Instruction Manual

Models DO30/FD30/PB30
Sensors and Fittings
for Dissolved Oxygen

YOKOGAWA

IM 12J6K4-E-E
4th edition

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1. INTRODUCTION

1-1. General

The Yokogawa EXA Dissolved Oxygen analyser systems DO402G/DO202G(S) use a galvanic and polarographic cell to measure dissolved oxygen in water continuously.

These analyzer systems have an excellent performance, a fast initial indication, many useful functions and easy maintenance. This makes it a versatile instrument for many applications. The dissolved oxygen analyser systems can control activated sludge processes in sewage water treatment plants. It can be used to supervise water quality of rivers, lakes and ponds or fish farms.

1-2. Configuration of the dissolved oxygen analyser system

The EXA dissolved oxygen analyser system consists of a dissolved oxygen sensor, a fitting and the EXA DO converter. The galvanic DO30-sensor is placed in an immersion fitting with optional cleaning mechanism or in a floating ball holder. Both the immersion and floating ball versions are standard equipped with possibility for sensordiagnosis.

The galvanic sensor type needs no external voltage. The diaphragm can be cleaned and replaced easily. The distance between sensor and converter is bridged by cable lenghts of 3, 5, 10, 15 and 20 metres.

The polarographic sensor type needs external voltage which is supplied by the analyzer. The diaphragm can easily be cleaned and replaced.

The immersion fitting is available with or without a flange. For types without a flange, a mounting set and a jet cleaner are available as options.

The design of the floating ball holder ensures minimum user maintenance and includes a winch mounting mechanism. The holder is normally specified as a unit complete with sensor and cable.

FEATURES:

- Fast response time
- Easy replaceable cartridge type diaphragm
- Long term stability
- Sensor diagnosis for membrane integrity

2. UNPACKING AND CHECKING

Upon receipt of the goods, carefully inspect the shipping package for any evidence of damage. If the carton is damaged, notify the shipping agent and the sales organisation immediately.

If the shipping package is not damaged, remove the products and parts. Confirm that all items shown on the packing list are available and that the package does not contain any parts or acessories hidden between the shock absorbing fillers. Notify the sales organisation if items are missing.

3. WARRANTY AND SERVICE

Products and parts are warranted to be free from defects in workmanship and material under normal use and service for a period of typically twelve months from the date of shipment by manufacturer. The sales organisation has the possibility to deviate from this typical warranty period and the actual terms and conditions as specified in the sales order must be consulted. Damage caused by wear and tear, inadequate maintenance, corrosion and attack by chemical processes are excluded from this warranty coverage.
All defective goods need to be sent to the service of the sales organisation for repair or replacement and the returned material should be accompanied by a letter of transmittal, which should include the following information:

1. Part number, Model code and Serial number
2. Date and number of sales order
3. Length of time of service and type of service
4. Description of the faulty operation of the device and the circumstances of the failure
5. Pressure, temperature, process composition and all other process conditions or environmental circumstances which are related to the installation and possibly failure of the device
6. Statement as to whether warranty or non-warranty service is requested
7. Complete shipping and billing instructions for return of material and name, phone number of contact person that can be approached for further information.

The returned goods that have been in contact with process fluids must be detoxified and disinfected prior to shipment for the health and safety of our employees. Material Safety Data sheets must be included for all components of the processes in which the sensors/ fittings have been used.

The shipping address where to the goods have to be returned is specified on the original sales order or on the back page of this manual.

4. GENERAL SPECIFICATIONS

4-1. Sensor, Model DO30

Medium to be measured : Dissolved Oxygen

Measuring principle : Galvanic cell method

Measuring Range
- Minimum : 0-2.5 ppm
- Maximum : 0 to 20 ppm

Liquid operating conditions
- Temperature : 0 to 40 °C
- Pressure : 0 to 1 bar
- Flow Velocity : Minimum 5 cm/sec
- Response time : <60 sec

Temperature Compensator : Thermistor

Wetted materials : Hard PVC
Fluorinated polymer (FEP)
Stainless steel (SUS304)
Nitrile rubber
Soft PVC
Polycarbonate

Membrane : 25 or 50 µm

Shipping details
- Weight : Approx. 0.9 kg (with cable length of 5m)
  Weight of the sensor is approx. 0.1 kg
- Package size : 295 x 230 x 165 mm

Accessories
- Electrolyte for sensor (50 ml) 1 bottle
- Diaphragm, O-ring 3 sets
- Syringe for replacing electrolyte 1

Model and suffix code

Model	Suffix Code	Description
DO30		DO Sensor
Membrane type	-S25	25 µm
	-S50	50 µm
Cable length	-03	3 metre
	-05	5 metre
	-10	10 metre
	-15	15 metre
	-20	20 metre

4-2. Immersion fitting, Model FD30

Wetted materials
- Body & flange : Polyvinylchloride (PVC)
- O-rings : Silicone rubber
- Blanking plug : Ryton R4 (remove before use!)
- Conductive bushing : Brass

Temperature
- Minimum : -10 °C
- Maximum : +50 °C

Pressure : 2 bar max.

Immersion length : 0.5 to 2.0 m (10 cm steps)
When ordered as a subassembly (pipe length 00), a tube with PVC cement will be delivered with the holder

Weight
- Without flange : 1.35 kg + 0.2 kg per 0.5 metre
- With flange : 0.5 kg extra

Options
- Sensor/cable : See DO30
- Flexible conduit : PVC and Nylon
  Option /PH5 : 5 meter protection hose
  Option /PH10 : 10 meter protection hose
- Jet cleaner (Option /JC) : - Materials; PVC, Nylon, PVDF and PTFE
  - Temperature; As FD30
  - Pressure; As FD30
  - Immersion length; Nominal + 4 cm
- Mounting set (Option /MS1): Material; Galvanised steel

Model and Suffix code

Model	Suffix code	Option code	Description
FD30V27			Immersion Fitting PVC
Immersion length	-00 -□□		Pipe supplied by user Between 0.5 and 2.0 (in steps of 0.1m) Example: 06 = 0.6 m
Mounting flange	-FN -F1 -F2		No flange DIN DN50 PN10 ANSI 2" 150 lbs
Options	*A		Style A
Cable		/C05 /C10	5 metre 10 metre
Protection hose		/PH5 /PH10	5 metre 10 metre
Cell assembly		/S25 /S50	25 µm 50 µm
Jet Cleaner		/JC	*
Mounting set		/MS1	*

* Not available with flanged versions.

4-3. Floating ball fitting, Model PB30

Wetted materials : High impact polystyrene, PVC & Brass

Temperature : 0-40°C

Mounting bracket : Galvanised steel, for rail, or surface mounting

Sensor/cable : See DO30

Shipping details

- Weight : 12.5 kg Approx.
- Package size : 490 x 320 x 340 mm
- Main support arm : 2.5 m

Note:

The standard pipe used for PB30 has a 50 mm outer diameter. For $1^1/_2$" pipe it is necessary to use the $1^1/_2$" adapters delivered with the PB30-00.

