

# General Specifications

## Model DO71 and DO72 Optical dissolved oxygen sensors

GS 12J06J01-00EN-P

### General

The dissolved oxygen sensors are based on optical technology. Dissolved oxygen measurement is carried out in various industries and applications where accurate measurement & control is required to improve or optimize the process.

The DO71 and DO72 Series combine an optical sensor and electro-optical module in one probe. The sensor is integrated in a stainless-steel cap that is screwed to the probe housing, so a used oxygen exchange sensor cap can easily be replaced.

These extremely robust probes can be installed in various applications. The Optical Sensors have a fast response time & good long-term stability. These sensors are prone to less maintenance and overall cost of ownership is low.

Sensors are available for different oxygen ranges, wide and trace range oxygen measurements, ideally suited for oxygen monitoring in industrial applications or for W&WW where they must stand harsh environmental conditions.

As a digital interface RS485 is used and can be connected directly to the FLXA402 4-Wire converter or other MODBUS hosts. Converter is designed to combine the superior functionality and ease of use from the Yokogawa FLXA series with the digitization of the future.



### Features

DO Sensor with Long-term Stability and Short Stabilization Time

- Wide and trace measuring range
- Simple integration at measurement site with PG 13.5 fitting
- Communication via RS485 (Modbus RTU)
- Sensor configuration/calibration via FLXA402 or SENCOMct commissioning tool
- A sensor cap that is easily replaceable
- Waterproof
- Ideal for aquaculture and environment research

Refer to GS12A01F01-01EN for FLXA402G 4-Wire Converter, GS 12B06W02-04E-E for WU10 cables and GS 12J05C02-00E for Holders.

## GENERAL SPECIFICATIONS DO71 SENSOR

### Measuring elements:

Optical dissolved oxygen sensor in probe body and an oxygen exchange cap (OEC).

### Electrical specifications

Output signal: Bi-directional digital comms.  
Physical layer: RS485  
Protocol: MODBUS, RTU mode  
Data rate: Default 19200 b/s  
(8, No Parity, 2 stop bits)  
Power supply: +7 ... +30 VDC  
Max. 1W in active mode  
< 150mW in stand-by mode  
Cable: Permanent, shielded,  
4 wire (0.14mm<sup>2</sup>)

### Mechanical specifications

Case/OEC: Stainless-steel (SS316L)  
OEC sealings / material: O-ring EPDM  
OEC sealing dimensions: ID 9x1 (0.35x0.03) mm (inch)  
Housing size: 106x12 mm (4.17x0.47) (LxDiam.)  
Weight: Min. 100g (0.22 lbs)  
Sensor mounting system: Adapter set  
Cable: Permanent shielded cable,  
Stripped wire end (5 mm) for  
terminal connection

### Performance

(at 20°C (68°F), 960-980 hPa (13.92 to 14.21 psi), humidified gas mixtures, after performing a calibration)

Measuring range: 0 to 22,5 mg/L O<sub>2</sub>  
Accuracy: ± 0.05 mg/L or 1% of reading  
whichever greater  
Repeatability ± 0.05 mg/L or 1% of reading  
whichever greater  
Temperature accuracy: ≤ 1.0°C (≤ 1.8°F)<sup>1</sup>  
Operating temperature: 0 to 50 °C (0 to 122°F)  
Mechanical pressure: 0 to 3 Barg (0 to 43.5 psi)  
(overpressure, when PVC adapter  
is used);  
0 to 0.990 Barg (0 to 14.36 psi)  
(underpressure)  
Flow rate: 2m/sec or less<sup>2</sup>  
Response time t<sub>90</sub>: ≤ 90 sec.<sup>3</sup>

### Shipping details

Package size (LxWxH)  
for cable length up to 10 meters (32.80 ft)  
Approx. 300x100x75 mm  
(11.8x3.9x3.0 inch)

for cable length 20 meters (65.61 ft)  
Approx. 360x220x105 mm  
(14.2x8.7x4.1 inch)

Weight (max.) Sensor	Sensor incl cable	Total package
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DO71 3m (9.84 ft)	100.4 g (0.22 lbs)	260 g (0.57 lbs)
DO71 5m (16.40 ft)	138 g (0.30 lbs)	297 g (0.65 lbs)
DO71 10m (32.80 ft)	232 g (0.51 lbs)	391 g (0.86 lbs)
DO71 20m (65.61 ft)	420 g (0.92 lbs)	615 g (1.35 lbs)
OEC K1531CA	6 g (0.01 lbs)	147 g (0.32 lbs)

## GENERAL SPECIFICATIONS DO72 SENSOR

### Measuring elements:

Optical dissolved oxygen sensor in probe body and an oxygen exchange cap (OEC).

### Electrical specifications

Output signal: Bi-directional digital comms.  
Physical layer: RS485  
Protocol: MODBUS, RTU mode  
Data rate: Default 19200 b/s  
(8, No Parity, 2 stop bits)  
Power supply: +7 ... +30 VDC  
Max. 1W in active mode  
< 150mW in stand-by mode  
Cable: WU10 with one side wired pins  
and the other side VarioPin  
connector

### Mechanical specifications

Case/OEC: Stainless Steel  
(1.4435), Ra<0.4µm  
OEC sealings / material: O-ring EPDM  
OEC sealing dimensions: ID 9x1 (0.35x0.03) mm (inch)  
Shaft sealing mm (inch): ID 11x3 (0.43x0.11)  
Housing size (LxDiam.): 120x12 mm (4.17x0.47)  
Weight: Min. 100g (0.22 lbs)  
Sensor mounting system: Sensor PG13.5 thread  
Sensor connection: VarioPin, 8 pins

### Performance

(at 20°C (68°F), 960-980 hPa (13.92 to 14.21 psi), humidified gas mixtures, after performing a calibration)

