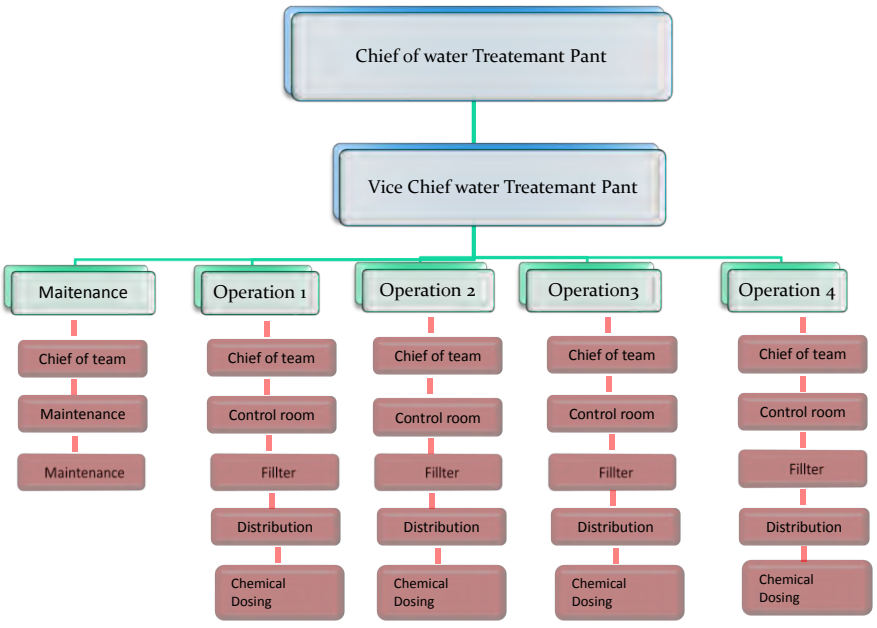
# 12. Control room

**The main control room is the center of plant operations. And comprises of a main control panel assembled from five individual consoles.**

- **Monitoring of electric facility**
- **Operation of pumps and valve.**
- **Recording of flow quantity.**
- **Monitoring of water quality.**
- **Monitoring of alarms.**



I.Ojective

**The maner setting of this operation standard which has the main objective as below :**

**1. Keep the water treatment of production system good condition.**
**2. Get long life of facilities.**
**3. Get high output from mechanical facilities.**
**4. Safety protect and avoid accident that happen by mechanical facilities.**
**5. Operation and maintenance of mechanical facilities with proper through the manual.**

## II. Management maintenance

2.1 Check and Maintenance of WTP

2-1-1 Daily check
2-1-1 Weekly check
2-1-1 Monthly check
2-1-1 Yearly check

How to check

- Listening - Looking
- Touching - Smelling
- Measuring ( by equipment )

# Daily check

**( must be follow the daily check sheet )**

*(This work practice by operation team checking )*

- **The operator has responsible on the operation of the mechanical facilities of the production system by the location work has to check and clearly record in the daily check sheet by meaning and points that have detail in the table of each mechanicals.**

- **The mechanical facilities which have to check everyday basically operated 24 hours:**

  **- Intake pump, distribution pump, rapid mixing system, flocculate, and chemical dosing system Etc.**

## Example: Daily check and maintenance of WTP

| Item | Maintenance | daily |
|---|---|---|
| Pumps | - Keep the motor and pump clean<br>- Check Electric Current of pump<br>- Check Bearing temperature (by hand )<br>- Check noise ( by feeling )<br>- Check Vibration ( by hand )<br>- Check leakage from gland packing<br>- Check Smell<br>- Check Smock<br>- Check Discharge and Suction pressure<br>- Check Valve opening | |
| Air vessel | - Check located between HWL and LWL<br>- Check vibration noise<br>- Check pressure gauge, unloader valve pressure switch and safety valve | |

## Surface Temperature and Sense of Touch

| Surface Temperature | Feeling | Remarks |
|---|---|---|
| 40 ºC | Somewhat warm | Feels slightly warm to the touch. |
| 45 ºC | Warm | Feels comfortably warm . |
| 50 ºC | Somewhat hot | Palm of the hand reddens if placed on unit for extended periods. |
| 60 ºC | Hot | Can hold your hand on the unit for 3-4 seconds |
| 70 ºC | Extermely hot | Can hold on finger on the the unit for 3 seconds |
| 80 ºC | Extermely hot | Can hold on finger on the the unit for 1 seconds |

## IMPORTANT KEY FACTORS TO CONTROL THE WATER TREATMENT PLANT

- NTU of clear water ( less than 1.0 )
- pH 6.5 to 8.5
- Cl2 from WTP 0.5 to 1.0 mg/L
- Supply pressure : the day from 3.9 – 4.2 bar
- Communication between Labo and Operator.
- Data Recording.
- Storage .
- Evaluation.

# EXPECTATION TO OPERATORS

- **Should Know WTP System**
- **Should Correctly Operate System**
- **Should Properly Maintain**
- **Should Keep WTP Clean**
- **Should Know Safety**
- **Should Make Record Correctly**

## Weekly Check
## ( must be follow the weekly check sheet)

*(The person who work in maintenance team checking )*

❖This work is as same as daily check need the maintenance team practice this work directly by check and clearly record weekly check sheet .

❖ The mechanical facilities which have to check weekly are basically operated a few hours a day.

# Monthly Check

**( must be follow the monthly check sheet )**

- **The maintenance team has to practice this work.**
- **Monthly check is more practice on some point of mechanical facilities by using instrument to check each mechanical.**

**Example: Alignment systems using instrument as.**

1. **Thickness gauges**
2. **Dial indicator . Mechanical displacement gauges**
3. **Vibration measuring instruments**
4. **Sound level meter**

## Example: Lubrication schedule maintenance

| Equipment | | Oil and Grease | | | | |
|---|---|---|---|---|---|---|
| Description | Qty | Type | Unit Qty gram | Interval | Frequency | Annual Usage |
| RWPM | 5 | Shell: Alvania Grease No.2 | 375 | 480h | 2 | 1875 gram |
| Flocculators | 20 | Oil No.460 | 850 | 1000h | 3 | 10200 L |
| Air blower | 2 | Oil No.220 | 10 | 2000h | 5 | 2000 L |

## Yearly check

**( must be follow the yearly check sheet)**

- **This work practice by maintenance team.**
- **Yearly check work is commonly internal with disassembly of equipment which very important to keep function.**

## III. Record and Repot

**Normal case**

- Mechanical is normal condition.

**Abnormal case**

- Mechanical is abnormal but it not so serious.

**Urgent case**

- Mechanical is abnormal and can damage seriously.

# IV. UNIFORM

- In the working time although in usual over work or holiday; all employees who working in the WTP has to wears the uniform as mention in IV for internal regulation PPWSA.
- The employees who work as repairing have to wear of safety material such as helmet, gloves and safety shoes.

## V. Encouragement and Penalization

The employees who follow correctly though this standard will get the incentive from organization; if follow the opposite of this will get penalize from them fault.

A. First fault is getting the direct blame from leader.
B. Second fault is getting the blame letter from director or administrative and human resources department .
C. Third fault is getting penalized by decision of regulation council.

# VI. Conclusion

Start from evident work of checking maintenance and repairing all of us have to analysis of this result work and make the discussion schedule to find that strong – weak point and step to coordinate and improve work for ensure the work efficiency and get successful

Phnom Penh Water Supply Authority

# Water Treatment Plant (2)

## (Operation and Maintenance of Electrical Facilities)

**Mr. Keb Kanvicheth**

**2012**

# Content

1. Safety work
2. Periodical Checking
3. How to use measuring machine
4. Basic of Sequence Circuit

## Safety Work

. Dressing
. Safety Path
. Danger Points of Electrical Facilities
. Conclusion

## Periodical Checking

. Daily, Weekly, Monthly, Yearly checking
. Arrangement and using of checking results
. Annual work plan
. Ledger
. Renewal plan

## How to use measuring machines

. Multi-meter
. Clamp-on tester
. Insulation resistance tester
. Grounding resistance tester
. Calibrator
. Protection Relay Tester
…

## Basic of Sequence circuit

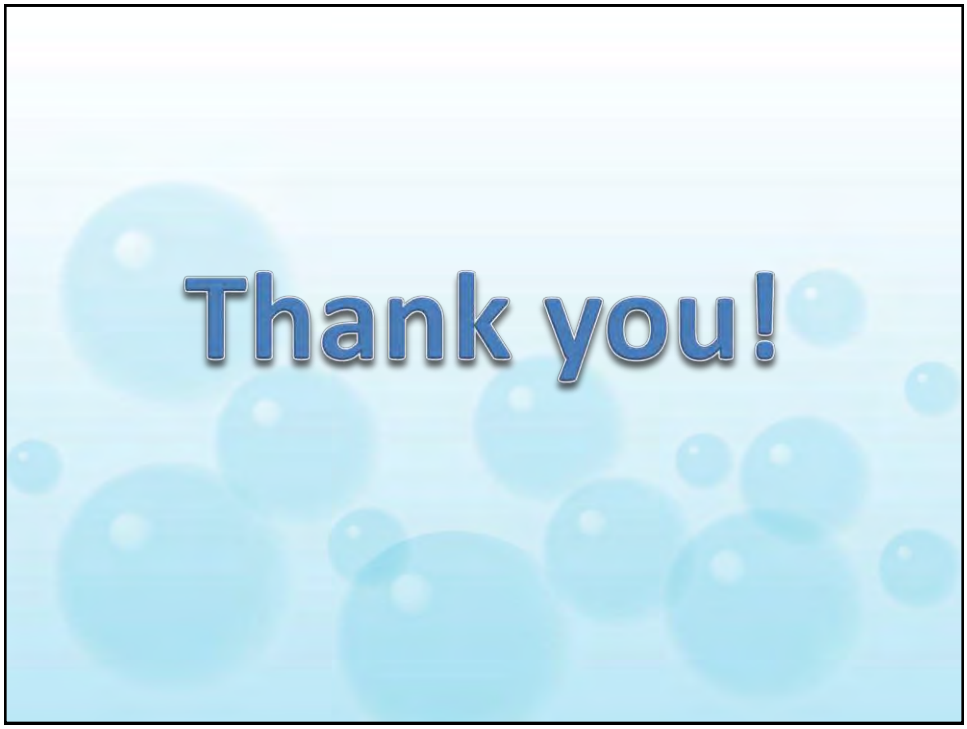
. Theory
. Elements and symbols
. Flow Chart
. Time Chart
. Basic circuit
. Advanced circuit

## Method

. Brainstorming
. Discussion
. Exercise

## Other

. Pre-Test (Before Training)
. Post-Test (After Training)

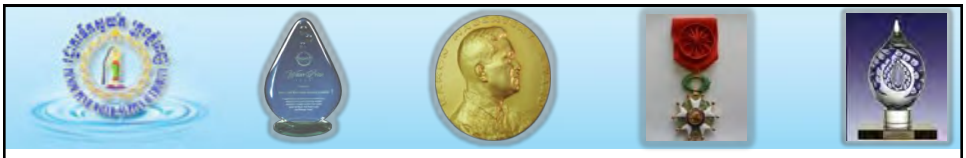

Thank you!

Phnom Penh Water Supply Authority

# Water Quality Management

**Mr. Keo Heng**
Chief of Laboratory

**2012**

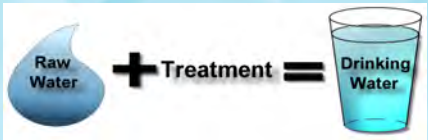


## Content

1. Objective of Water Quality Management
2. Water Quality Criteria
3. Frequency of Sampling and Water Analysis
4. Water Quality Analysis Methods
5. Data Management
6. Disclosure of Information

# 1. Objective of Water Quality Management

- To provide safe drinking water for people
- To ensure proper quality of the source water, water treatment plant , distribution system to the final destination (customer taps).