Model and suffix code

Model	Suffix Code	Description
PB30		Floating ball fitting
Pipe length	-00	Pipe supplied by user
	-25	2.5 metre
Sensor type	-SNN	No sensor
	-S25	25 µm membrane
	-S50	50 µm membrane
Cable length	-00	No cable
	-05	5 metre
	-10	10 metre
	-15	15 metre
	-20	20 metre

5. INSTALLATION

5-1. General

It is important to have the point of measurement in a location that is representing the process composition.
Check whether the specifications of the sensor/fitting/holder fulfil the maximum occuring process conditions.
Install the fitting in a place where it can be maintained and calibrated safely and easily.
After installation of the sensor it may need several hours to stabilise readings.
Stabilisation can take up to 24 hours.

ATTENTION
Do not insert the fitting/holder into the process without the sensor mounted, to avoid the cable leads becoming wet.

5-2. Sensor assembly

The DO-sensor is packed with a disconnected cable. Before use the cable must be plugged onto the socket of the sensor body. The cable is fixed by tightening the nut.

Note: Also check that the nut fixing the diaphragm is tight, to prevent leakage of electrolyte. Take care not to damage the diaphragm.

The cable plug has two O-rings to seal the connection (see figure 5-1).
Replacement of the diaphragm is described in chapter 7.
Remove the rubber cap from the sensor assembly by gently turning it clockwise.

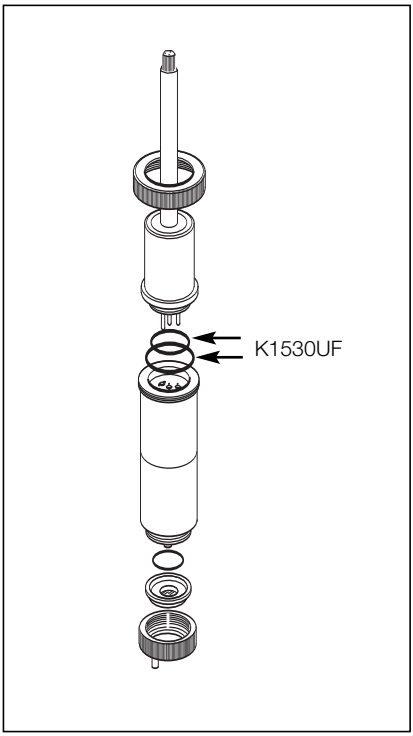


Fig. 5-1.

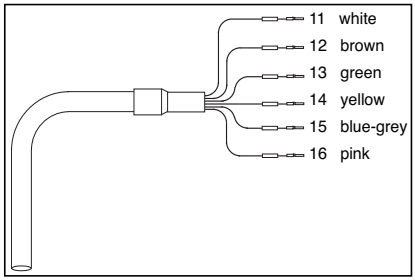


Fig. 5-2.

Connection of the sensor to the transmitter

The cable wires of the DO30 sensor are numbered 11 to 16 (see figure 5-2). This numbering is in accordance with the terminal numbering of the Yokogawa EXA DO402G/DO402G(S) converter. The connection diagram for the DO30 sensor is described in the instruction manual of the EXA DO converter.

5-3. Assembling and mounting of the immersion fitting

5-3-1. Checklist

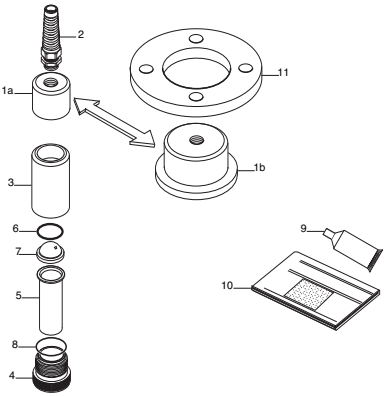
The FD30-V27-xx-FN-... fittings will be delivered completely assembled.

Flanges (suffix code -F1 or -F2) and options will be delivered seperately.
In case the sensor and cable assemblies are ordered as options, please refer to section 5-1 for instructions regarding the sensor.

The FD30-V27-00... version will be delivered in parts excluding the pipe (see figure 5-3).

The holder piece (3) and the top piece (1a/b) have an internal diameter suitable for both 40 mm and $1^{1}/_{4}$" customer's pipe.

The jet cleaning (option /JC) will be delivered as indicated in fig 5-4.



Top piece	(1a/b)
Pigtail	(2)
Holder piece	(3)
Screw piece	(4)
Conductive bushing	(5)
"O"-ring	(6)
Stopper	(7)
"O"-ring	(8)
Tube PVC adhesive	(9)
Instruction manual	(10)
Flange (if specified)	(11)

Item	Ordernr.	Description
6	K1500FX	Set of 5 each
8	K1500FY	Set of 5 each

Fig. 5-3.

5-3-2. Preparing the immersion fitting

Prepare the immersion fitting by unscrewing the screw piece (4) from the bottom of the fitting. Remove the stopper (7), which can be discarded, and the conductive bushing (5).
The screw piece will be used to fix the DO-sensor in the fitting.
When a flexible conduit (option /PH5 or /PH10) will be used, the pigtail part (2) can also be discarded.
When an immersion fitting with cleaner is used the cleaning cage will be used to fix the DO-sensor. In that case the screw piece can also be discarded.
In case of a FD30-V27-00-..version the top piece and the holder piece should be sticked to the customers pipe using the supplied adhesive. Ensure that the sealing will be watertight.

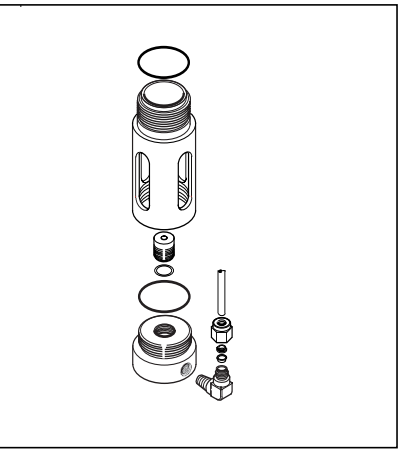


Fig. 5-4.

5-3-3. Mounting the sensor in the immersion fitting

(1) Pull the sensor cable through the O-ring into the fitting and through the pigtail (see fig. 5-5). In case a flexible conduit will be used please remove the pigtail and follow the instructions delivered with the /PH5 or /PH10 option. Push the O-ring over the cable assembly until it lies on the knurled ring.
(2) Plug the cable assembly into the sensor body, if this was not performed before. Secure the cable assembly with the knurled ring.
(3) Place the sensor in the fitting and put the bushing (essential for sensor diagnosis) around the sensor as far as it will go. Then screw the screw piece, or the cleaning cage, in again. This will fix the sensor in place by compressing the O-ring.
(4) Tighten the pigtail at the top of the fitting.

