant commercial YOKOGAWA.

##### Respecter la tension d'entrée maximum

Ne pas appliquer une tension dépassant 1000 V (c.c. + crête c.a.) entre un fil d'entrée et la terre ou entre deux fils d'entrée. La tension d'entrée maximum est de 1000 V (c.c. + crête c.a.) sans tenir compte de l'atténuation utilisée, 10:1 ou 100:1.

##### Doit être mis à terre

Cette sonde doit être mise à terre avec le connecteur BNC et le connecteur de terre auxiliaire du cordon d'alimentation de l'instrument de mesure ou d'un autre conducteur de mise à la terre approprié. Avant d'effectuer les connexions aux bornes d'entrée du produit, vérifiez que le connecteur de sortie est connecté au connecteur BNC de l'instrument de mesure et que la borne de mise à la terre auxiliaire est connectée à une mise à la terre appropriée.

##### Ne pas utiliser dans des conditions humides

Afin d'éviter un choc électrique, ne pas utiliser cette sonde dans des conditions humides."

##### Ne pas utiliser dans une atmosphère explosive

Afin d'éviter des risques de blessures ou d'incendie, ne pas utiliser cette sonde dans une atmosphère explosive.

##### Éviter les circuits exposés

Afin d'éviter des blessures, retirer les bijoux comme les bagues, montres et autres objets métalliques. Ne pas toucher les connexions et les composants exposés après mise sous tension.

##### Ne pas démonter ou modifier

Ne pas démonter ou modifier le produit. YOKOGAWA se dégage de toute responsabilité si vous démontez ou modifiez le produit.

##### Câble de signal endommagé

Si le câble de signal est déchiré et que le métal intérieur est exposé ou si une couleur différente de la gaine externe est visible, arrêter immédiatement d'utiliser ce câble.



#### ATTENTION

##### Tension d'entrée maximum

Ne pas appliquer à la sonde de tension dépassant la tension d'entrée maximum.

##### Utilisation adéquate de l'alimentation

Alimenter la sonde avec 4 piles sèches AA, avec une alimentation externe 6 VDC/200 mA ou 9 VDC/150 mA, ou en connectant le câble d'alimentation de la sonde à une borne d'alimentation sur un instrument de mesure série DL ou au 700938 ou 701934. L'utilisation de la sonde sous une alimentation supérieure à la tension spécifiée ci-dessus peut endommager l'instrument.

##### Connexion de l'alimentation externe à la sonde

Toujours éteindre l'interrupteur d'alimentation de la sonde lors de la connexion ou de la déconnexion de l'alimentation externe. En outre, n'installez pas les piles sèches lorsque vous utilisez une alimentation externe.

##### Conditions d'utilisation

Ce produit n'est pas conçu ou fabriqué pour des applications nécessitant une fiabilité élevée sur une longue période.

##### Limitations relatives à l'environnement opérationnel

Ce produit est un produit de classe A (pour environnements industriels). L'utilisation de ce produit dans un zone résidentielle peut entraîner une interférence radio que l'utilisateur sera tenu de rectifier.

### Waste Electrical and Electronic Equipment



#### Waste Electrical and Electronic Equipment (WEEE), Directive

(This directive is valid only in the EU.)

This product complies with the WEEE directive marking requirement. This marking indicates that you must not discard this electrical/electronic product in domestic household waste.

#### Product Category

With reference to the equipment types in the WEEE directive, this product is classified as a "Monitoring and control instruments" product.

When disposing products in the EU, contact your local Yokogawa Europe B.V. office. Do not dispose in domestic household waste.

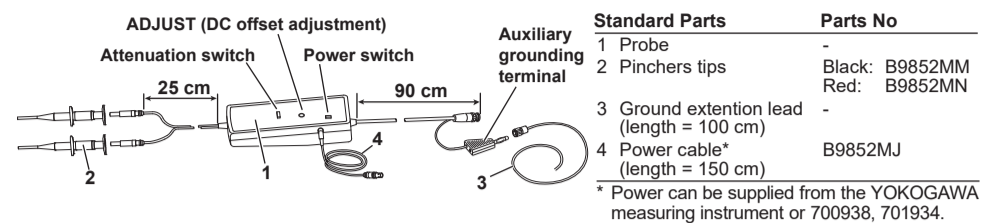
### Authorized Representative in the EEA

Yokogawa Europe B.V. is the authorized representative of Yokogawa Test & Measurement Corporation for this product in the EEA. To contact Yokogawa Europe B.V., see the separate list of worldwide contacts, PIM 113-01Z2.