*DO72-W Wide measuring range sensor characteristics*  
Measuring range: 0 – 22.5 mg/L O<sub>2</sub>  
Accuracy: ± 0.05 mg/L or 1% of reading  
whichever greater  
Repeatability ± 0.05 mg/L or 1% of reading  
whichever greater  
Temperature accuracy: ≤ 1.0°C (≤ 1.8°F)<sup>1</sup>

*DO72-T Trace measuring range sensor characteristics*  
Measuring range: 0 - 2 mg/L O<sub>2</sub>  
Accuracy: ± 3 ppb or 3% of reading  
whichever greater  
Repeatability ± 3 ppb or 3% of reading  
whichever greater  
Temperature accuracy: ≤ 1.0°C (≤ 1.8°F)<sup>1</sup>

### DO72W/T Sensor Common Characteristics

Operating temperature: 0 °C to + 50 °C (0 to 122°F)  
Mechanical pressure: 0 to 12 Barg (0 to 174 psi)  
(overpressure);  
0 to 0.990 Barg (0 to 14.36 psi)  
(underpressure)  
Flow rate 2 m/sec or less<sup>2</sup>  
Response time t<sub>90</sub> ≤ 90 sec.<sup>3</sup>

### Shipping details

Package size (LxWxH) Approx. 300x100x75 mm  
(11.8x3.9x3.0 inch)

Weight max Sensor	Sensor	Total package
DO72-W/-T	108 g (0.23 lbs)	272 g (0.59 lbs)
OEC K1531CB, K1531CC	6 g (0.01 lbs)	147 g (0.32 lbs)

## **DO71&DO72 sensor common specification**

### **Environmental conditions**

Storage temperature: -10 to +70°C (-14 to 158°F)<sup>4</sup>

Ingress protection: IPX8 according EN 60529:1991/A1:2000/A2:2013  
O-ring of OEC must be replaced once a year

Installation: Overvoltage Category I  
Pollution Degree 2  
Altitude 2000 m or less  
(6561.68 feet)

### **Regulatory compliance**

#### **CE**

Directive: 768/2008/EC  
CE-mark has been affixed on the product in 2021 for the first time

#### **UKCA**

UKCA-mark has been affixed on the product in 2021 for the first time

#### **EMC**

Directive: 2014/30/EU  
Standards: EN 61326-1: IEC 61326-1:  
Table 2 (for use in industrial locations)  
EN 55011 CISPR11 Group 1, Class B (for use in domestic establishments)  
Approvals: ACMA

#### **China**

GB30439

#### **LVD**

Directive: 2014/35/EU  
Standards: NEN-EN-IEC 61010-1  
NEN-EN-IEC 61010-2-030

#### **RoHS**

Directive: 2015/863/EU  
Commission Delegated Directive (EU) 2015/863 amending Annex II as regards the list of restricted substances, and by applying Annex IV as regards the application of sensors, detectors, and electrodes, by applying the following standards:

EN-IEC 63000

Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances.

Note 1: Temperature measurement with 22k NTC element for process compensation only

Note 2: Hi flow rate can influence sensor performance

Note 3: From air saturated water to a freshly prepared 1% sodium sulfite solution containin CoCl<sub>2</sub> as catalyst)

Note 4: Storage stability of the oxygen exchange cap is 5 years if stored under dark and dry conditions at 20°C (68°F)

## MODEL AND SUFFIX CODES

**Table 1: DO71 MS Code**

Model	Suffix code	Description
<b>DO71</b>		Optical Dissolved Oxygen sensor
Range	<b>-W</b>	Wide range (0 – 22,5 mg/L)
Insert length	<b>-106</b>	106 mm
Type	<b>-AA</b>	General purpose
Connection type	<b>-03</b>	Permanent cable, 3 meters
	<b>-05</b>	Permanent cable, 5 meters
	<b>-10</b>	Permanent cable, 10 meters
	<b>-20</b>	Permanent cable, 20 meters
Region	<b>-N</b>	Non-specific
Oxygen Exchange Cap	<b>-Y</b>	DO71 OEC
Option		

**Table 2: DO71 Spare part list**

Part No.	Part name	Description
K1531CA	OEC	Oxygen Exchange CAP DO71-W*
K1531BA	Sealings	O-RINGS EPDM 9x1 (6 PCS.) for OEC
K1500BV		O-RINGS EPDM 11X3 (6 PCS.)
K1500BZ		O-RINGS VITON 11X3 (6 PCS.)
K1500GR		O-RINGS SILICON 10.77x2.62 (8PCS)
K1524AA		O-RING SIL. 10.77x2.62&SLIDE RING (1PC)
K9679WJ		Gasket (lifetime parts for K9679WA, WB and WC)
K1531JA	Adapters	Adapter for mounting in Yokogawa fitting
K9679WA		Adapter for submersion type holder DOX8HS (stainless steel) (/S3)
K9679WB		Adapter for submersion type holder DOX8HS (polypropylene) (/PP)
K9679WC		Adapter for float type holder PB350G, PB360G (polypropylene) (/FPP)
L9920BR	Others	Zero adjusting reagent; Sodium sulfite (Na2SO3) 500 g

**Table 3: DO72 MS Code**

Model	Suffix code	Description
<b>DO72</b>		Optical Dissolved Oxygen sensor
Range	<b>-T</b>	Trace range (0 – 2 mg/L)
	<b>-W</b>	Wide range (0 – 22,5 mg/L)
Insert length	<b>-120</b>	120 mm
Type	<b>-AA</b>	General purpose
Connection type	<b>-VP</b>	VarioPin connector
Region	<b>-N</b>	Non-specific
Oxygen Exchange Cap	<b>-Y</b>	DO72 OEC <sup>5</sup>
Option		

Note 5: OEC is dependent on range type.