# Water Quality Management

Up stream | Raw | Settled | Filtered | Treated Water | Customer Taps Water

River — Water Treatment Plant

**Source Water**
- Manual sampling

Monitoring to investigate the situation of pollution

Twice a year
Dry and Rainy seasons

**Water Treatment Plant**
- Manual Sampling
- Real-time on-line monitoring

Maintaining good water quality in treatment Process

Daily analysis 3 times
Weekly, Monthly, and Yearly

**Network**
- Manual Sampling

Ensure good water quality at customer

80 samples a week

# 2. Water Quality Criteria

Cambodia established its National Drinking Water Quality Standard in 2004 with 53 parameters.

We also followed the WHO Standard

## National Drinking Water Quality Standard of Cambodia

| | | | | |
|---|---|---|---|---|
| | Bacteriological | | | |
| 1 | Thermotolerant coliforms or *E.coli* | less than | 0 | /100mL |
| 2 | Total coliforms | less than | 0 | /100mL |
| | Inorganic | | | |
| 3 | Arsenic | less than | 0.05 | mg/L |
| 4 | Barium | less than | 0.7 | mg/L |
| 5 | Cadmium | less than | 0.003 | mg/L |
| 6 | Chromium | less than | 0.05 | mg/L |
| 7 | Cyanaide | less than | 0.07 | mg/L |
| 8 | Fluoride | less than | 1.5 | mg/L |
| 9 | Lead | less than | 0.01 | mg/L |
| 10 | Mercury | less than | 0.001 | mg/L |
| 11 | Nickel | less than | 0.02 | mg/L |
| 12 | Nitrate | less than | 50 | mg/L |
| 13 | Nitrite | less than | 3 | mg/L |
| 14 | Selenium | less than | 0.01 | mg/L |

| | Organic | | | |
|---|---|---|---|---|
| 15 | Polychloriated biphenyls | less than | 0.5 | mg/L |
| 16 | Benzene | less than | 10 | mg/L |
| 17 | Trihalomethanes | less than | 250 | mg/L |
| 18 | 2,4-D | less than | 30 | mg/L |
| 19 | Aldrin and Dieldrin | less than | 0.3 | mg/L |
| 20 | Carbofuran | less than | 10 | mg/L |
| 21 | Chlordane | less than | 0.2 | mg/L |
| 22 | DDT | less than | 20 | mg/L |
| 23 | Dichlorvos | less than | 1 | mg/L |
| 24 | Dimethoate | less than | 6 | mg/L |
| 25 | Endosulfan | less than | 30 | mg/L |
| 26 | Endrin | less than | 0.6 | mg/L |
| 27 | Glyphosate | less than | 10 | mg/L |
| 28 | Heptachlor | less than | 0.3 | mg/L |
| 29 | Hexachlorobenzene | less than | 1 | mg/L |
| 30 | Methyl parathion | less than | 0.3 | mg/L |
| 31 | Mevinphos | less than | 5 | mg/L |
| 32 | Monocrotophos | less than | 1 | mg/L |
| 33 | Paraquat | less than | 30 | mg/L |
| 34 | Parathion | less than | 10 | mg/L |
| 35 | Permethrin | less than | 20 | mg/L |

| | Physical and chemical: aesthetic | | | |
|---|---|---|---|---|
| 36 | Taste | Acceptable | | |
| 37 | Odor | Acceptable | | |
| 38 | Color | less than | 5 | TCU |
| 39 | Turbidity | less than | 5 | NTU |
| 40 | Residual chlorine | 0.2 - 0.5 | | mg/L |
| 41 | pH | 6.5 - 8.5 | | |
| 42 | Aluminum | less than | 0.2 | mg/L |
| 43 | Ammonia | less than | 1.5 | mg/L |
| 44 | Chloride | less than | 250 | mg/L |
| 45 | Copper | less than | 1 | mg/L |
| 46 | Hardness | less than | 300 | mg/L |
| 47 | Hydrogen sulfide | less than | 0.05 | mg/L |
| 48 | Iron | less than | 0.3 | mg/L |
| 49 | Manganese | less than | 0.1 | mg/L |
| 50 | Sodium | less than | 200 | mg/L |
| 51 | Sulfate | less than | 250 | mg/L |
| 52 | Total dissolved solids | less than | 800 | mg/L |
| 53 | Zinc | less than | 3 | mg/L |

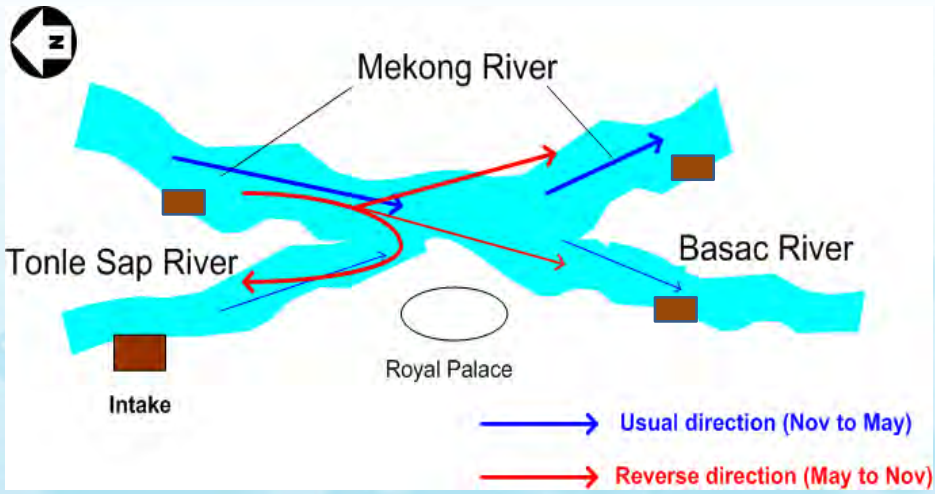
## 3. Frequency of Sampling and Water Analysis

- Water Sources
- Water Treatment Plant
- Network (Customer taps)

## Water Sources Quality

Surface water for the three water treatment plants.

- Sap River for Phum Prek WTP
- Mekong River for Chrouy Chang War WTP
- Bassac River for Chamcar Morn WTP




## Water Sources Quality

Frequency and Sampling

- 2 times a year (Dry and Rainy seasons)

Parameters

- Temperature
- pH value
- Conductivity
- Organic substances
- Color
- UV absorption
- Dissolved oxygen
- Total coliforms
- E. coli

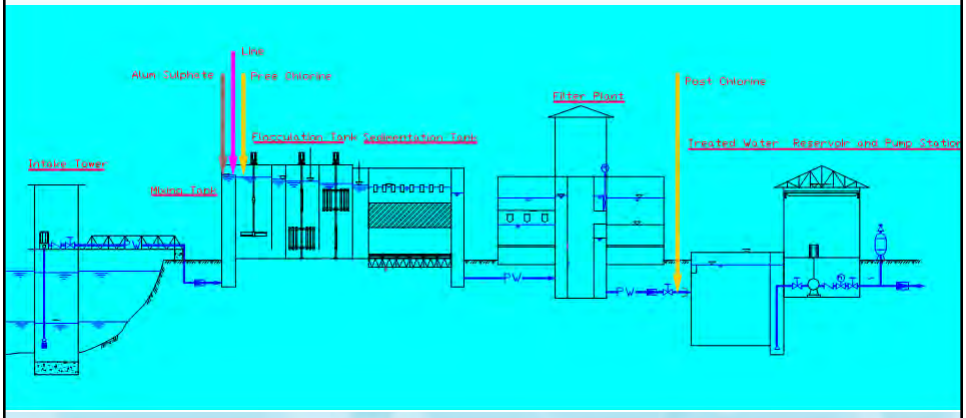
# Water Treatment Plant Quality

## Treatment Process :

The treatment process follows direct river abstraction and pumping to the works and consists :

- Receiving Well and Mixing Tanks adding Pre-chorine, Lime and Alum Sulfate or PAC.
- Sedimentation tank or Clarifier.
- Filter Basin.
- Post Chlorine " residual chlorine control "
- Reservoir and Pumping to the Network.

# Water Treatment Plant Process



## Frequency and Sampling Point

Daily: **3 times** (8:30, 11:00, 14:30)
- Raw water
- Settled water
- Filtered water
- Treated water

Weekly: **1 time**
- Raw water
- Treated water

Monthly, Quarterly, Yearly : **1 time**
- Raw water
- Treated water

Water Treatment Plant Quality

## Daily:

Cooperation closely with the operator in exchanging the information of water quality and water production.

Data Recording , Storage and Evaluation.

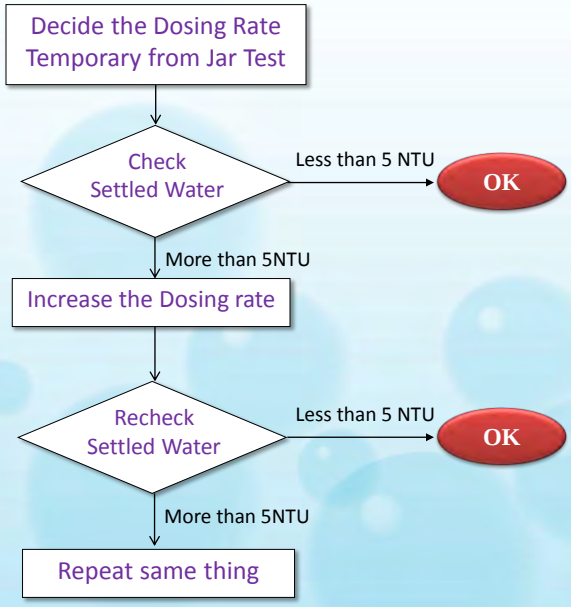
**Day time:** 3 times by laboratory staffs
**Night time:** 2 times by operator (simple parameter)

- Raw, Settled, Filtered, Treated water

**. Parameters**

Temperature, pH, Turbidity, Conductivity, Suspended Solid, Total Dissolve Solid, Color, Free Available Chlorine, Total Available Chlorine, Alkalinity , UV absorbance.

## Decide Coagulant Dosing Rate




**Jar Test**

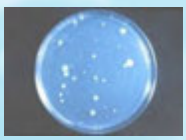
## Water Treatment Plant Quality

**Weekly:** 1 time

- Raw Water.
- Treated Water

**. Parameters**

Total coliforms, E. coli, Ca hardness,
Total hardness, Magnesium hardness,
Organic substance, Dissolved oxygen, Algae.



Water Treatment Plant Quality

# Monthly: 1 time

- Raw water
- Treated Water

**. Parameters**

Aluminum, Ammonia, Ammonia Nitrogen,
Carbon Dioxide, Copper,
Chloride, Cyanide,
Chromium Total,
Chromium Hexavalent,
Fluoride, Iron, Manganese,
Nitrate Nitrogen,
Nitrate, Nitrite Nitrogen,
Nitrite, Zinc, Phosphate,
Sulfide, Sulfate.