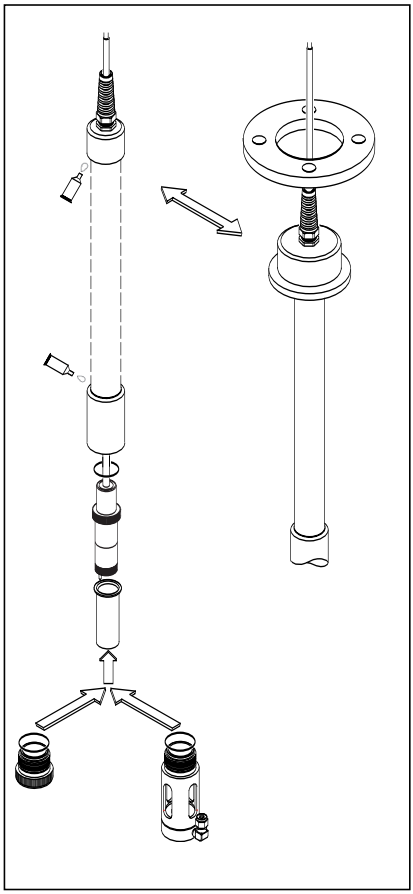


Fig. 5-5.

5-3-4. Mounting the cleaning (only if option /JC is ordered)

(1) After fixing the sensor with the cleaning cage it is possible to screw the cleaner tubing on the cage using the swage lock coupling material provided with the cleaner.
(2) It is recommended to fix the tubing to the holder using tie wraps.
(3) Keep some flexible length of tubing for ease of maintenance.

The cleaner can be used for both water and air. It is recommended to use a solenoid valve of the normally closed type with matching connections. The solenoid valve can be switched with the wash-contact of the EXA DO-converter.

5-3-5. Mounting the flexible conduit (/PH5 or /PH10)

To protect the cable against weather or other influences, it is recommended to use a flexible conduit. This can easily be mounted. A seperate mounting instruction is provided with the option.

5-4. Installing the floating ball fitting

5-4-1. Checklist

The floating ball fitting with sensor for Dissolved Oxygen will be delivered in parts and has to be assembled before it can be used. Check if all standard parts are delivered, see fig. 5-6.
Please note that items (4), (5) and (2 + 6) are optional and, if not specified with the order, these parts will not be delivered.
The position ring (9) will only be received when PB30-00. is ordered. This part is only needed when 1 1/2" pipe will be used in stead of 50 mm.

5-4-2. Installation

Mount the floating ball not exactly vertical, but under a slight angle, so that air bubbles do not 'stick' or adhere to the membrane.

5-4-3. Assembling (ref to fig 5-6)

1. Attach the mounting bracket (1) to wall or pipe; clamps are already fixed to the bracket.
2. Install the main support arm (2) (in case of PB30-00... the customers pipe), in the mounting bracket (1) and adjust its length to the desired length.
3. Use the supplied adhesive (7) to stick the lower support to the main support arm (2). When a 1 1/2" pipe is used, the position ring (10) must be sticked in between them to compensate for the difference.
4. Attach (not for PB30-00...) the 90° elbow (6) to the upper end of the main support arm and cement it with adhesive (7).
5. Guide the cable assembly (4) through the main support arm.
6. Position the complete sensor (4+5) in the lower support.
7. Place the lower support (3) into the ball (8) by screwing the fixing nut hand-tight.
8. Connect the leads of the cable to the EXA DO converter, see also section 5-2-1.

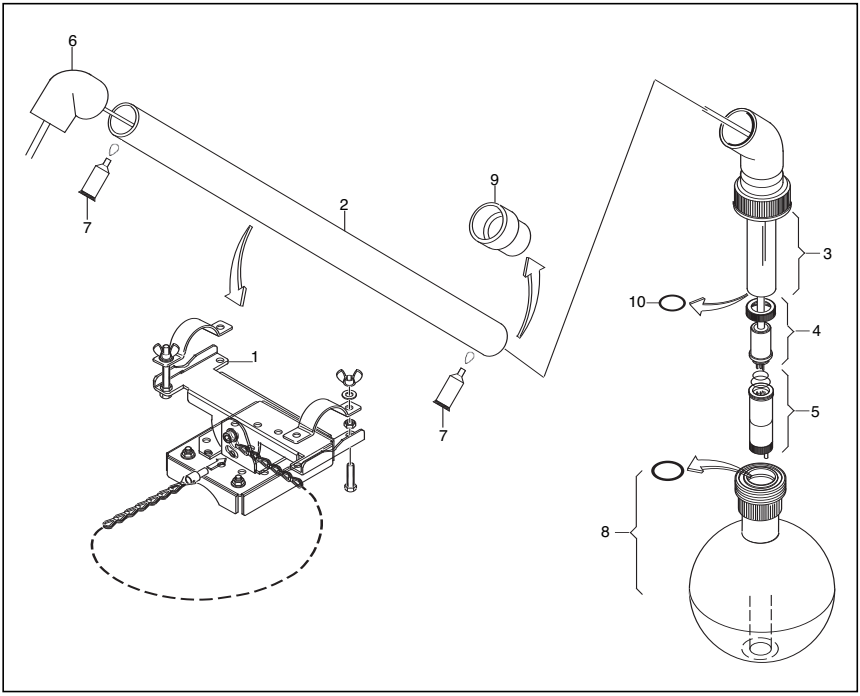


Fig. 5-6.

Item	Description	Spare part no
1	Mounting bracket	K1530DQ
2	Main support arm	
3	Lower support arm with O-ring	K1530QA
4	Cable assembly 3 meter	K1530UC
	15 meter	K1530UD
	20 meter	K1530UE
5	Cell assembly 50 micron	K1530DA
	25 micron	K1530DC
6	Elbow 90º	
7	Tube PVC adhesive	
8	Floating ball assembly with O-ring	K1530SA
9	Position ring	
10	O-ring 25,3 x 3,2 Viton 70º shore	K1500AV (5x)

6. CALIBRATION

The co-operation between the Dissolved Oxygen (DO) sensor and the converter is such, that the calibration procedure is related to the one described in the manual for the EXA DO converter.
Two calibration types are commonly accepted:

1 Air calibration, that is a calibration with the ambient air as a reference. As the ambient air will always contain a known amount of oxygen, this can be used for calibration.
2 Water calibration indicated as H_2O calibration, is a calibration in a vessel filled with water, which is then saturated by bubbling air through it. The water will then contain the maximum amount of dissolved oxygen possible at that water temperature.

6-1. Air calibration

Air-calibration is the usual procedure of calibrating a DO measuring loop. It corrects the slope (= sensitivity) of the sensor. A zero point calibration is unnecessary.
During this calibration procedure the sensor should be kept 5 to 10 cm above the water level in a partly filled bucket with process water. The relative humidity should be approximately 100%. From Henry's law the concentration of oxygen in a liquid is proportional to its activity, provided the temperature and composition of the liquid remain constant.
During the air-calibration mode, the instrument prompts the operator to remove the sensor from the water, checks the signal for stable conditions and then calibrates.