**Table 4: DO72 Spare part list**

Part No.	Part name	Description
K1531CB	OEC	Oxygen Exchange CAP DO72-W*
K1531CC		Oxygen Exchange CAP DO72-T*
K1531BA	Sealings	O-RINGS EPDM 9x1 (6 PCS.) for OEC
K1500BV		O-RINGS EPDM 11X3 (6 PCS.)
K1500BZ		O-RINGS VITON 11X3 (6 PCS.)
K1500GR		O-RINGS SILICON 10.77x2.62 (8PCS)
K1524AA		O-RING SIL. 10.77x2.62&SLIDE RING (1PC)
K1523JA	Adapters	Adapter Pg13.5 in F*40 PPO
K1523JC		Adapter Pg13.5 in F*40 SS
K1520JN		Adapter M25x1.5 - PG13.5 PVC
K1520JP		Adapter M25x1.5 - PG13.5 RVS
K1500DV		Adapter M25x1.5 - PG13.5 PVDF
K1523JB		Adapter PG13.5 to ¾"NPT PPO
K1523JD		Adapter PG13.5 to ¾"NPT SS
K9148NA		Adapter for mounting PG13.5-sens. For submersion type holder DOX8HS (stainless steel) (/S3)
K9148NB		Adapter for mounting PG13.5-sens. For submersion type holder DOX8HS (polypropylene) (/PP)
K9679CA		For float type holder PB350G, PB360G (polypropylene) (/FPP)
L9920BR	Others	Zero adjusting reagent; Sodium sulfite (Na2SO3) 500 g

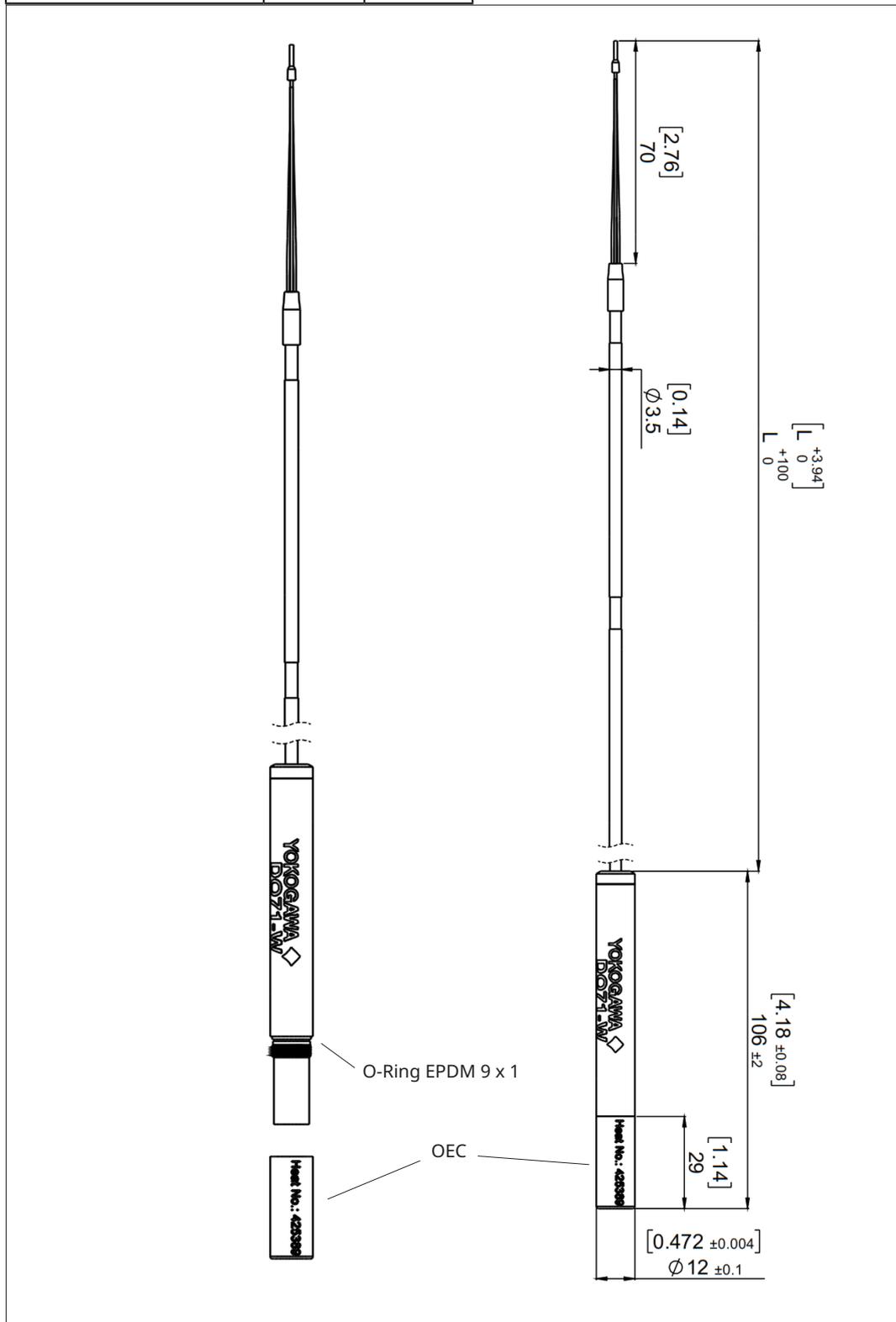
\* The recommendable exchange cycle of a optical exchange cap is 1 time in 12 months.

## DIMENSIONS

The DO71 sensor is provided with in four cable lengths as described in table 5. Sensor and O-ring dimensions are described in figure 1.