## Yearly: 1 time

- Treated water
- Test by Laboratory of Ministry of Environment

**. Parameters**

Barium (Ba)
Cadmium (Cd)
Lead (Pb)
Mercury (Hg)
Nickel (Ni)
Selenium (Se)
Sodium (Na)

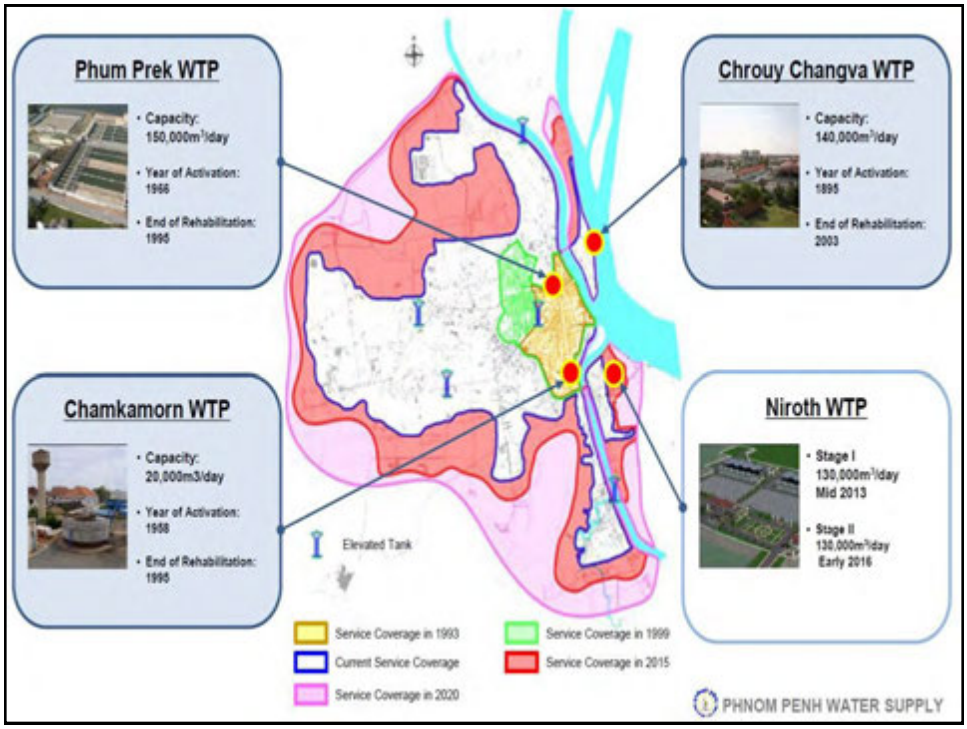
## Network (Customer tap) Water Quality

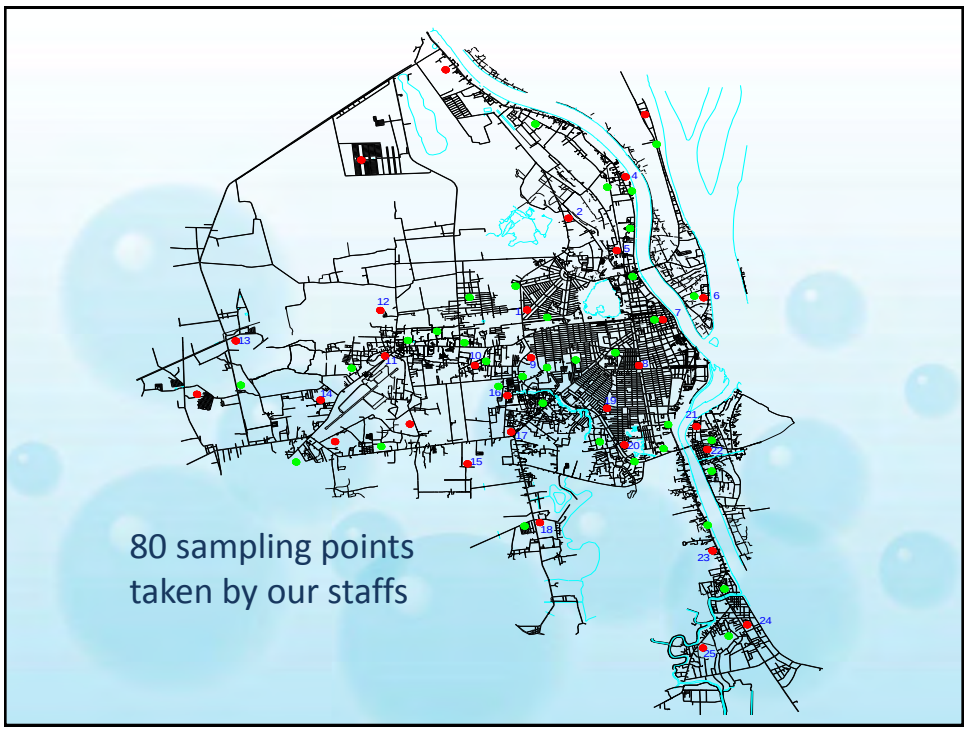
Weekly:

80 sampling points taken by PPWSA staffs from their house for testing by Water Testing Laboratory.

Parameter:

Temperature, pH, Turbidity, Color, Conductivity, Free Available Chlorine, Total Available Chlorine, Total coliforms, E. coli.


Phum Prek WTP
• Capacity: 150,000m³/day
• Year of Activation: 1966
• End of Rehabilitation: 1995
Chrouy Changva WTP
• Capacity: 140,000m³/day
• Year of Activation: 1895
• End of Rehabilitation: 2003
Chamkamorn WTP
• Capacity: 20,000m3/day
• Year of Activation: 1958
• End of Rehabilitation: 1995
Niroth WTP
• Stage I 130,000m³/day Mid 2013
• Stage II 130,000m³/day Early 2016
Elevated Tank
Service Coverage in 1993
Service Coverage in 1999
Current Service Coverage
Service Coverage in 2015
Service Coverage in 2020
PHNOM PENH WATER SUPPLY


80 sampling points
taken by our staffs




# 4. Water Quality Analysis Methods

| . Parameters | Method Analysis |
|---|---|
| pH | pH Meter, HACH |
| Turbidity | Turbidimeter, HACH |
| Conductivity | Conductivity Meter, HACH |
| Suspended Solid | Spectrophotometer, HACH |
| Total Dissolve Solid | Conductivity Meter, HACH |
| Free Available Chlorine | Pocket Colorimeter, HACH |
| Total Available Chlorine | Pocket Colorimeter, HACH |
| Alkalinity | Titration with $H_2SO_4$ |
| Total Hardness | Titration with EDTA |
| Ca Hardness | Titration with EDTA |
| Organic Substance | Titration |
| Dissolved Oxygen | D.O meter, HACH |
| E-coli | Membrane Filtration |
| Total Coliform | Membrane Filtration |

## 4. Water Quality Analysis Methods (cont.1)

| . Parameter | Method |
|---|---|
| Color | UV-Visible Spectrophotometer |
| UV, Absorption | UV-Visible Spectrophotometer |
| Aluminum | Spectrophotometer, HACH |
| Ammonia | Spectrophotometer, HACH |
| Ammonia Nitrogen | Spectrophotometer, HACH |
| Carbon Dioxide | Spectrophotometer, HACH |
| Copper | Spectrophotometer, HACH |
| Chloride | Spectrophotometer, HACH |
| Cyanide | Spectrophotometer, HACH |
| Chromium Total | Spectrophotometer, HACH |
| Chromium Hexavalent | Spectrophotometer, HACH |
| Fluoride | Spectrophotometer, HACH |
| Iron | Spectrophotometer, HACH |
| Manganese | Spectrophotometer, HACH |

## 4. Water Quality Analysis Methods (cont.2)

| . Parameter | Method |
|---|---|
| Nitrate | Spectrophotometer, HACH |
| Nitrate Nitrogen | Spectrophotometer, HACH |
| Nitrite | Spectrophotometer, HACH |
| Nitrite Nitrogen | Spectrophotometer, HACH |
| Zinc | Spectrophotometer, HACH |
| Phosphate | Spectrophotometer, HACH |
| Sulfide | Spectrophotometer, HACH |
| Sulfate | Spectrophotometer, HACH |

## Water Quality Analysis Equipment

Spectrophotometer

UV-Visible Spectrophotometer


## Water Quality Analysis Equipment (cont.)


Turbidimeter

Pocket Colorimeter

## Water Quality Analysis Equipment (cont.)

pH Meter

Conductivity Meter

DO Meter

## 5. Data Management

- Daily Report
- Weekly Report
- Month Report
- Yearly Report

## 6. Disclosure of Information

### Public Relation

*Customer complaints it means to determine the true of water quality*

24 hr service communication with the customers.

Establishment of warning programs.
24 hr permanent team.

## Public Education

- To educate the customers to understand the need of residual chlorine in the water.
  ( Killing bacteria, Better life, No need to boil )

- Smell of res chlorine in the water is not effect to the life ( WHO standard is 0.10 mg/l - 1.0 mg/l).

- Effective and regular communication with the customers and public awareness.

- Bringing customers to true of safe water from the tap.

# Thank you very much !

# See You Again..!

Phnom Penh Water Supply Authority

# Water Distribution Facilities Maintenance

**Mr. Pheng Ty**

Deputy Director of Production and Distribution Department

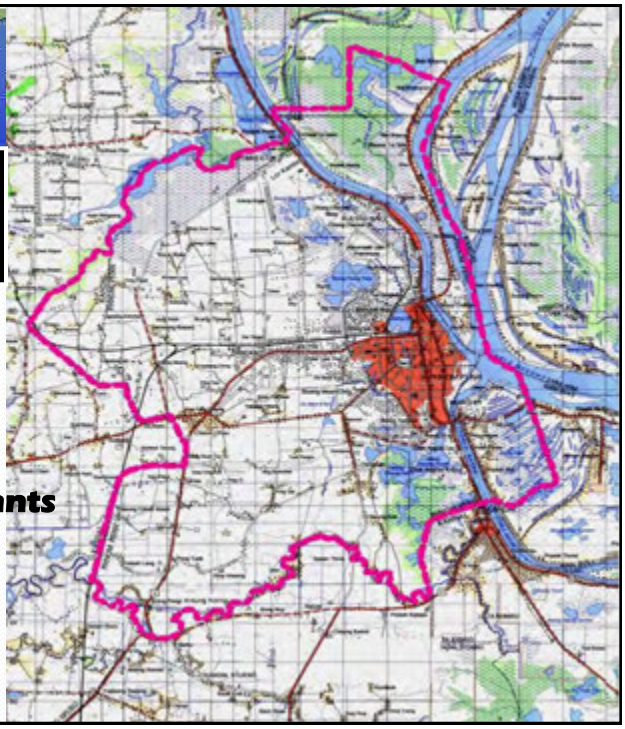
**2012**

Land:
181,035 km²
Population:
14.7 mil.

PHNOM PENH

**678.5 km²**

**1.7 million inhabitants**



# Content

1. Objective of Water supply Maintenance
2. Distribution Facilities Maintenance
3. Incentive and Penalty
4. Conclusion

## 1. Objective of Water Supply Maintenance

- Supply drinking and safe water sustainable to the customer all the service area.
- Keep the pipe and facilities component have long live, good water quality from the treatment plan, reduce the water loss and cut down the high expenditure for repairing.
- The lack of maintenance it cause loss a lot of money not only the authority but also the country.
- Conservation is the work of securing satisfactory function of pipe line under the certain condition for longer period of time.
- Advanced maintenance is the work of improvement of pipe line for more practical maintenance and experience in the future.

## 2-DISTRIBUTION FACILITIES Maintenance
## 2.1-Water Pipe Section: Ductile Iron Pipe

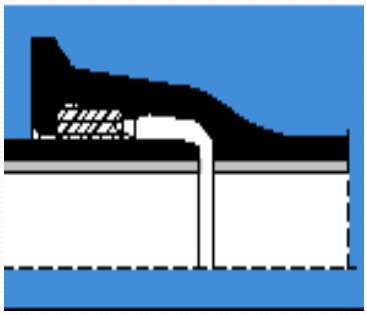
6m length, ensure high pressure, easy to construct, can be used more than 50 years and expensive.