## 1 Description

By using this device, oscilloscopes with single-ended input can be easily used as oscilloscopes with differential inputs.

## 2 Appearance



## 3 Installing/Replacing the Batteries

Shift the lid at the back side of the probe and install/replace the four dry cells. The dry cells are not installed on receipt of the instrument.

## 4 Operation

1. Install four AA cells. When using an external power supply, do not install the dry cells. Supply power only through the external power supply.
2. Simply plug-in the BNC output connector to the vertical input of an oscilloscope, and connect the auxiliary grounding terminal to a proper ground. If necessary, use a ground extension lead.
3. Select the proper range setting. For higher resolution and less noise when measuring signals below 70 V, switch the attenuation to 1/10. Otherwise, set the attenuation to 1/100 when measuring signals above 70 V.
4. If the offset voltage is large, short the top of input leads, and turn the ADJUST variable resistor (DC voltage adjustment) using a flat-head screwdriver to adjust the offset voltage.
5. Connect the input to the circuits under measurement.



### WARNING

- To protect against electric shock the ground side of the output cable (the shielded side of the BNC connector) must be grounded.
- Make sure to avoid an electric shock when connecting the probe to the object of measurement. Do not remove the probe from the measuring instrument after the object of measurement is connected.
- When disconnecting the probe BNC output connector, first turn OFF the power to the circuit under measurement. Then, disconnect the probe from the high voltage parts of the circuit under measurement.
- When replacing batteries or connecting an external power supply, first turn OFF the power to the circuit under measurement. Then, remove the input lead from the circuit under measurement.



### CAUTION

- This probe is to carry out differential measurement between two points on the circuit under measurement. This probe is not for electrically insulating the circuit under measurement and the measuring instrument.
- Use a soft cloth to clean the dirt. Prevent damage to the probe. Avoid immersing the probe, using abrasive cleaners, and using chemicals contains benzene or similar solvents.

## French



### AVERTISSEMENT

- Pour éviter les chocs électriques, la mise à la terre du câble de sortie (côté blindé du connecteur BNC) doit être effectuée.
- S'assurer d'éviter un choc électrique lors de la connexion de la sonde à l'objet de la mesure. Ne pas retirer la sonde de l'instrument de mesure après avoir connecté l'objet de la mesure.
- Lors de la déconnexion du connecteur de sortie BNC de la sonde, mettre d'abord HORS tension le circuit faisant l'objet de la mesure. Puis déconnecter la sonde des parties à haute tension du circuit faisant l'objet de la mesure.
- Lors du remplacement des piles ou de la connexion d'une alimentation externe, coupez d'abord l'alimentation du circuit sous tension. Ensuite, retirez le câble d'entrée du circuit à mesurer.



### ATTENTION

- Cette sonde doit effectuer une mesure différentielle entre deux points sur le circuit à mesurer. Cette sonde n'est pas destinée à isoler électriquement le circuit à mesurer et l'instrument de mesure.
- Utiliser un chiffon doux pour nettoyer la sonde. Faire attention de ne pas casser la sonde. Ne pas immerger la sonde dans un liquide ni utiliser de nettoyants abrasifs sur la sonde. Ne pas utiliser de benzène ni d'autres solvants sur la sonde.

## Note

- Connect the BNC connector to the input terminal of the oscilloscope and for two point measurement (differential measurement), connect both input leads. Because the performance declines in case you carry out measurements with only one input lead connected, make sure to always connect both.
- Accurate measurement may not be possible near objects with strong electric fields (such as cordless equipment, transformers, or circuits with large currents).
- Before use, flip the attenuation switch back and forth several times. The switch's electrical contacts can weaken if not used for long periods of time.
- To take accurate measurements, we recommend that you calibrate the probe once a year.