**Table 5:** Sensor model code and cable length

Model code	L (m)	L (ft)
DO71-W-106-AA-03-N-Y	3	10
DO71-W-106-AA-05-N-Y	5	16,5
DO71-W-106-AA-10-N-Y	10	33
DO71-W-106-AA-20-N-Y	20	66



**Figure 1.** DO71 dimensions in mm [inches]

## DO72 sensor

The DO72 sensor is provided with Vario Pin connector for connection to WU10/WE10 connection cable. Sensor and O-ring dimensions are described in figure 2.

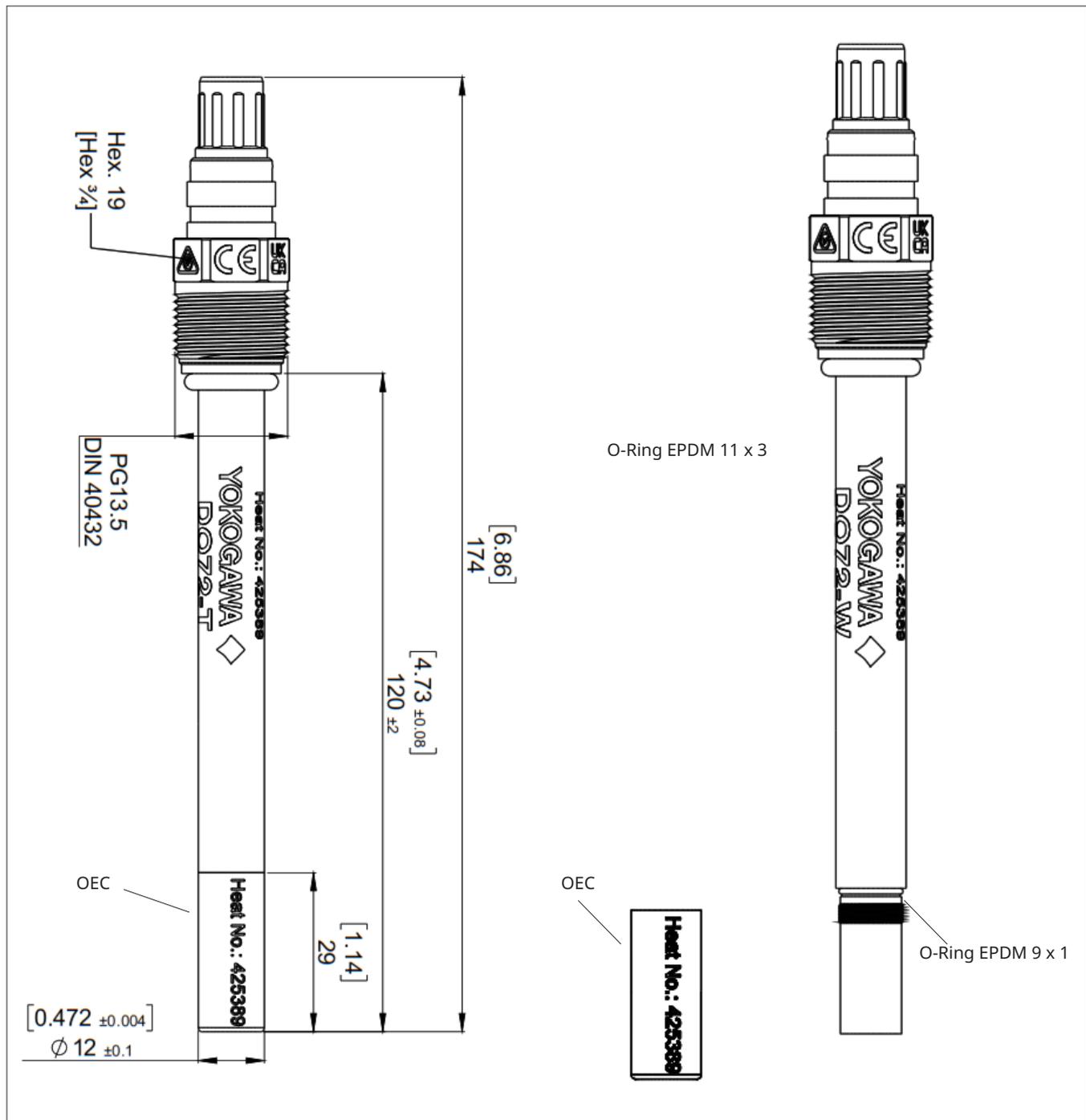
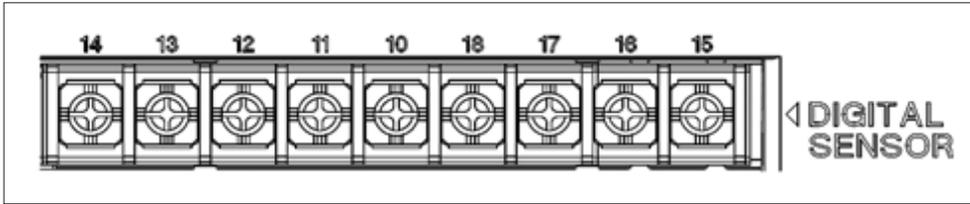


Figure 2. DO72-W and DO72-T dimensions in mm [inch]

## WIRING

DO71 Sensor connection to converter is delivered with permanent, shielded, 4 wire (0.14mm<sup>2</sup>) cable, stripped wire end (5 mm). DO72 Sensor can be connected using WU10/WE10 connection cable - terminal connection (Figure 3) and wiring numbering as described in table 6 for DO71 / table 7 for DO72.