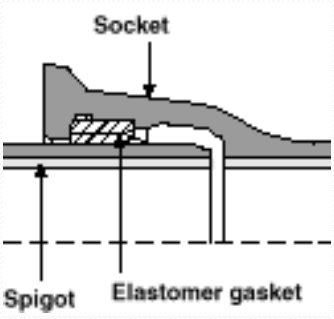
**DI pipe**

**DI connection**

## 2-DISTRIBUTION FACILITIES Maintenance
## 2.1-Water Pipe Section: Pipe Joints

Automatic Joints or Push joint

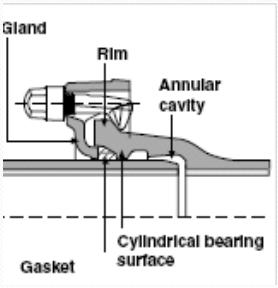


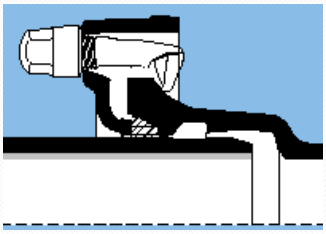


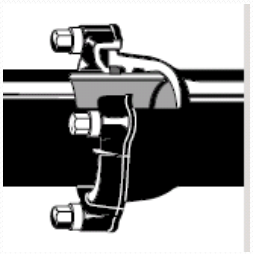

**Automatic Joint**

## 2-DISTRIBUTION FACILITIES Maintenance
## 2.1-Water Pipe Section: Pipe Joints

Mechanical joint



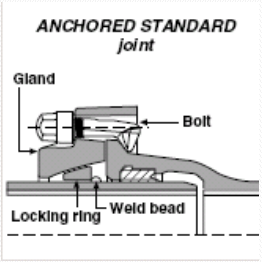



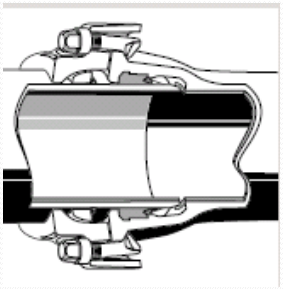


**Mechanical Joint**

## 2-DISTRIBUTION FACILITIES Maintenance
## 2.1-Water Pipe Section: Pipe Joints

Self Anchored joint

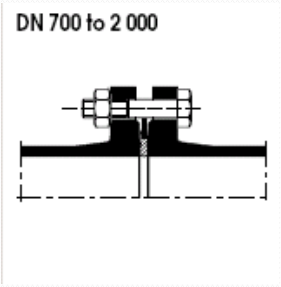


**Self Anchored Joint**

## 2-DISTRIBUTION FACILITIES Maintenance
## 2.1-Water Pipe Section: Pipe Joints

Flange joint




**Flange Joint**

## 2-DISTRIBUTION FACILITIES Maintenance
## 2.1-Water Pipe Section: HDPE Pipe

11.7m length, ensure high pressure, easy to construct.

## 2-DISTRIBUTION FACILITIES Maintenance
## 2.2-Stop Vale: Role

- Control flow and water current and shut off the water in the pipe line when maintenance is required ,
- In some case Stop valves is used for adjust the pressure in distribution system.
- Generally, butterfly valve is used for stop valve, because of they are too big size.
- The valve stop maintenance schedule is set up every **06 months.**

## 2-DISTRIBUTION FACILITIES Maintenance
## 2.2-Stop Vale: Maintenance procedure

The maintenance schedule for valve stop as below:

- First of all pump off the water and take off the sludge clean up all the facilities in side the chamber.
- Check and record the pipe, valve, bolt and nuts and fittings situation in side the chamber.
- Check the bolt and nuts by tightening all of them.
- Remove the corrosion from the valve, bolt and nuts and others equipment.
- Repaint the place where we remove the corrosion and put the grease for bolt and nuts.

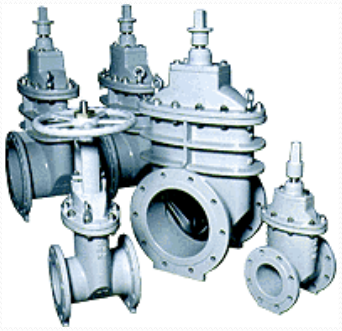
## 2-DISTRIBUTION FACILITIES Maintenance
## 2.2-Stop Vale: Maintenance procedure

- Check the condition of rein-force concrete (crack or wet) and manhole cover.
- In case of rein-force concrete have crack or wet, it's necessary to repair and paint by anti corrosion paint in order to protect the corrosion.
- During the repairing don't allow to close the valve it cause damage for big burst on the pipe line. Another hand, the type of this valve have liner inside to protect the corrosion.

## 2-DISTRIBUTION FACILITIES Maintenance
## 2.2-Stop Vale: Picture for Valve stop Maintenance

## 2-DISTRIBUTION FACILITIES Maintenance
## 2.2-Stop Vale: Gate valve and Butterfly valve

**Butterfly Valve**

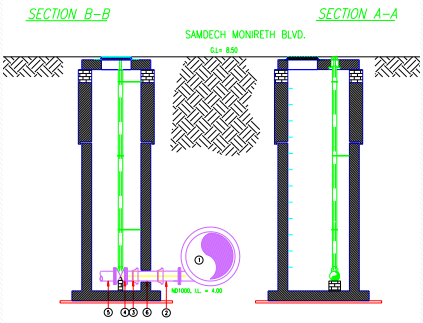


**Gate Valve**

## 2-DISTRIBUTION FACILITIES Maintenance
## 2.3-Wastout or Drain out Valve: Role

Take out the water in the pipe in order to clean the pipe, generally, the location of these valves are located at the lowest point of the pipe.

The maintenance schedule is set up every **6 months.**




**Washout**

## 2-DISTRIBUTION FACILITIES Maintenance
## 2.3-Wash out or Drain out Valve: Maintenance procedure

The maintenance schedule for wash out we did the same stop valve maintenance, in additional, just flow out the sludge and dirty water from the pipe.

In case of rein-force concrete have crack or wet it necessary to repair and re-paint by anti corrosion in order to protect the corrosion.

## 2-DISTRIBUTION FACILITIES Maintenance
## 2.4-Air Valve: Role

Air valve is used to take the air out from the pipe. In generally, air vale are located at the highest point of the pipe line.

The maintenance schedule is set up every **01 year.**

**Single Air Valve**

**Double Air Valve**

## 2-DISTRIBUTION FACILITIES Maintenance
## 2.4-Air Vale: Maintenance procedure

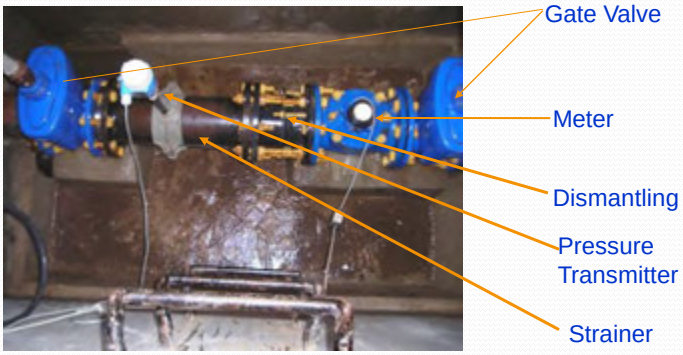
The maintenance schedule for Air valve as below:

- First of all pump off the water and take off the sludge clean up all the facilities in side the chamber.
- Check and record the air valve condition, bolt and nuts as well the condition of operation.
- Remove the corrosion from the air valve body, bolt and nuts.
- Re-paint the place where we remove the corrosion and put the grease for bolt and nuts.
- Check the condition of rein force concrete(crack or wet) and manhole cover.

## 2-DISTRIBUTION FACILITIES Maintenance
## 2.5-Zone meter: Role

To measure water flow in in the block distribution. In PPWSA, every zone meter, we install the Telemeter system for collection the flow and pressure data.

The maintenance schedule is set up every **06 Months.**



## 2-DISTRIBUTION FACILITIES Maintenance
## 2.5-Zone meter: Maintenance procedure

The maintenance schedule for meter as below:

- First of all pump off the water, especially, after raining and take off the sludge clean up all the facilities in side the chamber.
- Check and record water running, bolt and nuts as well the strainer condition.
- Remove the corrosion from the air valve body, bolt and nuts.
- Re-paint the place where we remove the corrosion and put the grease for bolt and nuts.
- Check the condition of rein force concrete(crack or wet) and manhole cover.

## 2-DISTRIBUTION FACILITIES Maintenance
## 2.6-Telemeter: Maintenance procedure

The maintenance schedule for meter as below:

- Check the local panel by considering mainly on the humidity, heater, dust and insects that is prohibited, in side the local panel, as well out site the panel.
- If we found the abnormal situation, it's necessary to repair it. Increasing heat mean that the air fan will have a problem.

## 2-DISTRIBUTION FACILITIES Maintenance
## 2.7-Cleaning the pipe: Role and Procedure

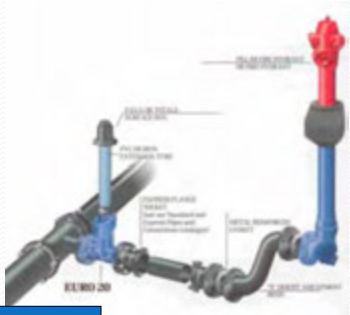
To clean all the sand and dirty water in the network system. It cause of the reason: Pipe construction and leakage repairing didn't respect to the technical standard and Valve closing when leakage happens.

The maintenance schedule is set up every **02 Years.**
The procedure as below:

- Proper digging the trench for cleaning the pipe
- Close the valve and cut the pipe end for cleaning (Valve must be closed 100% with the proper velocity.
- Check the water which flow from the pipe every 1 mn by using the clean bottle with the volume 5 meters.
- Don't open the valve without checking.
- Record the pipe end in the as built drawing.

## 2-DISTRIBUTION FACILITIES Maintenance
## 2.8-Fire Hydrant: Role

Hydrant can be used to blow out the air in the pipe and to wash out the pipe to keep good water quality.
Fire hydrant is installed for public purpose tp prevent the fire disaster.



**3 Outlet Hydrant**

## 2-DISTRIBUTION FACILITIES Maintenance
## 2.8-Fire Hydrant: Maintenance procedure

The maintenance schedule for Hydrant as below:

- Check the valve operation situation
- Check out let flow and body of fire hydrant as well as protection barrier.
- If found the corrosion or peeling off the paint have to remove the corrosion and re-paint it again.

## 2-DISTRIBUTION FACILITIES Maintenance
## 2.9-Leakage repairing: Role and Procedure

Water leakage is the most importance factor for water loss reduction. That why, leak repairing is the mains job which highly take in account.

The procedure as below:

- The starting after got the information not less than 01 hour.
- Big burst repairing which related to the closing valve for cut off the water in each block or sub zone is requested to carry out at night time. In case of emergency, need to ask the permission from the boss.
- Repair the leak at the dark place is prohibited because we can't see anything.
- It's necessary to flow out the water before making the connection.

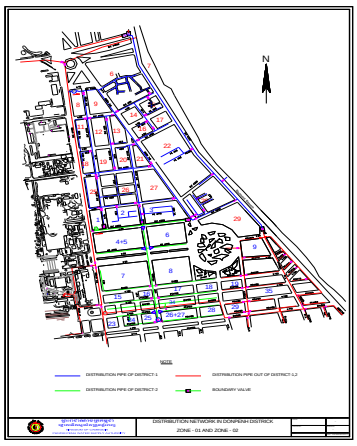
## 2-DISTRIBUTION FACILITIES Maintenance
## 2.10- Network Records: All network facilities

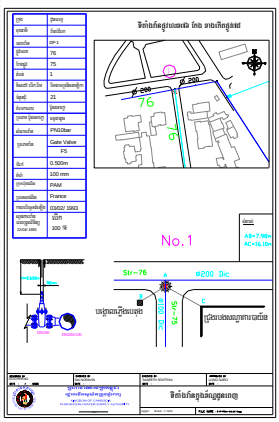
In order to get the efficient maintenance, it's necessary to make a book record for all the equipment of fittings such as detail plan, referent point, detail fittings,..Etc

The following information must be included and kept in the documents:

- Road name
- Main pipe distributing water
- Reservoir and pump station
- Valve hydrant and the place where we can drain the water

## 2-DISTRIBUTION FACILITIES Maintenance
## 2.10- Records: All network facilities





## 3-INCENTIVE AND PENALTY
## 3.1- Chief of group Punishment

The staff who carry out property and correctly according to the Standard Operating Procedure(SOP) will be provide the incentive, in the opposite, will be penalty according to the mistake. The limitation of the punishment depend on their mistake.