Please look into the instruction manual of your EXA DO converter for the calibration procedure.

Step by step procedure:
- Select “AIR.CAL” on your EXA DO converter
- Lift the holder with sensor out of your process
- Rinse the sensor with water and wipe it with a tissue
- Place the sensor 5 to 10 cm above the water surface
- Calibrate
- Reinstall the fitting with the sensor into the process to continue the measurement within 10 minutes after finishing the calibration

This is all that is needed to calibrate the DO-sensor in air. The whole process will take about 60 minutes and should be repeated at least every month or whenever the EXA DO converter signals a malfunction.
The calibration interval is highly dependent on the actual process conditions. It is advised to start with a calibration interval of 2 weeks. If the calibration is within acceptable limits, the interval can be increased.

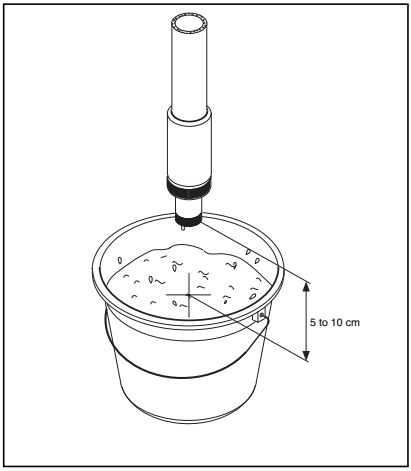


Fig. 6-1. Air calibration

6-2. Water (H_2O) calibration

6-2-1. ISO-5814 table (chloride concentration compensation)

In processes containing salt, like seawater or brine, the water calibration is the only correct method as it compensates for the chloride contents of the water. Especially in case you want to have an indication in percent of saturation, water calibration is the only correct calibration method.

The chloride concentration compensation corrects for the influence that salt has on the solubility of oxygen in water. The ISO-5814 table describes the solubility of oxygen in water as a function of temperature, barometric pressure and chloride concentration. In table 6-1 values to be extracted from the normal solubility data are given.

Table 6-1. Solubility of oxygen (mg/l) in water as a function of temperature & salinity

Temp	Solubility of oxygen in water in equilibrium with air @101.325kPa[pO_2]	Correction to be substracted for each degree of salinity expressed in grams per kilogram of total salts in water [ΔpO_2]
°C	mg/l	mg/l
0	14.62	0.0875
1	14.22	0.0843
2	13.83	0.0818
3	13.46	0.0789
4	13.11	0.0760
5	12.77	0.0739
6	12.45	0.0714
7	12.14	0.0693
8	11.84	0.0671
9	11.56	0.0650
10	11.29	0.0632
11	11.03	0.0614
12	10.78	0.0593
13	10.54	0.0582
14	10.31	0.0561
15	10.08	0.0545
16	9.87	0.0532
17	9.66	0.0514
18	9.47	0.0500
19	9.28	0.0489
20	9.09	0.0475
21	8.91	0.0464
22	8.74	0.0453
23	8.58	0.0443
24	8.42	0.0432
25	8.26	0.0421
26	8.11	0.0407
27	7.97	0.0400
28	7.83	0.0389
29	7.69	0.0382
30	7.56	0.0371

The effect of chloride concentration on the measurement can be shown by the following examples

Example 1. During calibration
Demineralized water at 21°C (70°F) has a solubility of 9.2 ppm. Sea water at the same temperature has a solubility of 7.8 ppm. If the DO sensor is calibrated in aerated sea water without using Chloride compensation, the analyzer will assume the solubility of the sea water to be 9.2 ppm, when the actual concentration will be 7.8 ppm due to the salt concentration. This will cause the measured value to read 18% high.

Example 2. % Saturation readout
Using the values from the above example. If the DO sensor measures 5 ppm in 21°C sea water, the EXA converter will show 54% saturation (5 ppm/9.2 ppm) if the Chloride compensation function is not activated. In reality the saturation value is 64% (5 ppm/7.8 ppm).

Table 6-2. Solubility of Oxygen (mg/l) of Sea Water & Fresh Water (Based on Sea Level Barometric Pressure of 760mm Hg)

Temp	Solubility	
°C	Seawater mg/l	Fresh water mg/l
0	11.97	14.62
2	11.36	13.84
4	10.82	13.13
6	10.29	12.48
8	9.84	11.87
10	9.43	11.33
12	9.05	10.83
14	8.69	10.37
16	8.37	9.95
18	8.06	9.54
20	7.77	9.17
22	7.48	8.83
24	7.21	8.53
26	6.93	8.22
28	6.67	7.92
30	6.41	7.63

Barometric pressure also influences the solubility of oxygen in water. Simular to the chloride effect described before, the solubility of oxygen is proportinal to the partial pressure of the oxygen in contact with water.

The partial pressure of Oxygen (pO_2) is the percent concentration of oxygen in air, multiplied by the total presure. In dry air, the oxygen concentration is 20.95%.

If the barometric pressure is 740 mm Hg, the partial pressure of oxygen would be: 155 mm Hg (0.2095 times 740 mm Hg = 155 mm Hg).

If the Barometric pressure changes to 765 mm Hg (0.2095 times 765 = 160 mm Hg) and is not compensated for, there will be an error of 3% in the displayed value.

The EXA DO402G converter automatically compensates for barometric pressure using a built-in pressure sensor.

The EXA DO202G(S) the baromatic pressure has to be entered manually.

In table 6-3 the solubility data at various temperatures and barometric pressures are given.

Table 6-3. Solubility of oxygen (mg/l) at various temperatures and elevations (based on sea level barometric pressure of 760 mm Hg)

Temp.	Elevation (metres above sea level)						
°C	0	300	600	900	1200	1500	1800
0	14.6	14.1	13.6	13.2	12.7	12.3	11.8
2	13.8	13.3	12.9	12.4	12.0	11.6	11.2
4	13.1	12.7	12.2	11.9	11.4	11.0	10.6
6	12.4	12.0	11.6	11.2	10.8	10.4	10.1
8	11.8	11.4	11.0	10.6	10.3	9.9	9.6
10	11.3	10.9	10.5	10.2	9.8	9.5	9.2
12	10.8	10.4	10.1	9.7	9.4	9.1	8.8
14	10.3	9.9	9.6	9.3	9.0	8.7	8.3
16	9.9	9.5	9.2	8.9	8.6	8.3	8.0
18	9.5	9.2	8.9	8.6	8.3	8.0	7.7
20	9.1	8.8	8.5	8.2	7.9	7.7	7.4
22	8.7	8.4	8.1	7.8	7.6	7.3	7.1
24	8.4	8.1	7.8	7.6	7.3	7.1	6.8
26	8.1	7.8	7.6	7.3	7.0	6.8	6.6
28	7.8	7.5	7.3	7.0	6.8	6.6	6.3
30	7.5	7.2	7.0	6.8	6.5	6.3	6.1
32	7.3	7.1	6.8	6.6	6.4	6.1	5.9
34	7.1	6.9	6.6	6.4	6.2	6.0	5.8
36	6.8	6.6	6.3	6.1	5.9	5.7	5.5
38	6.6	6.4	6.2	5.9	5.7	5.6	5.4
40	6.4	6.2	6.0	5.8	5.6	5.4	5.2

6-2-2. 100% calibration

Calibration in water is executed with process water saturated with air as a calibrating solution. This method is obliged for measurements in seawater or brine, for calibration by chemical analysis or for calibration with the display value in percent saturation. It is also the advised method when there is a big difference between the ambient temperature and the process temperature.
During the water-calibration mode, the instrument prompts the operator to put the sensor in the aerated water, checks the signal for stable conditions and then calibrates.