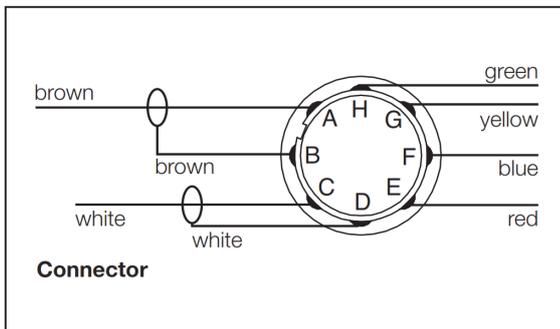
For information on DO71 and DO72 connection to FLXA402, refer to the Instruction manual for FLXA402 4-Wire Converter (IM12A01F01-02EN).



**Figure 3.** D6 module terminal assignment for DO71 dissolved oxygen sensor

**Table 6:** DO71 Pin terminal wiring numbering

Wire Pin no.	Wire color	Description
12	yellow	RS485 Data + (B)
11	green	RS485 Data - (A)
13	white	GND
10	brown 5 – 30 VDC	5 – 30 VDC
14	transparent	cable shield / probe body



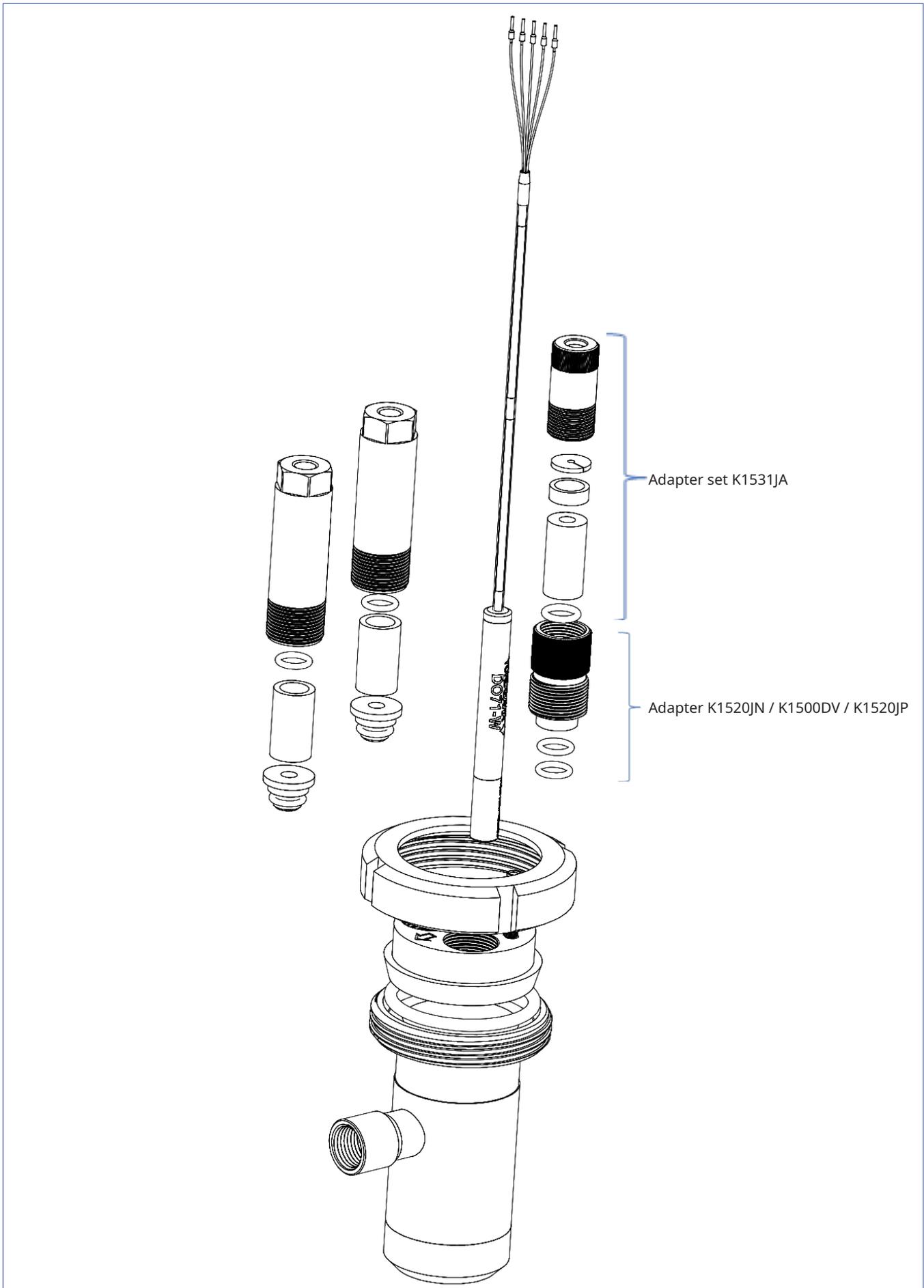
**Figure 4.** Connection diagram – WU10-V-D