Chief group punishment as below:

- First mistake is provided punishment by blaming directly from the position according rank.
- First mistake is provided punishment by blaming letters from the director of AHR department and Penalty 100,000R
- Third mistake is provided punishment from the discipline committees decision

## 3-INCENTIVE AND PENALTY
## 3.2- Chief section and Vice Manager punish.

Chief section and Vice manger punishment as below:

- First mistake is provided punishment by blaming directly from the position according rank.
- First mistake is provided punishment by blaming letters from the director of AHR department and Penalty 200,000R
- Third mistake is provided punishment from the discipline committees decision

  - Only the chief of group, chief section and the vice manger are punished.

## 4-CONCLUSION

**All good work experience and mistake in job implementation, managers and directors have to spread to all the concerning staffs in order to improve and develop the work skill as well as to avoid the future mistake.**

# The Kent range of bulk meters
# H4000 Woltmann cold water meters
## Service manual

www.elster.com

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# H4000

## Woltmann cold water meters

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**Contents**

## Introduction

The H4000 is a horizontal (parallel axis) Woltmann-type meter designed to measure bulk flows of cold potable water at flow rates of between 0.35m³/h and 2000m³/h. There are ten meter sizes (40mm, 50mm, 65mm, 80mm, 100mm, 125mm, 150mm, 200mm, 250mm and 300mm) and ISO4064, BS5728 Class B performance requirements are considerably exceeded in the forward flow direction. Forward flow accuracy is guaranteed to ±5% qmin to qt and ±2% qt to qs. Reverse flow performance equates to class B requirements in sizes up to and incuding 125mm. The H4000 is suitable for water temperatures up to 50ºC and has a maximum working pressure of 16 bar.

The helical vane is driven by the water and revolves in direct proportion to the quantity of water passing through the meter. The revolutions of the helical vane are transferred by appropriate reduction gearing and a magnetic drive to a register which is calibrated in metric, imperial or US gallons units.

The H4000 has been designed with the minimum number of components allowing long-term maintenance to be carried out by easy replacement of sub-assemblies.

## Installation

It is recommended that a straight length of pipe the same diameter as the meter and equivalent in length to 10 times its diameter is fitted immediately prior to the meter inlet. Before installation the pipe line should be thoroughly flushed to remove any debris which may be present.

The meter should be fitted in accordance with the arrows shown on the body and top cover and it must be completely filled with water with no air present in the pipe line for correct operation to be obtained.

There must be no restriction in the pipe line at the meter inlet. Flange joints should not obstruct the flow into the meter body and any valve on the inlet side should be fully open. Any regulation of the flow should be carried out on the outlet side of the meter. The meter may be fitted in horizontal, vertical or inclined pipe lines without affecting its accuracy with the register arranged in the most convenient position for reading.

Flange bore masks should be removed prior to installation and the meter should be installed using suitable flange gaskets.

## Removal from service

For relevant diagrams refer to the rear of this manual:

**a)** If the mechanism only is to be removed:

1. Shut off the supply and vent the line to remove any water pressure.
2. Break the cover screw lead seal (10).
3. Slacken the screws (9) and (12) securing the mechanism (3) to the body (1) but **do not remove**. To release any residual pressure within the meter, gently tap the cover (5) to break the joint. Remove the cover screws and washers (13) and lift out the mechanism.
4. Replace the mechanism either by another or fit a blank to cover (5a) using a new 'O' ring (7).

**b)** If the complete meter is to be taken out:

1. Shut off the supply.
2. Remove the flange bolts and nuts and lift out the meter.

## Dismantling (Refer to page 10, exploded view, for item numbers).

1. If the meter is complete, remove the mechanism in accordance with the procedure given under Removal from service (a).
2. Remove the element securing screws (16) and washers (17) and place the cover, complete with register, to one side.
3. Drift out the spirol pins (22) from the element assembly using a pin punch and remove helical vane support (21).
4. Remove helical vane (20).
5. Undo the bearing screw (19). Remove front bearing (18) together with the regulator (23) and worm wheel assembly (26) simultaneously extracting both components.

**Note:**

The measuring mechanism is now completely dismantled except the diaphragm assembly (6) which normally would not need attention. We recommend this assembly is left in place to preserve the original calibration if at all possible. If, however, in the unlikely event damage has occured the following procedure should be used.

6. Push out the diaphragm (6) with a large headed punch noting its posiiton relative to the cast arrow on the cover (5).
7. Replace with new diaphragm (6) and 'O' ring (7). It may assist re-assembly if the 'O' ring is lightly greased with lithium listate grease.
8. Position diaphragm (6) by rotating with the diaphragm adjustment tool (48)

Tools: With the exception of the diaphragm adjustment tool no other special tools are required to maintain the meters. Proprietary hand tools should be available locally.

## Re-Assembly

This is a direct reversal of the dismantling procedure.

**Note:**

The position of the diaphragm (6) within the cover is determined by initial factory calibration and it is recommended that this setting is not disturbed. If, however, the two components have to be separated then, a) the original diaphragm position should be marked on the cover such that it can be precisely repositioned or, b) the complete mechanism should be re-calibrated after assembly.

## Fitment of Pulse Sensors to Polymer Register Assembly

If it is required to add sensors to the pulse outputs of the register, follow the procedure below:

## Reed Switch Sensor

1. Undo the two shroud screws (41) and remove the shroud (40).
2. Insert sensor in appropriate position with the cable to the bottom as shown on the label (39) inside the register lid.
3. Run the cable out through the slot in the lid ring (35) adjacent to the hinge.
4. Replace the shroud and fasten the screws.

## Opto Switch Sensor

This is fitted in a similar manner to the reed switch above. It must however only be located in the slot with the reflective drum showing through the register wall.

## Fitment of Pulse Sensors to Copper Can Register Assembly

If it is required to add sensors to the pulse outputs of the register, follow the procedure below:

## Reed Switch Sensor

1. Undo the two shroud screws (41) and remove the shroud (40).
2. Clip in the sensor in appropriate position with the cable to the bottom after first removing the closure panel (42) as shown on the label inside the register lid.
3. Run the cable out through the slot in the base ring (35a) adjacent to the hinge. Ensuring that the restraint ferrule on the cable is inside the shroud and that the cable runs in an anti-clockwise direction from the sensor.
4. Replace the shroud and fasten the screws.

## Opto Switch Sensor

1. Remove the cover plugs (44) on the top of the shroud (40).
2. Locate the opto switch sensor (46) using the two thumb screws (47).

**Note:**

For further information on pulse sensors, refer to the H4000 specification sheet.

## Performance

| Size of meter (mm) | | 40 | 50 | 65 | 80 | 100 | 125 | 150 | 200 | 250 | 300 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Maximum peak flow ±2% qs | $m^3/h$ | 90 | 90 | 120 | 200 | 250 | 250 | 600 | 1000 | 1600 | 2000 |
| Recommended continuous flow rate ±2% qp | $m^3/h$ | 50 | 50 | 65 | 120 | 180 | 180 | 450 | 700 | 1000 | 1500 |
| Transitional flow rate ±2% qt | $m^3/h$ | 1.0 | 1.0 | 1.5 | 2.0 | 2.0 | 2.0 | 4.0 | 6.0 | 11 | 15 |
| Minimum flow rate (horizontal) ±5% qmin | $m^3/h$ | 0.35 | 0.35 | 0.4 | 0.5 | 0.6 | 0.6 | 1.8 | 4.0 | 6.0 | 12 |
| Maximum water temperature | °C | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Maximum working pressure | bar | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 |

## Standard ISO 4064/BS5728/EEC specification Class B

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Maximum peak flow ±2% qs | $m^3/h$ | – | 30 | 50 | 80 | 120 | 200 | 300 | 500 | 800 | 1200 |
| Recommended continuous flow rate ±2% qp | $m^3/h$ | – | 15 | 25 | 40 | 60 | 100 | 150 | 250 | 400 | 600 |
| Transitional flow rate ±2% qt | $m^3/h$ | – | 3 | 5 | 8 | 12 | 20 | 30 | 50 | 80 | 120 |
| Minimum flow rate ±5% qmin | $m^3/h$ | – | 0.45 | 0.75 | 1.2 | 1.8 | 3.0 | 4.5 | 7.5 | 12 | 18 |

## Materials of construction

### 40mm – 125mm

| Parts | Materials |
|---|---|
| Body | Grey iron |
| Cover | Grey iron |
| Diaphragm | Brass |
| Measuring element | Loaded Noryl |
| Rotor support | Loaded Noryl |
| Regulator blade | Loaded Noryl |
| Front bearing unit | Loaded Nylon |
| WW spindle top brg bush | Loaded Nylon |
| Helical vane | Loaded polypropylene |
| Helical vane worm | Loaded polypropylene |
| Worm wheel | Loaded polyphenylene sulfide |
| Element security clip | Loaded Noryl |
| Rotor journal bearings | Synthetic sapphire |
| Rotor bearings spacers | Noryl |
| Stub spindles | Tungsten carbide |
| Thrust pads | Tungsten carbide |
| Stub spindle box | Stainless steel |
| Worm wheel spindle | Stainless steel |
| Magnet carrier | Loaded Noryl |
| Magnets | Samarium cobalt |
| 'O' seals | Synthetic rubber |
| Fasteners | Stainless steel |
| Body and cover finish | Epoxy powder coated |
| **Counter**: | |
| Lid | Acrylonitrile butadiene styrene/polycarbonate |
| Lid ring | Polycarbonate |
| Clamp ring | Polyacetal |
| Shroud | Acrylonitrile butadiene styrene/polycarbonate |
| **Counter assembly:** | |
| Gear plates | Loaded Noryl |
| Gears | Nylon |
| Housing | Polycarbonate or copper |
| Rollers | Polyacetal |
| Spindles | Stainless steel |
| Jewel | Synthetic sapphire |
| 'O' seal | Synthetic rubber |
| Screws | Stainless steel |

### 150mm – 300mm

| Parts | Materials |
|---|---|
| Body | Grey iron |
| Cover | Grey iron |
| Diaphragm | Brass |
| Measuring element | Loaded Noryl |
| Rotor support | Loaded Noryl |
| Regulator blade | Loaded Noryl |
| Front bearing unit | Loaded Nylon |
| WW spindle top brg bush | Loaded Nylon |
| Helical vane | Polypropylene |
| Helical vane worm | Loaded polyphenylene sulfide |
| Worm wheel | Loaded polyphenylene sulfide |
| Element security clip | Polystyrene |
| Rotor journal bearings | Synthetic sapphire |
| Rotor bearings spacers | Noryl |
| Stub spindles | Tungsten carbide |
| Thrust pads | Tungsten carbide |
| Stub spindle box | Stainless steel |
| Worm wheel spindle | Stainless steel |
| Magnet carrier | Loaded Noryl |
| Magnets | Samarium cobalt |
| 'O' seals | Synthetic rubber |
| Fasteners | Stainless steel |
| Body and cover finish | Epoxy powder coated |
| **Counter**: | |
| Lid | Acrylonitrile butadiene styrene/polycarbonate |
| Lid ring | Polycarbonate |
| Clamp ring | Polyacetal |
| Shroud | Acrylonitrile butadiene styrene/polycarbonate |
| **Counter assembly:** | |
| Gear plates | Loaded Noryl |
| Gears | Nylon |
| Housing | Polycarbonate or copper |
| Rollers | Polyacetal |
| Spindles | Stainless steel |
| Jewel | Synthetic sapphire |
| 'O' seal | Synthetic rubber |
| Screws | Stainless steel |