Standard calibration procedure:

Preparation:Take a bucket of clean process water and bubble air through it with a pump or by leading in pressurised air.
Note: Wait approximately for 15 minutes for complete saturation.

- Select "H_2O.CAL", "100%" on your EXA DO converter
- Lift the holder with the sensor from your process and rinse the sensor with water
- Insert the sensor in water saturated with air.
- Calibrate
- Reinstall the fitting with the sensor into the process to continue the measurement.

This is all that is needed to calibrate the DO-sensor in water. The whole process will take less than 60 minutes and should be repeated whenever you think it is necessary or whenever your EXA DO converter signals a malfunction.
The calibration interval depends on the actual process conditions.

6-2-3. 0% calibration

If activated in the service menu of your EXA DO converter, it is also possible to perform a zero-calibration of your DO sensor using a liquid without oxygen.

Preparation:Prepare a Na_2SO_3 (sodium sulphite) solution by pouring approx. 100 ml of tapwater into a beaker and adding approx. 3g Na_2SO_3 into the water and fully dissolve it.

- Select "H_2O.CAL", "0%" on your EXA DO converter
- Lift the holder with the sensor from your process and rinse the sensor with water
- Insert the sensor in the prepared sodium suplphite solution
- Calibrate
- Reinstall the fitting with the sensor into the process to continue the measurement.

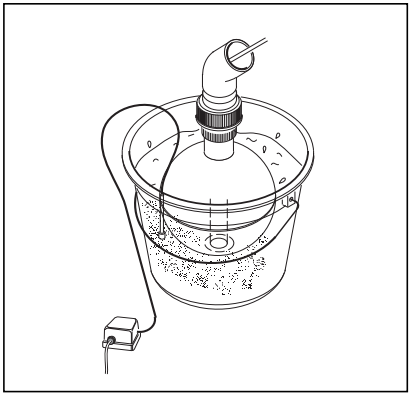


Fig. 6-2. Water calibration (100 %)

Notes

1:A zero calibration must always be performed in combination with a 100% calibration, otherwise it makes no sense.
2:If the stabilisation time setting of your converter is programmed too small, it is possible to have an incorrect calibration.

7. PREVENTIVE INSPECTION AND MAINTENANCE

7-1. Periodical checks

The measurement should be calibrated once every month or periodically depending on the experience with the process. If the calibration gives rise to relatively large changes in the measured value, check the diaphragm for stains or wrinkles. When the diaphragm is stained, clean it carefully with tissue paper and clean water. If the diaphragm is damaged, replace it according to the procedure described in the next paragraph.

7-2. Replacing the diaphragm and electrolyte of the sensor

It is recommended to replace the electrolyte every 6 to 8 months. Do not wait until the electrolyte has deteriorated so far that a calibration cannot be implemented. Replace the diaphragm with a new one at the same time as the electrolyte exchange.

Note: A 50 mm membrane can be recognised by 10 welding places in the plastic of the membrane. The 25 mm membrane has 8 welding places.

Replace the electrolyte as follows: prepare the electrolyte, diaphragm and syringe supplied as a kit.

WARNING: As the electrolyte is a strong alkali (Potassium hydroxide = KOH), take care not to let it touch your skin or eyes. Use gloves and safety glasses to prevent this. In case of accidental contact to the electrolyte, wash immediately with lots of clean water! Afterwards visit a doctor to check for burns.

- Wash out the dirt on the DO-sensor as it was removed from the holder.
- Remove the diaphragm. Then remove the nut fixing the diaphragm and pull it from the silver-electrode. Also remove the O-ring (see figure 7-1).

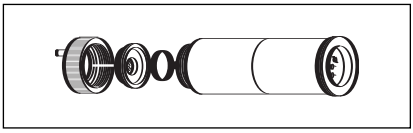


Fig. 7-1. Replacing diaphragm

- Extract the electrolyte from the sensor body by injecting air with the syringe (see figure 7-2).

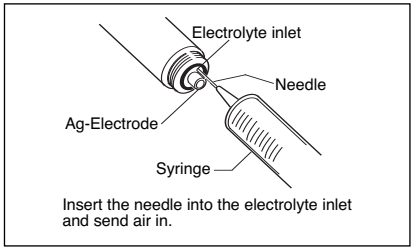


Fig. 7-2. Extracting electrolyte

  Hold the sensor in the angled position as indicated.
- Polish the silver-electrode with polisher (alumina) applied on a wetted gauze until it shines. Wipe off the remaining polisher from the electrode. (polisher is not supplied with the accessorie kit)
- Use the syringe to inject the electrolyte into the sensor-body (see figure 7-3). Hold the sensor in the vertical position indicated.Fill the sensor with approximately 8 ml of electrolyte and then pull out about 1 ml to leave some air inside. Also put a drop of electrolyte on the silver-electrode.

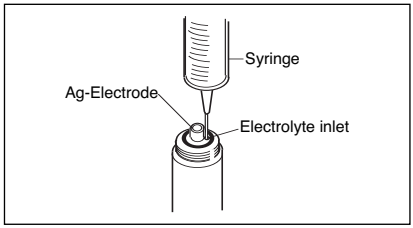


Fig. 7-3. Injecting electrolyte

- Install a new O-ring and diaphragm. Fix the diaphragm with the knurled nut. The replacement procedure is finished now.

Perform a calibration, before restarting the measurement.

7-3. Replacing parts of the holders

It is recommended to replace the O-rings in the holders when remounting the holders. For information on partnumbers of the spares please look to the respective page in chapter 5.