**Table 7:** DO72 Pin terminal wiring numbering

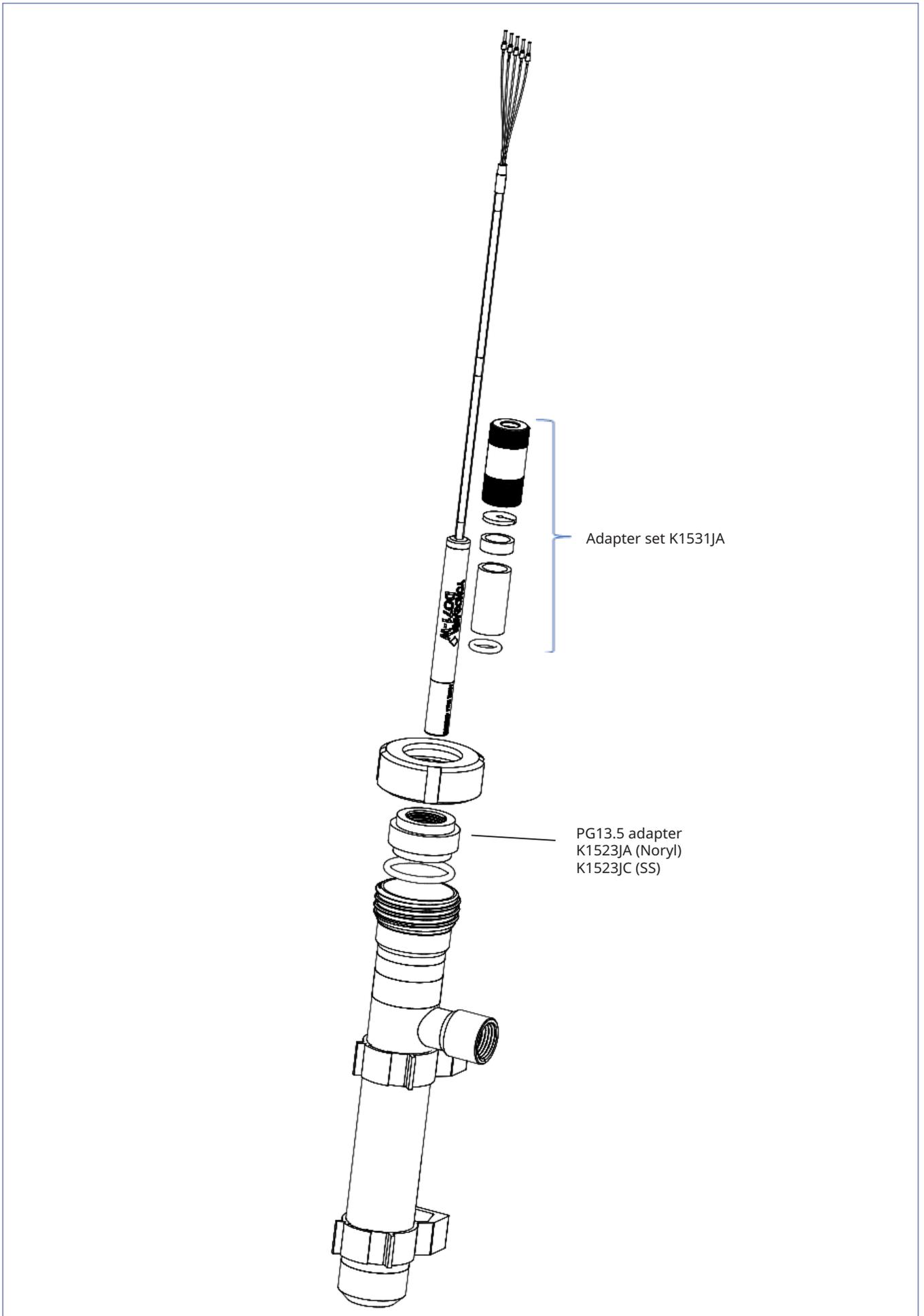
Wire Pin no.	VP pin	Wire color <sup>5</sup>	Description
11	G	Yellow	RS485 Data - (A)
12	H	Green	RS485 Data + (B)
13	D	White	GND
10	C	White	7 – 30 VDC
14	S	Black	cable shield / probe body