# H4000 Spare Parts List

| Item | Description | Qty | 40mm | 50mm | 65mm | 80mm | 100mm |
|---|---|---|---|---|---|---|---|
| 1a | Body – overall length: BS5728 (short) | | 200mm | 200mm | 200mmm | 200mm | 250mm |
| | Flanges drilled to suit BS4504 PN16 | 1 | – | HPB0902 | HPC0902 | HPD0902 | HPE0902 |
| | Flanges drilled to suit BS4504 PN10 | 1 | – | HPB0902 | HPC0902 | HPD0902 | HPE0902 |
| | Flanges drilled to suit ISO R13 | 1 | – | HPB0902 | HPC0902 | HPD0902 | HPE0902 |
| 1b | Body – overall length: 225mm | | – | – | – | 225mm | – |
| | Flanges drilled to suit BS4504 PN10/16 | 1 | – | – | – | HPD0903 | – |
| | Flanges drilled to suit ISO R13 | 1 | – | – | – | HPD0906 | – |
| 1c | Body – overall length: BS5728 (long) | | 300mm | 300mm | 300mmm | 350mm | 350mm |
| | Flanges drilled to suit BS4504 PN10/16 | 1 | HPA0918 | HPB0918 | HPC0918 | HPD0918 | HPE0918 |
| | Flanges drilled to suit ISO R13 | 1 | HPA0918 | HPB0918 | HPC0918 | HPD0918 | HPE0918 |
| 1d | Body – overall length: Kent | | 311mm | 311mm | – | 413mm | 483mm |
| | Flanges drilled to suit BS4504 PN16 | 1 | HPA0917 | HPB0917 | – | HPD0917 | HPE0917 |
| | Flanges drilled to suit BS4504 PN10 | 1 | HPA0917 | HPB0917 | – | HPD0917 | HPE0917 |
| | Flanges drilled to suit ISO R13 | 1 | HPA0917 | HPB0917 | – | HPD0917 | HPE0917 |
| 2 | Flange washers to suit BS4504 PN10/16 and ISO R13 | 2 | 2413X4006 | 2413X4008 | 2413X4012 | 2413X4016 | 2413X4020 |
| 3 | Complete mechanism, includes register assembly and 'O' ring (14), excludes items 9 to 13 | | | | | | |
| | With polymer reg. assbly. (0.001m³/pulse) | 1 | HPA7804 | HPB7804 | HPC7804 | HPD7804 | HPE7804 |
| | With polymer reg. assbly. (0.001, 0.1 & 1m³/pulse) | 1 | HPA7801 | HPB7801 | HPC7801 | HPD7801 | HPE7801 |
| | With copper can reg. assbly. (0.001m³/pulse) | 1 | HPA7806 | HPB7806 | HPC7806 | HPD7806 | HPE7806 |
| | With copper can reg. assbly. (0.001, 0.01 & 1m³/pulse) | 1 | HPA7807 | HPB7807 | HPC7807 | HPD7807 | HPE7807 |
| | With copper can reg. assbly. (0.001, 0.1 & 1m³/pulse) | 1 | HPA7808 | HPB7808 | HPC7808 | HPD7808 | HPE7808 |
| 4 | Cover assembly | 1 | HPD4920 | HPD4920 | HPD4920 | HPD4920 | HPD4920 |
| 5 | Cover | 1 | HPD0920 | HPD0920 | HPD0920 | HPD0920 | HPD0920 |
| 5a | Blank cover (not shown on diagram) | 1 | HPD7600 | HPD7600 | HPD7600 | HPD7600 | HPD7600 |
| 6 | Diaphragm assembly | 1 | HPD7003 | HPD7003 | HPD7003 | HPD7003 | HPD7003 |
| 7 | 'O' ring | 1 | 2411X2548 | 2411X2548 | 2411X2548 | 2411X2548 | 2411X2548 |
| 8 | Size identification label | 1 | HPA0015 | HPB0015 | HPC0015 | HPD0015 | HPE0015 |
| 9 | Cover sealing screw | 1 | HPD0010 | HPD0010 | HPD0010 | HPD0010 | HPD0010 |
| 10 | Lead seal | 1 | MNA0030 | MNA0030 | MNA0030 | MNA0030 | MNA0030 |
| 11 | Lock wire | 1 | MNA0031 | MNA0031 | MNA0031 | MNA0031 | MNA0031 |
| 12 | Cover screw | 3 | 2201M3299 | 2201M3299 | 2201M3299 | 2201M3299 | 2201M3299 |
| 13 | Washer | 4 | 2290M3282 | 2290M3282 | 2290M3282 | 2290M3282 | 2290M3282 |
| 14 | 'O' ring | 1 | 2411X2549 | 2411X2549 | 2411X2549 | 2411X2549 | 2411X2549 |
| 15 | Measuring element | 1 | HPB0900 | HPB0900 | HPB0900 | HPB0900 | HPB0900 |
| 16 | Element screw | 3 | 2220M3205 | 2220M3205 | 2220M3205 | 2220M3205 | 2220M3205 |
| 17 | Washer | 3 | 2290M3162 | 2290M3162 | 2290M3162 | 2290M3162 | 2290M3162 |
| 18 | Front bearing | 1 | HPD0801 | HPD0801 | HPD0801 | HPD0801 | HPD0801 |
| 19 | Front bearing screw | 1 | 2261M3178 | 2261M3178 | 2261M3178 | 2261M3178 | 2261M3178 |
| 20 | Helical vane assembly | 1 | HPB7002 | HPB7002 | HPB7002 | HPD7002 | HPD7002 |
| 21 | Helical vane support assembly | 1 | HPB7001 | HPB7001 | HPB7001 | HPD7001 | HPD7001 |
| 22 | Spirol pin | 2 | 2287M3192 | 2287M3192 | 2287M3192 | 2387M3192 | 2387M3192 |
| 23 | Regulator blade | 1 | HPB0800 | HPB0800 | HPB0800 | HPD0800 | HPD0800 |
| 24 | 'O' ring | 1 | 2411X2550 | 2411X2550 | 2411X2550 | 2411X2550 | 2411X2550 |
| 25 | Worm wheel spindle | 1 | HPB0002 | HPB0002 | HPB0002 | HPD0002 | HPD0002 |
| 26 | Worm wheel | 1 | HPD0003 | HPD0003 | HPD0003 | HPD0003 | HPD0003 |
| 27 | Clip | 1 | MHA0012 | MHA0012 | MHA0012 | MHA0012 | MHA0012 |
| 28 | Magnet/carrier assembly | 1 | HPD4008 | HPD4008 | HPD4008 | HPD4008 | HPD4008 |

## H4000 Spare Parts List – continued

| Item | Description | Qty | 40mm | 50mm | 65mm | 80mm | 100mm |
|---|---|---|---|---|---|---|---|
| 29 | Polymer register assembly: | | | | | | |
| | 0.001m³/pulse | 1 | HPX4100 | HPX4100 | HPX4105 | HPX4110 | HPX4115 |
| | 0.001, 0.1 and 1m³/pulse | 1 | HPX4102 | HPX4102 | HPX4107 | HPX4112 | HPX4117 |
| 29a | Copper can register and sensor holder assembly: | | | | | | |
| | 0.001m³/pulse | 1 | HPA7025 | HPA7025 | HPC7025 | HPD7025 | HPE7025 |
| | 0.001, 0.01 and 1m³/pulse | 1 | HPA7026 | HPA7026 | HPC7026 | HPD7026 | HPE7026 |
| | 0.001, 0.1 and 1m³/pulse | 1 | HPA7027 | HPA7027 | HPC7027 | HPD7027 | HPE7027 |
| 30 | 'O' ring – to suit polymer register assembly | 1 | 2411M2668 | 2411M2668 | 2411M2668 | 2411M2668 | 2411M2668 |
| 31 | Clamp ring – to suit polymer register | 1 | CAE0001 | CAE0001 | CAE0001 | CAE0001 | CAE0001 |
| 31a | Clamp ring – to suit copper can register | 1 | CAE0071 | CAE0071 | CAE0071 | CAE0071 | CAE0071 |
| 32 | Clamp ring screw – to suit polymer register | 3 | 2203M3173 | 2203M3173 | 2203M3173 | 2203M3173 | 2203M3173 |
| | Clamp ring screw – to suit copper can register | 3 | 2214M3173 | 2214M3173 | 2214M3173 | 2214M3173 | 2214M3173 |
| 33 | Clamp ring sealing plug – to suit polymer register | 1 | CAE0020 | CAE0020 | CAE0020 | CAE0020 | CAE0020 |
| 33a | Clamp ring sealing plug – to suit copper can register | 3 | CAE0060 | CAE0060 | CAE0060 | CAE0060 | CAE0060 |
| 34 | Clamp ring lead seal – to suit polymer register only | 2 | 2376M1201 | 2376M1201 | 2376M1201 | 2376M1201 | 2376M1201 |
| 35 | Lid ring – to suit polymer register | 1 | CAE0003 | CAE0003 | CAE0003 | CAE0003 | CAE0003 |
| 35a | Base ring – to suit copper can register | 1 | CAE0069 | CAE0069 | CAE0069 | CAE0069 | CAE0069 |
| 36 | Lid ring nut | 2 | 2240M6115 | 2240M6115 | 2240M6115 | 2240M6115 | 2240M6115 |
| | Shroud ring nut – to suit copper can register | 3 | 2240M6115 | 2240M6115 | 2240M6115 | 2240M6115 | 2240M6115 |
| 37 | EC approval plate – to suit polymer register: | | | | | | |
| | For 10 bar working pressure | 1 | HPA7040 | HPB7040 | HPC7040 | HPD7040 | HPE7040 |
| | For 16 bar working pressure | 1 | HPA7040 | HPB7040 | HPC7040 | HPD7040 | HPE7040 |
| 37a | EC approval label – to suit copper can register: | | | | | | |
| | For 10 bar working pressure | 1 | HPA0066 | HPB0066 | HPC0066 | HPD0066 | HPE0066 |
| | For 16 bar working pressure | 1 | HPA0066 | HPB0066 | HPC0066 | HPD0066 | HPE0066 |
| 38 | Lid (Kent) – to suit polymer register | 1 | CAE0009 | CAE0009 | CAE0009 | CAE0009 | CAE0009 |
| | Lid (Kent) – to suit copper can register | 1 | CAE0073 | CAE0073 | CAE0073 | CAE0073 | CAE0073 |
| 39 | Sensor fitting label (English) – to suit polymer reg. | 1 | 7604M2022 | 7604M2022 | 7604M2022 | 7604M2022 | 7604M2022 |
| | Sensor fitting label (English) – to suit copper can reg. | 1 | 7604M2055 | 7604M2055 | 7604M2055 | 7604M2055 | 7604M2055 |
| 40 | Shroud – to suit polymer register | 1 | CAE0002 | CAE0002 | CAE0002 | CAE0002 | CAE0002 |
| | Shroud – to suit copper can register | 1 | LAE0073 | LAE0073 | LAE0073 | LAE0073 | LAE0073 |
| 41 | Shroud screw – to suit polymer register | 2 | 2204M3145 | 2204M3145 | 2204M3145 | 2204M3145 | 2204M3145 |
| | Shroud screw – to suit copper can register | 2 | 2214M3174 | 2214M3174 | 2214M3174 | 2214M3174 | 2214M3174 |
| 42 | Closure panel – to suit copper can register only | 3 | CAE0059 | CAE0059 | CAE0059 | CAE0059 | CAE0059 |
| 43 | Spirol pin – to suit copper can register only | 1 | 2287M3137 | 2287M3137 | 2287M3137 | 2287M3137 | 2287M3137 |
| 44 | Cover plug – to suit copper can register only | 2 | 2378M2500 | 2378M2500 | 2378M2500 | 2378M2500 | 2378M2500 |
| 45 | Reed switch pulser (polymer and copper can register) | | Contact Elster Metering Limited for full list of pulsers | | | | |
| 46 | Opto switch pulser – polymer register | | Contact Elster Metering Limited for full list of pulsers | | | | |
| 46a | Opto switch pulser – copper can register | | Contact Elster Metering Limited for full list of pulsers | | | | |
| 47 | Opto switch pulser thumb screws | 2 | CAE0082 | | | | |
| 48 | Diaphragm adjustment tool (not shown) | 1 | HPA7800 | | | | |

Note: An inductive sensor is also available, contact Elster Metering Limited for details.

Item 34 – these seals are not available as a spare as they may only be fitted to original factory supplied meters which have been calibrated and certified to EEC standards.

Items 31 and 35 are only supplied as a sub-assembly.

Items 31a, 35a and 37a are only supplied as a sub-assembly.