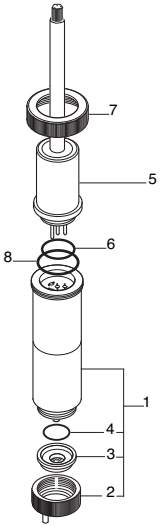
8. TROUBLESHOOTING

Fault	Possible Cause	Suggested Remedy
Instable measured value	1. Leaking of electrolyte	Renew electrolyte and check diaphragm and O-ring for damages
	2. Leaking of processwater into the cable connection	Clean and dry the cable connection, replace the O-ring sealing
	3. Sensor body is damaged	Check the integrity of the sensor and replace if necessary
	4. Cable assembly is damaged	Check the cable on short-circuit or break and replace if necessary
	5. Heavy interference on electronics	Check the grounding of the cable and converter
Measured value too low	1. The electrolyte has been exhausted	Replace electrolytte with fresh and replace diaphragm and O-ring
	2. Damage to diaphragm	Replace electrolyte with fresh and replace diaphragm and O-ring
	3. Leaking of processwater into cable connection	Clean and dry the cable connec tion, replace the O-ring sealing
	4. The lead(Pb)-electrode is exhausted or damaged	Check the integrity of the sensor and replace if necessary
	5. Cable assembly is damaged	Check the cable on short-circuit or break and replace if necessary
	6. The DO converter has failed	Call the Yokogawa Service organisation
Slow response	1. Process flow to low	Change the installation point to a better measuring point
	2. Diaphragm is stained	Clean the diaphragm or replace it if necessary
	3. Silver (Ag)-electrode surface is stained	Polish the Ag-electrode, replace electrolyte and diaphragm
Large fluctuations in the measured value	1.Diaphragm or sealing damaged	Replace diaphragm and O-ring sealing. If necessary exchange the electrolyte
	2. Process flow too low	Change the installation site to a better measuring point
Measured value very high	The temperature sensor is defective	Replace the sensor with a new one
Zero point is deviating	The diaphragm is damaged	Exchange electrolyte and replace the diaphragm and O-ring
Calibration is not possible	1. The diaphragm is stained	Clean the diaphragm or replace it
	2. The diaphragm is stained	Exchange electrolyte and polish the silver-electrode, replace the diaphragm and O-ring
	3. The silver (Ag)-electrode is stained	Exchange electrolyte and polish the silver electrode, replace the diaphragm and O-ring
	4. The electrolyte is exhausted	Exchange electrolyte and polish the silver-electrode, replace the diaphragm and O-ring
	5. The lead(Pb)-electrode is exhausted	Replace the sensor

9. SPARE PARTS

9-1.General

Partnumber	Description	DO30	FD30	PB30
K1530YZ	Jet cleaner (Option /JC)	x	x	x
K1541ZY	Mounting set (Option /MS1)	x	x	x
K1500AW	Flexible conduit 5 m and conn. set (Option /PH5)	x	x	x
K1500AX	Flexible conduit 10 m and conn.n set (Option /PH10)	x	x	x
K1530UC	Cable, 3 m	x	x	x
K1530UA	Cable, 5 m (Option /C05)	x	x	x
K1530UB	Cable, 10 m (Option /C10)	x	x	x
K1530UD	Cable, 15 m	x	x	x
K1530UE	Cable, 20 m	x	x	x
K1530UH	Membrane, 50 µm	x	x	x
K1530UJ	Membrane, 25 µm	x	x	x
K1530UK	Spray nozzle for Jet Cleaner		x	
K1500AZ	Nozzle parts		x	
K1500FX	O-ring set (5 pieces, silicone) for sealing		x	
K1530DQ	Mounting bracket for PB30			x
K1500AV	O-ring set for PB30			x

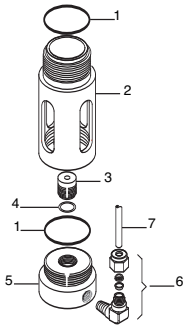


9-2. Sensor assembly

Item	Partnumber	Description	Qty
1-4	K1530DA/DC	Cell assembly	1
2	K1530DD	Box nut assembly	1
3	K1530UH	Accessory kit for 50 µm membrane	1
	K1530UJ	Accessory for 25 µm membrane	1
5-8	-	Cable assembly (see section 9-1)	5
6+8	K1530UF	O-rings	5
7	K1530DD	Box nut	1

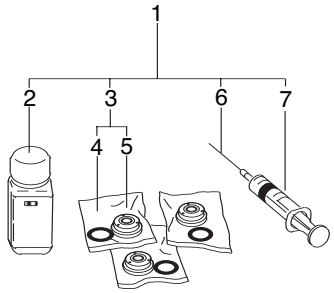
9-3. Cleaning jet assembly

Item	Partnumber	Description	Qty
1	K1500FY	O-ring 37.7 x 2.6 for mounting sensor in fitting	5
2	-	Holder	
3+4	K1500AZ	Nozzle parts	1
7	K1530UL	Tubing 1/4" for jetcleaner 10m.	1
3, 4, 6	K1530UK	spray nozzle for jetcleaner	1



9-4. Consumables

Item	Partnumber	Description	Qty
1a	K1530UH	Kit for 50 µm membrane	1
2		Bottle with electrolyte	1
4/5		O-ring set	3
6/7		Syringe/needle set	1
1b	K1530UJ	Kit for 25 µm membrane	1
2		Bottle with electrolyte	1
4/5		O-ring set	3
6/7		Syringe/needle set	1



Other accessories see:

GS 12D7K1-01E-E	Conductivity flowfittings
GS 12J6B1-E-E	EXA Dissolved Oxygen transmitter (DO402G)
GS 12J6C3-E-E	EXA Dissolved Oxygen transmitter (DO202G(S))