Note 5: DO72 cable wire coloring is different from DO71

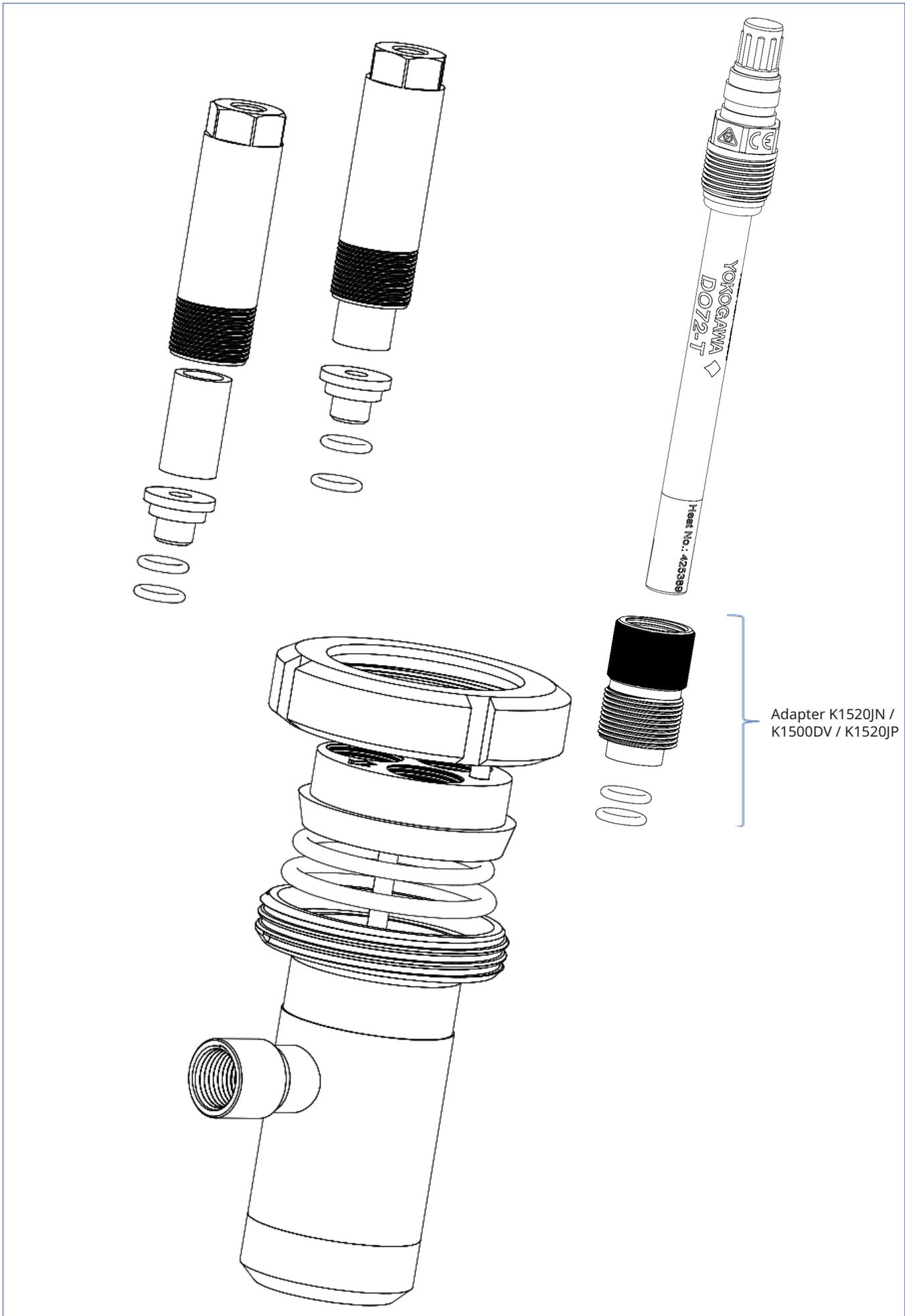
## Addendum 1: Typical installations



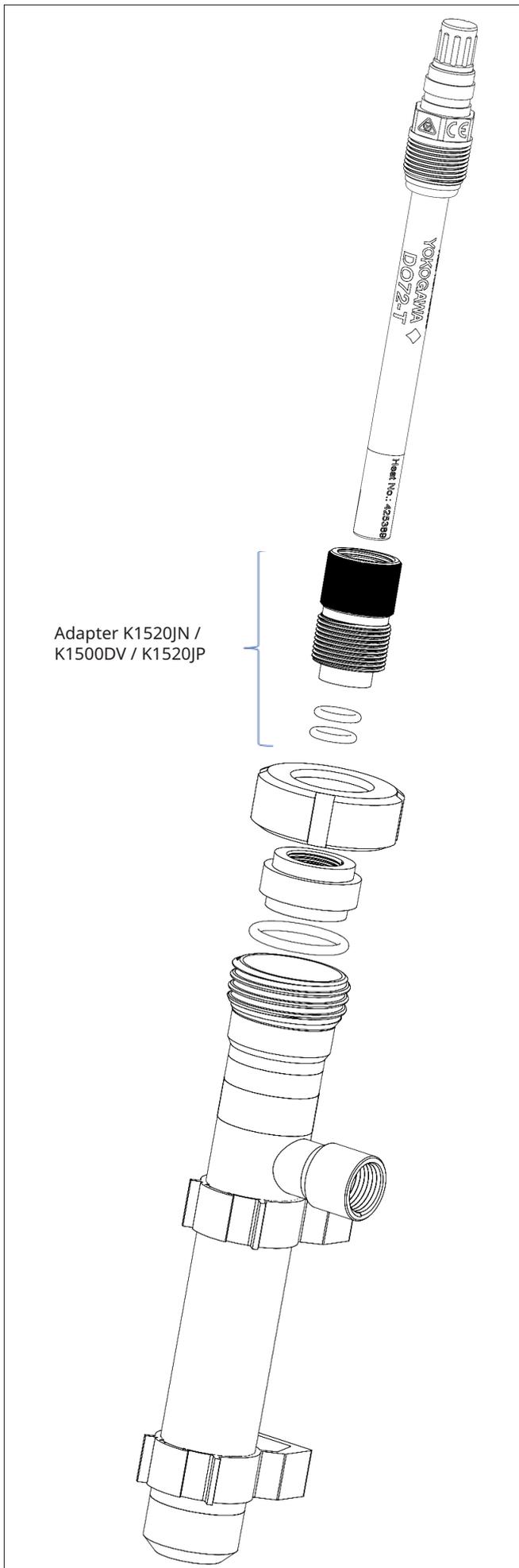
**Figure 5.** DO71 installation in Yokogawa FF20 fitting<sup>6</sup> using the adapter K1531JA sensor adapter set and adapter to fitting K1520JN, K1500DV or K1520JP



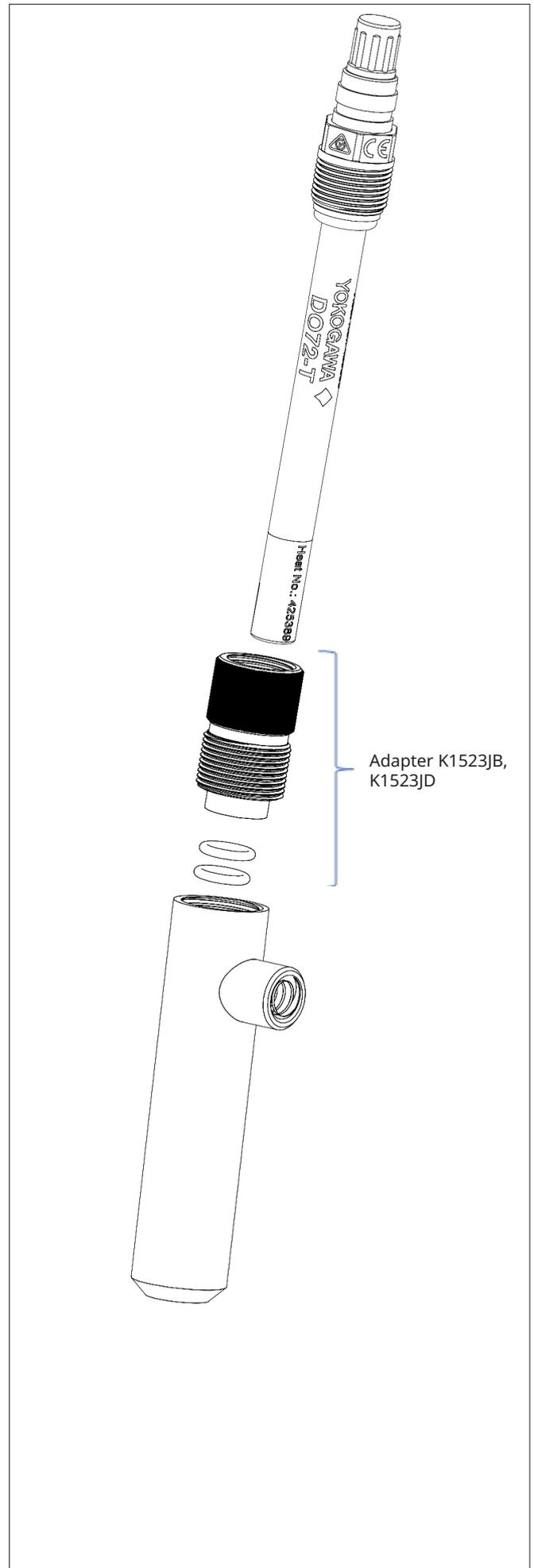
**Figure 6.** DO71 installation in Yokogawa FF40 fitting<sup>6</sup> using the adapter K1531JA sensor adapter set to fit in PG13.5 fitting adapter K1523JA (Noryl) K1523JC (SS)