## 5 Specifications

Item	Specifications									
Frequency bandwidth <sup>1, 2</sup>	DC to 100 MHz (-3 dB)									
Input type	Balancing difference input									
Attenuation ratio	switched ratios of 10:1 and 100:1									
Output offset voltage <sup>2, 3</sup>	±7.5 mV (value after the ADJUST variable resistor is adjusted)									
Input resistance/capacity <sup>4</sup>	4 MΩ/13 pF each side to ground									
Differential allowable voltage (between + - terminal)	At 10:1 attenuation, ±70 V (DC + ACpeak) At 100:1 attenuation, ±700 V (DC + ACpeak)									
Max common mode voltage	±700 V (DC + ACpeak)									
Max input voltage(to ground) <sup>5</sup>	±1000 V (DC + ACpeak)									
CMRR (typical) <sup>1, 4</sup>	60 Hz: less than -80 dB; 20 kHz: less than -60 dB									
Output voltage <sup>1, 2</sup>	±7 V (DC or ACpeak) Value when the probe is used in combination with a measuring instrument whose input resistance is 50 kΩ or higher									
Output impedance	Using 1 MΩ input system oscilloscope									
Gain accuracy <sup>1, 2, 3</sup>	<table border="1"> <thead> <tr> <th>Attenuation</th> <th>10:1</th> <th>100:1</th> </tr> </thead> <tbody> <tr> <td>Common mode voltage</td> <td>≤ 50 V and ≥ -50 V</td> <td>±2%</td> </tr> <tr> <td>&gt; 50 V or &lt; -50 V</td> <td>±3%</td> <td>±2%</td> </tr> </tbody> </table>	Attenuation	10:1	100:1	Common mode voltage	≤ 50 V and ≥ -50 V	±2%	> 50 V or < -50 V	±3%	±2%
Attenuation	10:1	100:1								
Common mode voltage	≤ 50 V and ≥ -50 V	±2%								
> 50 V or < -50 V	±3%	±2%								
Operating environment	5 to 40°C, 25 to 85% (no condensation)									
Storage environment	-30 to 60°C, 25 to 85% (no condensation)									
Operating altitude	2000 m or less									
Operating altitude	3000 m or less									
Power requirements <sup>6</sup>	Internal battery: four dry cells (AA, R6) External power supply: 6 VDC/200 mA or more, or 9 VDC/150 mA or more, with a positive center pin. Power is supplied through the dedicated cable B9852MJ from a YOKOGAWA measuring instrument's probe power supply terminal or from a 700938 or 701934 probe power supply.									
Cell life time	In continuous duty, approx. 7 hours (when using the alkali dry cells)									
Warm-up time	At least 30 minutes									
Dimensions	207 mm × 83 mm × 38 mm (excluding connector and cable)									
Weight	Approx. 530 g (excluding the dry cells)									
Withstanding voltage	2000 VACrms (between input terminal and BNC-ground), for 5 minutes									
Safety standards	Complying standards EN61010-031 Measurement category III <sup>7</sup> : 700 V (DC + ACpeak) Pollution degree 2 <sup>8</sup>									
Emission	Complying standards EN61326-1 Class A EN55011 Class A, Group 1 EMC standards of Australia and New Zealand EN55011 Class A, Group 1 This product is a Class A (for industrial environment) product. Operation of this product in a residential area may cause radio interference in which case the user is required to correct the interference.									
Immunity	Complying standards EN61326-1 Table 1									

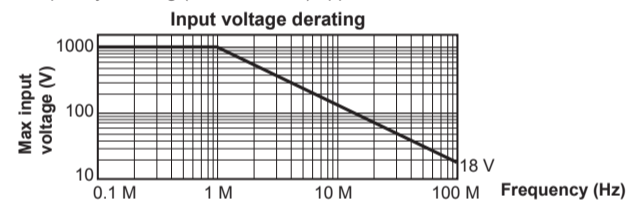
1 When the power supply voltage from the dry cells is 5 V or more, or when using an external power supply.

2 Ambient temperature 23±5°C, humidity 55% ± 10% RH, 30 minutes after the power is turned on.

3 The accuracy is the total of the gain accuracy and offset voltage.

4 Typical values are typical or mean values. They are not strictly guaranteed.

5 Frequency derating (load reduction) applies.



6 When the capacity of dry cells goes down LED blinks. In such a case, replace the dry cells. Also, do not install the dry cells when using an external power supply.

7 This equipment is for measurement category III (CAT III). Do not use it with measurement category IV (CAT IV). CAT III applies to measurement of the distribution level, that is, building wiring, fixed installations. CAT IV applies to measurement of the primary supply level, that is, overhead lines, cable systems, and so on.

8 Pollution degree applies to the degree of adhesion of a solid, liquid, or gas which deteriorates withstand voltage or surface resistivity. Pollution degree 2 applies to normal indoor atmospheres (with only non-conductive pollution).