10. DIMENSIONS

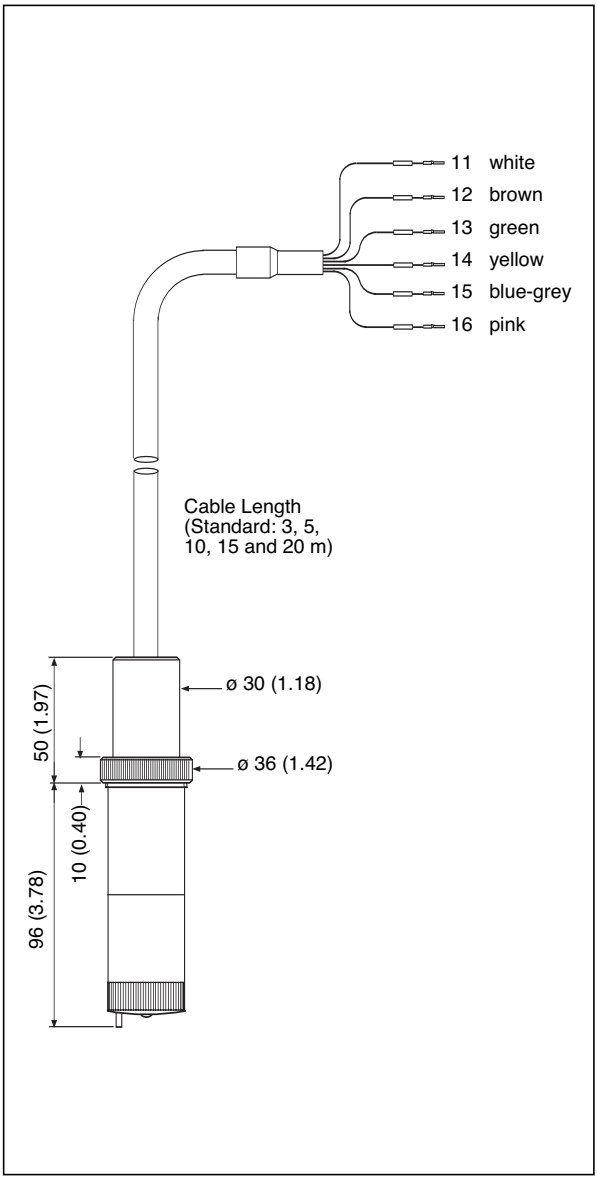


Fig. 10-1. DO30

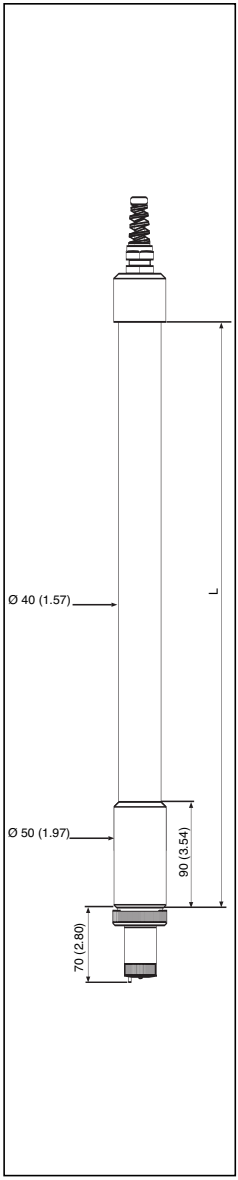


Fig. 10-2. FD30

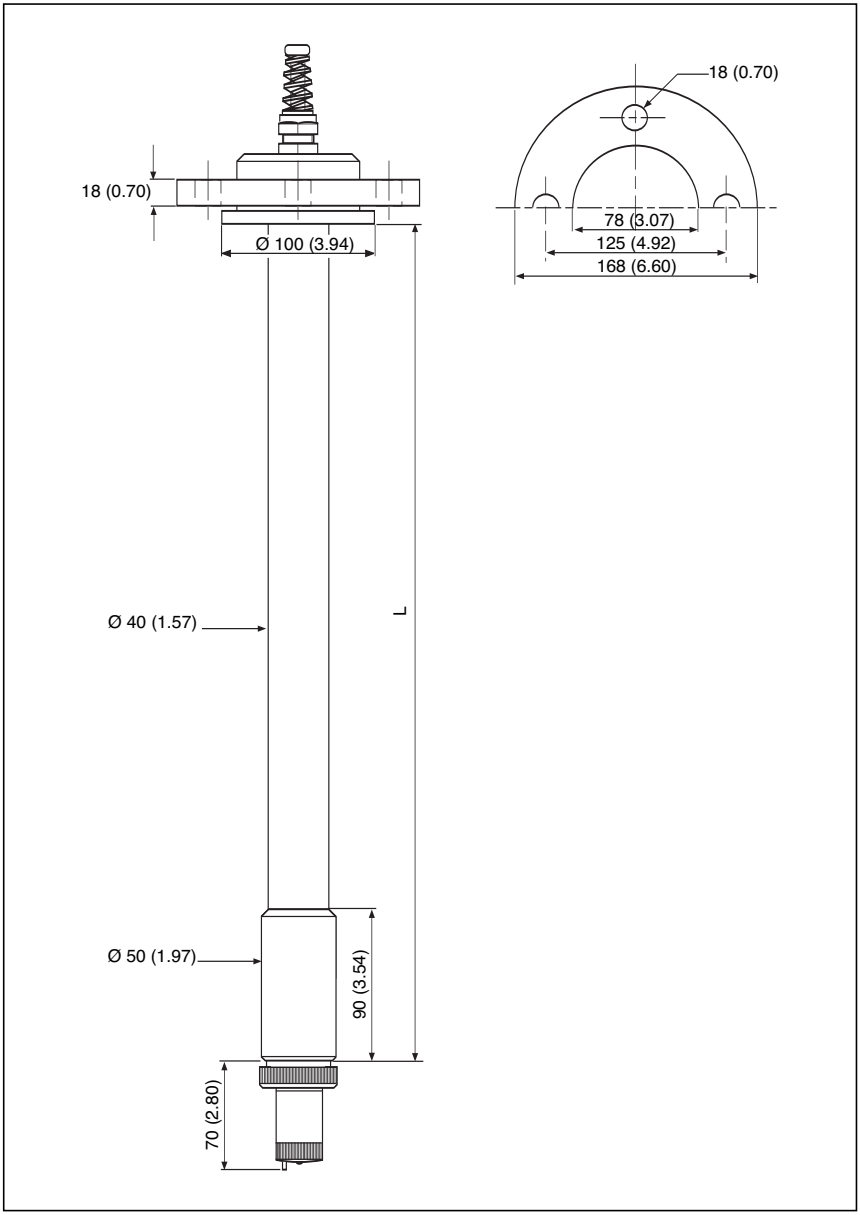


Fig. 10-3. FD30 with flange

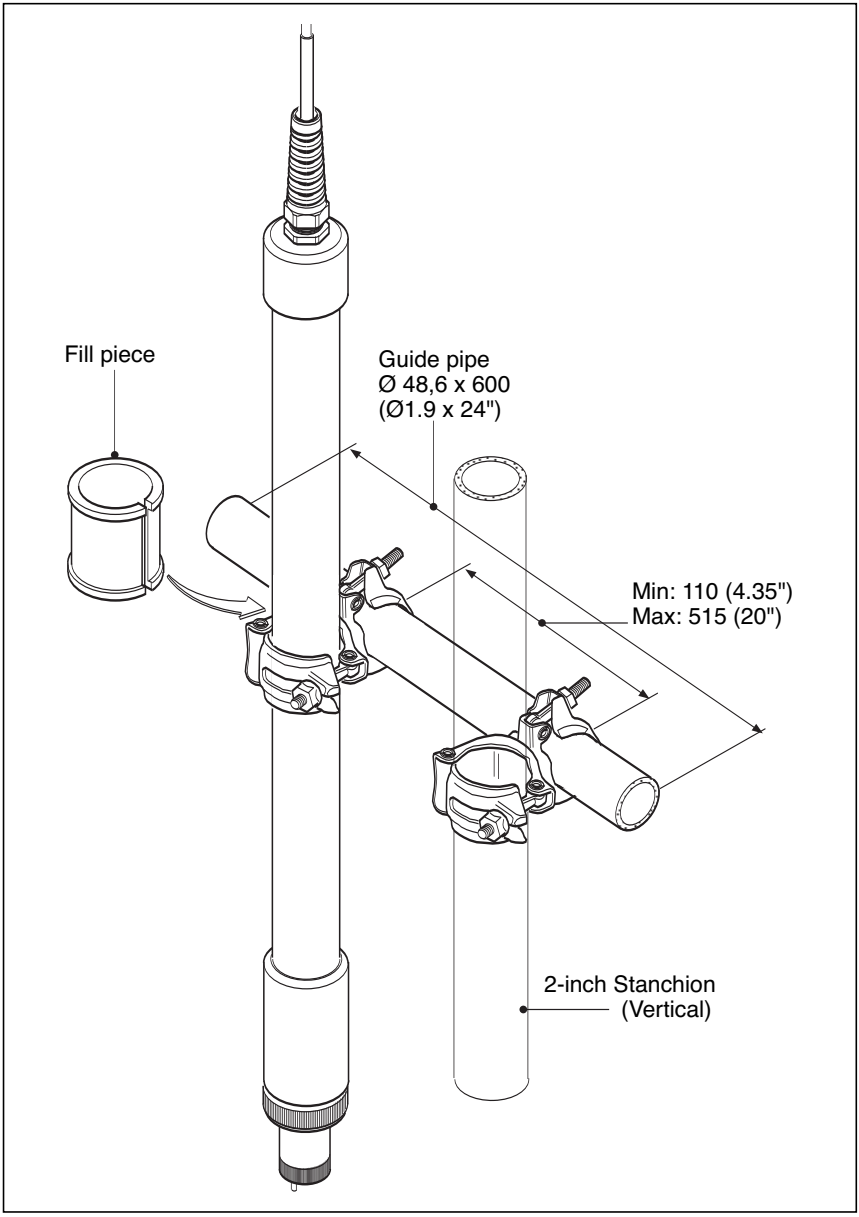