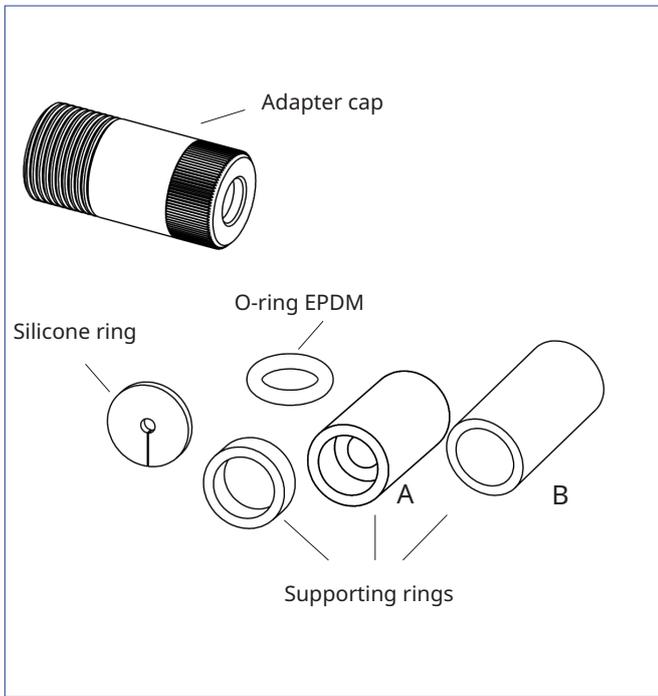
**Figure 7.** DO72 installation in Yokogawa FF20 fitting<sup>6</sup> using the adapter K1520JN, K1500DV or K1520JP



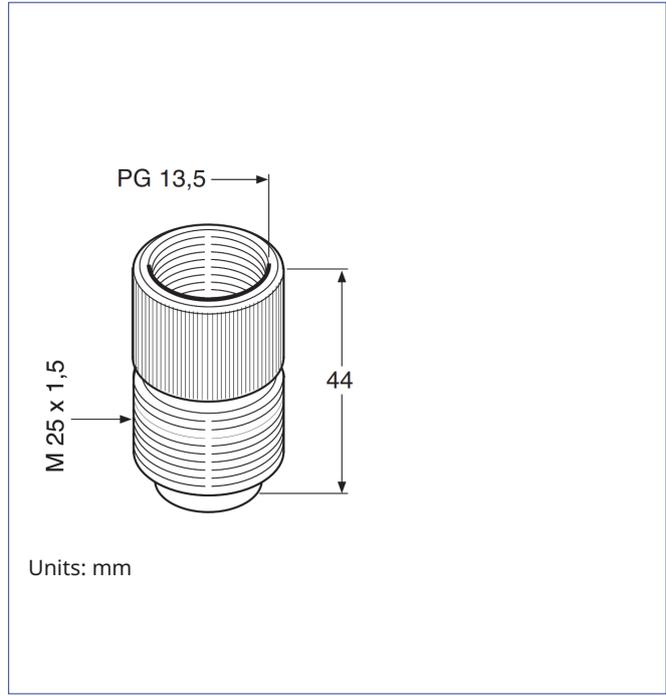
**Figure 8.** DO72 installation in FF40/FS40 fitting<sup>6</sup> using the adapter K1520JN, K1500DV or K1520JP



**Figure 9.** DO72 Installation in SC4A SS flow fitting<sup>6</sup> using the adapter K1523JB, K1523JD



**Figure 10.** Adapter set K1531JA



**Figure 11.** Adapter K1520JN (PVC-C), K1500DV (PVDF), K1520JP (SS)

Note 6: Depending on supporting ring used, A or B, and installation in FF20 or FF40 fitting, DO71 insertion length varies from 30 to 60mm. This is important to keep in mind to let sensor be in fluid stream. For details on fitting dimensions and options please refer to the respected fitting general specification sheet or instruction manual.

**Addendum 2: Available model codes**

**Table 8:** DO71 and DO72 available model codes

MS-code	DO71-W-106-AA-03-N-Y
	DO71-W-106-AA-05-N-Y
	DO71-W-106-AA-10-N-Y
	DO71-W-106-AA-20-N-Y
	DO72-W-120-AA-VP-N-Y
	DO72-T-120-AA-VP-N-Y

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