Items 38 and 39 are only supplied as a sub-assembly.

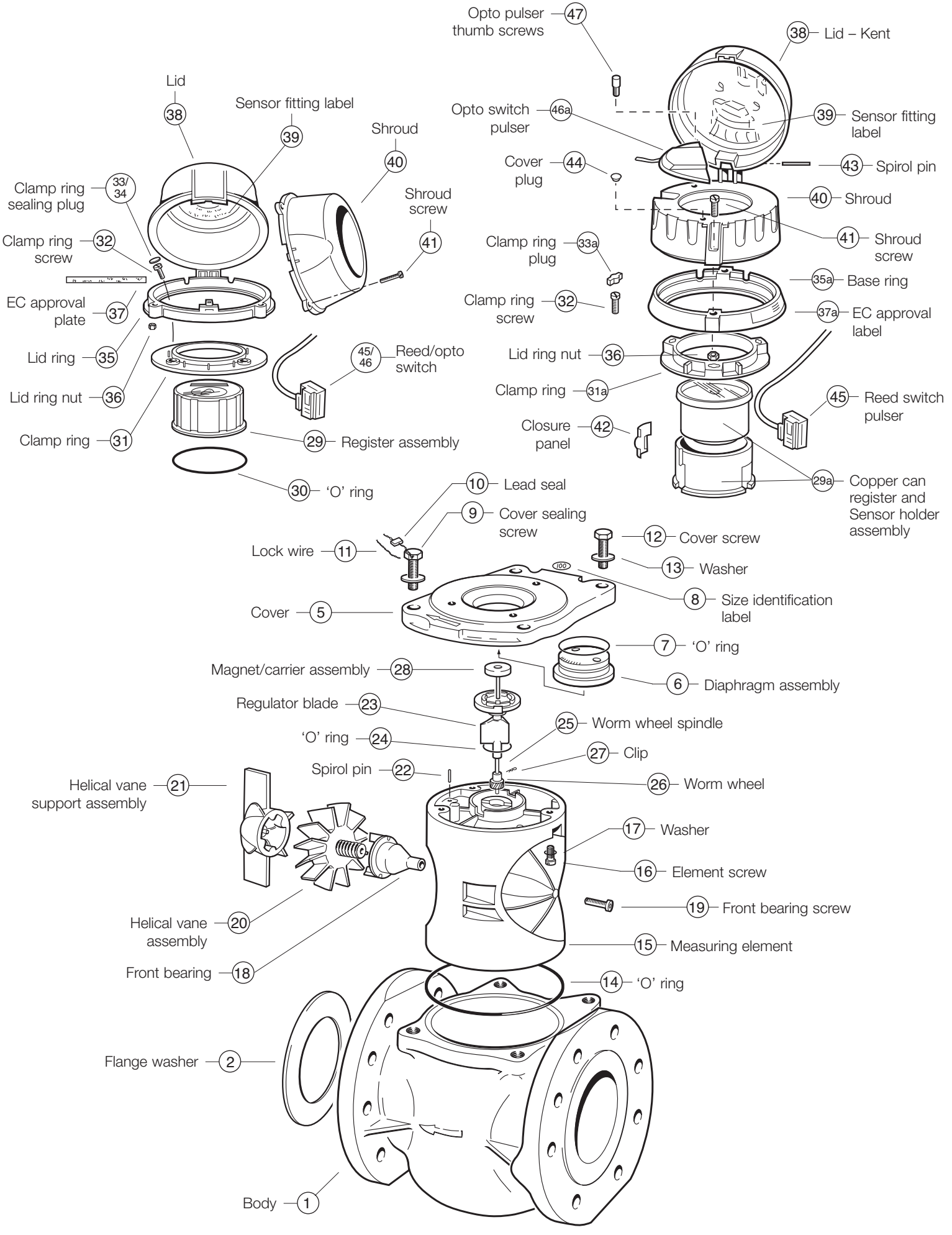
# Helix 4000 Spare Parts List

| Item | Description | Qty | 125mm | 150mm | 200mm | 250mm | 300mm |
|---|---|---|---|---|---|---|---|
| 1a | Body – overall length: BS5728 (short) | | 250mm | 300mm | 350mmm | 450mm | 500mm |
| | Flanges drilled to suit BS4504 PN16 | 1 | HPF0902 | HPG0902 | HPH0902 | HPJ0902 | HPK0902 |
| | Flanges drilled to suit BS4504 PN10 | 1 | HPF0902 | HPG0902 | HPH0902 | HPJ0902 | HPK0902 |
| | Flanges drilled to suit ISO R13 | 1 | HPF0902 | HPG0902 | HPH0902 | HPJ0902 | HPK0902 |
| 1b | Body – overall length: BS5728 (long) | | – | 500mm | – | – | – |
| | Flanges drilled to suit BS4504 PN10/16 | 1 | – | HPG0918 | – | – | – |
| | Flanges drilled to suit ISO R13 | 1 | – | HPG0918 | – | – | – |
| 1d | Body – overall length: Kent | | – | – | 520mm | – | – |
| | Flanges drilled to suit BS4504 PN16 | 1 | – | – | HPH0917 | – | – |
| | Flanges drilled to suit BS4504 PN10 | 1 | – | – | HPH0928 | – | – |
| | Flanges drilled to suit ISO R13 | 1 | – | – | HPH0928 | – | – |
| 2 | Flange washers to suit BS4504 PN10/16 and ISO R13 | 2 | 2413X4024 | KXH0630 | KXJ0630 | – | – |
| 3 | Complete mechanism, includes register assembly and 'O' ring (14), excludes items 9 to 13 | | | | | | |
| | With polymer reg. assbly. (0.001m³/pulse) | 1 | HPF7804 | n/a | n/a | n/a | n/a |
| | With polymer reg. assbly. (0.01m³/pulse) | 1 | n/a | HPG7804 | HPH7804 | HPJ7804 | HPK7804 |
| | With polymer reg. assbly. (0.001, 0.1 and 1m³/pulse) | 1 | HPF7801 | n/a | n/a | n/a | n/a |
| | With polymer reg. assbly. (0.01, 1 and 10m³/pulse) | 1 | n/a | HPG7801 | HPH7801 | HPJ7801 | HPK7801 |
| | With copper can reg. assbly. (0.001m³/pulse) | 1 | HPF7806 | n/a | n/a | n/a | n/a |
| | With copper can reg. assbly. (0.01m³/pulse) | 1 | n/a | HPG7806 | HPH7806 | HPJ7806 | HPK7806 |
| | With copper can reg. assbly. (0.001, 0.1 & 1m³/pulse) | 1 | HPF7807 | n/a | n/a | n/a | n/a |
| | With copper can reg. assbly. (0.01, 0.1 & 10m³/pulse) | 1 | n/a | HPG7807 | HPH7807 | HPJ7807 | HPK7807 |
| | With copper can reg. assbly. (0.001, 0.1 & 1m³/pulse) | 1 | HPF7808 | n/a | n/a | n/a | n/a |
| | With copper can reg. assbly. (0.01, 0.1 & 10m³/pulse) | 1 | n/a | HPG7808 | HPH7808 | HPJ7808 | HPK7808 |
| 4 | Cover assembly | 1 | HPD4920 | HPG4920 | HPG4920 | HPG4920 | HPG4920 |
| 5 | Cover | 1 | HPD0920 | HPG0920 | HPG0920 | HPG0920 | HPG0920 |
| 5a | Blank cover (not shown on diagram) | 1 | HPD7600 | HPG7600 | HPG7600 | HPG7600 | HPG7600 |
| 6 | Diaphragm assembly | 1 | HPD7003 | HPD7003 | HPD7003 | HPD7003 | HPD7003 |
| 7 | 'O' ring | 1 | 2411X2548 | 2411X2548 | 2411X2548 | 2411X2548 | 2411X2548 |
| 8 | Size identification label | 1 | HPF0015 | HPG0015 | HPH0015 | HPJ0015 | HPK0015 |
| 9 | Cover sealing screw | 1 | HPD0010 | HPG0010 | HPG0010 | HPG0010 | HPG0010 |
| 10 | Lead seal | 1 | MNA0030 | MNA0030 | MNA0030 | MNA0030 | MNA0030 |
| 11 | Lock wire | 1 | MNA0031 | MNA0031 | MNA0031 | MNA0031 | MNA0031 |
| 12 | Cover screw (125mm) | 3 | 2201M3299 | n/a | n/a | n/a | n/a |
| | Cover screw (150-300mm) | 5 | n/a | 2201M3314 | 2201M3314 | 2201M3314 | 2201M3314 |
| 13 | Washer (125mm) | 4 | 2290M3282 | n/a | n/a | n/a | n/a |
| | Washer (150-300mm) | 6 | n/a | 2290M3285 | 2290M3285 | 2290M3285 | 2290M3285 |
| 14 | 'O' ring | 1 | 2411X2549 | 2411X2552 | 2411X2552 | 2411X2552 | 2411X2552 |
| 15 | Measuring element | 1 | HPD0900 | HPG0900 | HPG0900 | HPG0900 | HPG09000 |
| 16 | Element screw (125mm) | 3 | 2220M3205 | n/a | n/a | n/a | n/a |
| | Element screw (150-300mm) | 5 | n/a | 2220M3208 | 2220M3208 | 2220M3208 | 2220M3208 |
| 17 | Washer (125mm) | 3 | 2290M3162 | n/a | n/a | n/a | n/a |
| | Washer (150-300mm) | 5 | n/a | 2290M3284 | 2290M3284 | 2290M3284 | 2290M3284 |
| 18 | Front bearing | 1 | HPD0801 | HPG0801 | HPG0801 | HPG0801 | HPG0801 |
| 19 | Front bearing screw | 1 | 2261M3179 | 2261M3179 | 2261M3179 | 2261M3179 | 2261M3179 |
| 20 | Helical vane assembly | 1 | HPD7002 | HPG7002 | HPH7002 | HPJ7002 | HPK7002 |
| 21 | Helical vane support assembly | 1 | HPD7001 | HPG7001 | HPG7001 | HPG7001 | HPG7001 |
| 22 | Spirol pin | 2 | 2287M3192 | 2287M3257 | 2287M3257 | 2287M3257 | 2287M3257 |
| 23 | Regulator blade | 1 | HPD0800 | HPG0800 | HPG0800 | HPG0800 | HPG0800 |
| 24 | 'O' ring | 1 | 2411X2550 | 2411X2551 | 2411X2551 | 2411X2551 | 2411X2551 |
| 25 | Worm wheel spindle | 1 | HPD0002 | HPG0002 | HPG0002 | HPG0002 | HPG0002 |
| 26 | Worm wheel | 1 | HPD0003 | HPG0003 | HPH0003 | HPJ0003 | HPJ0003 |