Fig. 10-4. Option /MS1

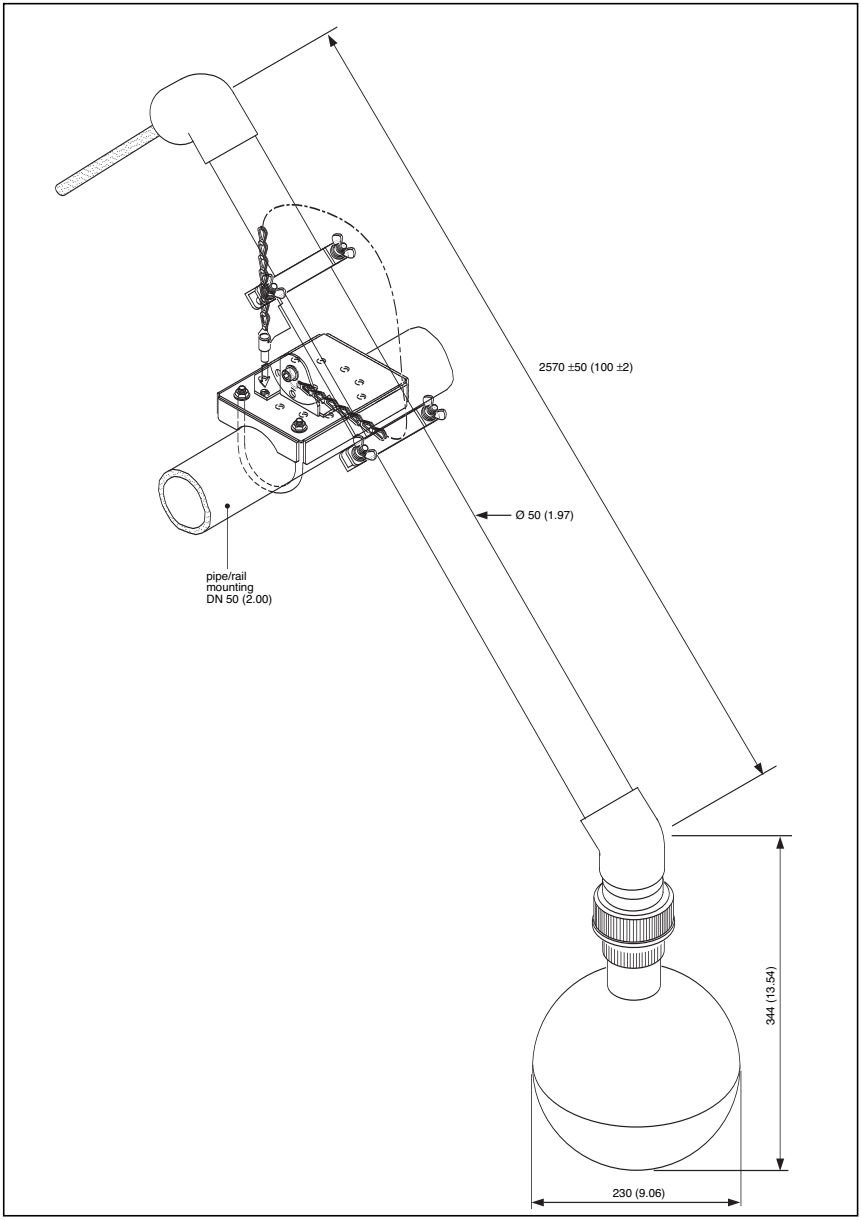


Fig. 10-5. PB30 Rail mounting

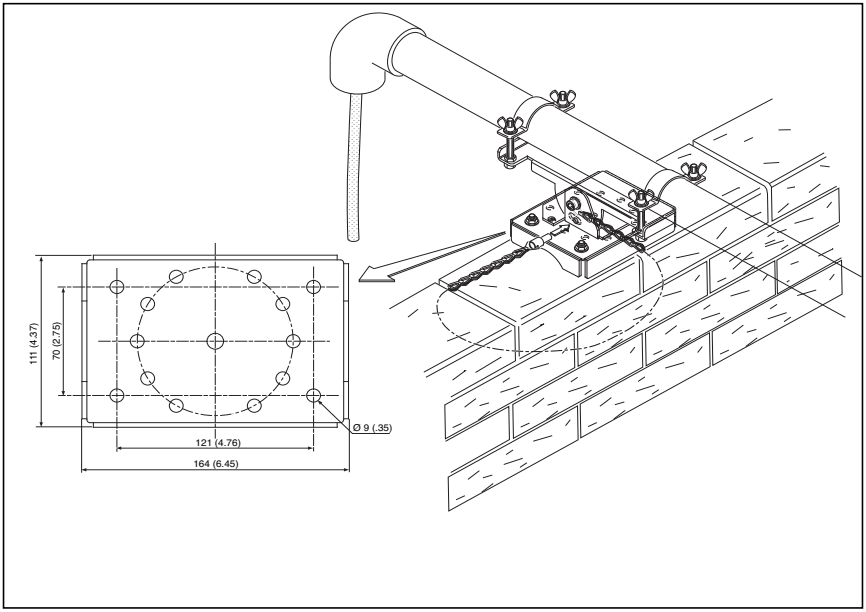


Fig. 10-6. PB30 Wall mounting

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