## Helix 4000 Spare Parts List – continued

| Item | Description | Qty | 125mm | 150mm | 200mm | 250mm | 300mm |
|---|---|---|---|---|---|---|---|
| 27 | Clip | 1 | MHA0012 | MHA0012 | MHA0012 | MHA0012 | MHA0012 |
| 28 | Magnet/carrier assembly | 1 | HPD4008 | HPD4008 | HPD4008 | HPD4008 | HPD4008 |
| 29 | Polymer register assembly: | | | | | | |
| | 0.001m³/pulse | 1 | HPX4115 | n/a | n/a | n/a | n/a |
| | 0.01m³/pulse | 1 | n/a | HPX4230 | HPX4235 | – | – |
| | 0.001, 0.1 and 1m³/pulse | 1 | HPX4117 | n/a | n/a | n/a | n/a |
| | 0.1, 1 and 10m³/pulse | 1 | n/a | HPX4232 | HPX4237 | – | – |
| 29a | Copper can register and sensor holder assembly: | | | | | | |
| | 0.001m³/pulse | 1 | HPE7025 | n/a | n/a | n/a | n/a |
| | 0.01m³/pulse | 1 | n/a | HPG7025 | HPH7025 | – | – |
| | 0.001, 0.01 and 1m³/pulse | 1 | HPE7026 | n/a | n/a | n/a | n/a |
| | 0.01, 0.1 and 10m³/pulse | 1 | n/a | HPG7026 | HPH7026 | – | – |
| | 0.001, 0.1 and 1m³/pulse | 1 | HPE7027 | n/a | n/a | n/a | n/a |
| | 0.01, 1 and 10m³/pulse | 1 | n/a | HPG7027 | HPH7027 | – | – |
| 30 | 'O' ring – to suit polymer register assembly | 1 | 2411M2668 | 2411M2668 | 2411M2668 | 2411M2668 | 2411M2668 |
| 31 | Clamp ring – to suit polymer register | 1 | CAE0001 | CAE0001 | CAE0001 | CAE0001 | CAE0001 |
| 31a | Clamp ring – to suit copper can register | 1 | CAE0071 | CAE0071 | CAE0071 | CAE0071 | CAE0071 |
| 32 | Clamp ring screw – to suit polymer register | 3 | 2203M3173 | 2203M3173 | 2203M3173 | 2203M3173 | 2203M3173 |
| | Clamp ring screw – to suit copper can register | 3 | 2214M3173 | 2214M3173 | 2214M3173 | 2214M3173 | 2214M3173 |
| 33 | Clamp ring sealing plug – to suit polymer register | 1 | CAE0020 | CAE0020 | CAE0020 | CAE0020 | CAE0020 |
| 33a | Clamp ring sealing plug – to suit copper can register | 3 | CAE0060 | CAE0060 | CAE0060 | CAE0060 | CAE0060 |
| 34 | Clamp ring lead seal – to suit polymer register only | 2 | 2376M1201 | 2376M1201 | 2376M1201 | 2376M1201 | 2376M1201 |
| 35 | Lid ring – to suit polymer register | 1 | CAE0003 | CAE0003 | CAE0003 | CAE0003 | CAE0003 |
| 35a | Base ring – to suit copper can register | 1 | CAE0069 | CAE0069 | CAE0069 | CAE0069 | CAE0069 |
| 36 | Lid/base ring nut | 2 | 2240M6115 | 2240M6115 | 2240M6115 | 2240M6115 | 2240M6115 |
| | Shroud ring nut – to suit copper can register | 3 | 2240M6115 | 2240M6115 | 2240M6115 | 2240M6115 | 2240M6115 |
| 37 | EC approval plate – to suit polymer register: | | | | | | |
| | For 10 bar working pressure | 1 | HPF7040 | HPF7040 | HPH7041 | HPJ7041 | HPK7041 |
| | For 16 bar working pressure | 1 | HPF7040 | HPG7040 | HPH7040 | HPJ7040 | HPK7040 |
| 37a | EC approval label – to suit copper can register: | | | | | | |
| | For 10 bar working pressure | 1 | HPF0066 | HPG0066 | HPH0067 | HPJ0067 | HPK0067 |
| | For 16 bar working pressure | 1 | HPF0066 | HPG0066 | HPH0066 | HPJ0066 | HPK0066 |
| 38 | Lid (Kent) – to suit polymer register | 1 | CAE0009 | CAE0009 | CAE0009 | CAE0009 | CAE0009 |
| | Lid (Kent) – to suit copper can register | 1 | CAE0073 | CAE0073 | CAE0073 | CAE0073 | CAE0073 |
| 39 | Sensor fitting label (English) – to suit polymer reg. | 1 | 7604M2022 | 7604M2022 | 7604M2022 | 7604M2022 | 7604M2022 |
| | Sensor fitting label (English) – to suit copper can reg. | 1 | 7604M2055 | 7604M2055 | 7604M2055 | 7604M2055 | 7604M2055 |
| 40 | Shroud – to suit polymer register | 1 | CAE0002 | CAE0002 | CAE0002 | CAE0002 | CAE0002 |
| | Shroud – to suit copper can register | 1 | LAE0073 | LAE0073 | LAE0073 | LAE0073 | LAE0073 |
| 41 | Shroud screw – to suit polymer register | 2 | 2204M3145 | 2204M3145 | 2204M3145 | 2204M3145 | 2204M3145 |
| | Shroud screw – to suit copper can register | 2 | 2214M3174 | 2214M3174 | 2214M3174 | 2214M3174 | 2214M3174 |
| 42 | Closure panel – to suit copper can register only | 3 | CAE0059 | CAE0059 | CAE0059 | CAE0059 | CAE0059 |
| 43 | Spirol pin – to suit copper can register only | 1 | 2287M3137 | 2287M3137 | 2287M3137 | 2287M3137 | 2287M3137 |
| 44 | Cover plug – to suit copper can register only | 2 | 2378M2500 | 2378M2500 | 2378M2500 | 2378M2500 | 2378M2500 |
| 45 | Reed switch pulser (polymer and copper can register) | | Contact Elster Metering Limited for full list of pulsers | | | | |
| 46 | Opto switch pulser – polymer register | | Contact Elster Metering Limited for full list of pulsers | | | | |
| 46a | Opto switch pulser – copper can register | | Contact Elster Metering Limited for full list of pulsers | | | | |
| 47 | Opto switch pulser thumb screws | 2 | CAE0082 | | | | |
| 48 | Diaphragm adjustment tool (not shown) | 1 | HPA7800 | | | | |

Note: An inductive sensor is also available, contact Elster Metering Limited for details.
Item 34 – these seals are not available as a spare as they may only be fitted to original factory supplied meters which have been calibrated and certified to EEC standards.
Items 31 and 35 are only supplied as a sub-assembly.
Items 31a, 35a and 37a are only supplied as a sub-assembly.
Items 38 and 39 are only supplied as a sub-assembly.


Opto pulser thumb screws 47
38 Lid – Kent
Lid 38
Sensor fitting label 39
Shroud 40
Opto switch pulser 46a
39 Sensor fitting label
Cover plug 44
43 Spirol pin
Clamp ring sealing plug 33/34
40 Shroud
Shroud screw 41
Clamp ring screw 32
41 Shroud screw
Clamp ring plug 33a
35a Base ring
EC approval plate 37
Clamp ring screw 32
37a EC approval label
Lid ring 35
45/46 Reed/opto switch
Lid ring nut 36
Lid ring nut 36
Clamp ring 31a
45 Reed switch pulser
Clamp ring 31
29 Register assembly
Closure panel 42
30 'O' ring
29a Copper can register and Sensor holder assembly
10 Lead seal
9 Cover sealing screw
12 Cover screw
Lock wire 11
13 Washer
8 Size identification label
Cover 5
7 'O' ring
Magnet/carrier assembly 28
6 Diaphragm assembly
Regulator blade 23
25 Worm wheel spindle
'O' ring 24
27 Clip
Spirol pin 22
Helical vane support assembly 21
26 Worm wheel
17 Washer
16 Element screw
19 Front bearing screw
Helical vane assembly 20
15 Measuring element
Front bearing 18
14 'O' ring
Flange washer 2
Body 1

## About Elster Group

Elster Group is the world's leading manufacturer and supplier of highly accurate, high quality, integrated metering and utilisation solutions to the gas, electricity and water industries. In addition, through its subsidiary Ipsen International, it is the leading global manufacturer of high level thermo-chemical treatment equipment.

The group has over 9,000 staff, operations in 38 countries and serves over 115 markets around the world. Elster's high quality products and systems reflect the wealth of knowledge and experience gained from over 170 years of dedication to measuring precious resources and energy.

Pressure equipment directive 97/23/EC

This product is applicable in networks for the supply, distribution and discharge of water and associated equipment and is therefore exempt.

Elster Metering Limited
www.elstermetering.com
water.metering@gb.elster.com



8507C4444

## The Kent Range of Domestic Meters

# Kent PSM Volumetric cold water meters

### The world's favourite domestic water meter


George Kent (Malaysia) Berhad

# Kent PSM Volumetric cold water meters

- **The world's biggest-selling domestic water meter**
- **Optimum accuracy and performance at all times, in any position**
- **Revolutionary grooved piston for improved durability and performance**
- **Durable tamperproof construction**
- **Full range of sizes from 15mm to 40mm**
- **Water temperatures up to 50°C**
- **Maximum working pressure of 16 bar**
- **Pulse output available providing access to management information**

The Kent PSM is the world's favourite domestic water meter, with over 50 million already in service in over 100 countries, and offers accuracy, long life, low maintenance and tamperproof operation.
Available in sizes from 15mm to 40mm, with flow rates of between 7.5 l/h to 20 $m^3$/h, Kent PSM meters offer unrivalled performance to BS5728, ISO4064 Class C or D (for 15mm to 25mm only).
In addition, models can provide valuable management information via a probe pulse unit upgrade.

## Unrivalled accuracy in any position, for any flow

Due to the volumetric rotary piston measurement principle, the Kent PSM range can achieve the highest levels of reading accuracy even at the lowest flow rate.
The meter can be installed in any position: horizontally, vertically or inclined pipelines, maintaining optimum performance with no loss of accuracy.

## Robust, leak-proof construction

The use of advanced engineering plastics for the meter's measuring chamber significantly reduces wear and helps maintain reliable, accurate measurement over all operating conditions. Solid particles are gathered by a large surface area strainer, further preventing damage; and its advanced design ensures that partial obstruction of the strainer will have no ill effect on the accuracy of the meter's registration.
A body 'O' ring seal between the measuring chamber and meter body ensures that internal leaks which could by-pass the measuring chamber are eliminated.

## Easy to read

The counter is fully sealed, liquid filled using a vacuum and offers simple, straight-reading presentation. The number rollers are completely immersed in a lubricating non-toxic

liquid, and a sac attached to the counter casing acts as a balancing membrane, ensuring the pressure of the liquid in the counter equals that of the external water. The counter window is inside the meter body in the direction of flow for simplified reading.

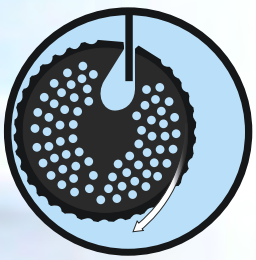
## Tamperproof operation

The Kent PSM offers unrivalled resistance to illegal tampering: its unique conical body-half design eliminates the risk of disassembly whilst in service and the mechanically driven cyclometer-type counter is resistant to magnetic interference.

An optional return reverse flow restrictor provides further protection against outside interference, preventing the meter being operated in the reverse direction to reduce the reading. This restrictor cannot be removed without opening the meter and destroying the seal.

## Revolutionary grooved piston

Meter stoppages are substantially reduced, durability enhanced and performance improved as a result of a uniquely-designed grooved piston within the meter measuring chamber, increasing applications flexibility (available in 15mm and 20mm sizes).



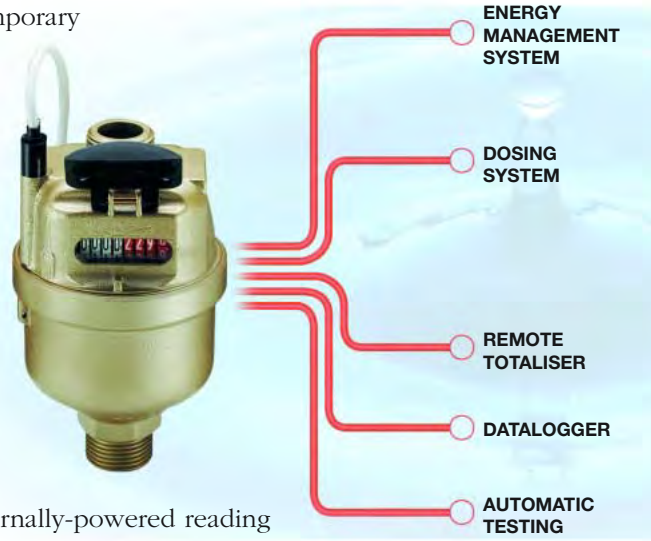
**Relative motion of the grooved piston.**
Its action, with the stationary chamber wall, creates small flow eddies which hold solids in suspension until flushed out, reducing meter stoppages.

## Reliability guaranteed

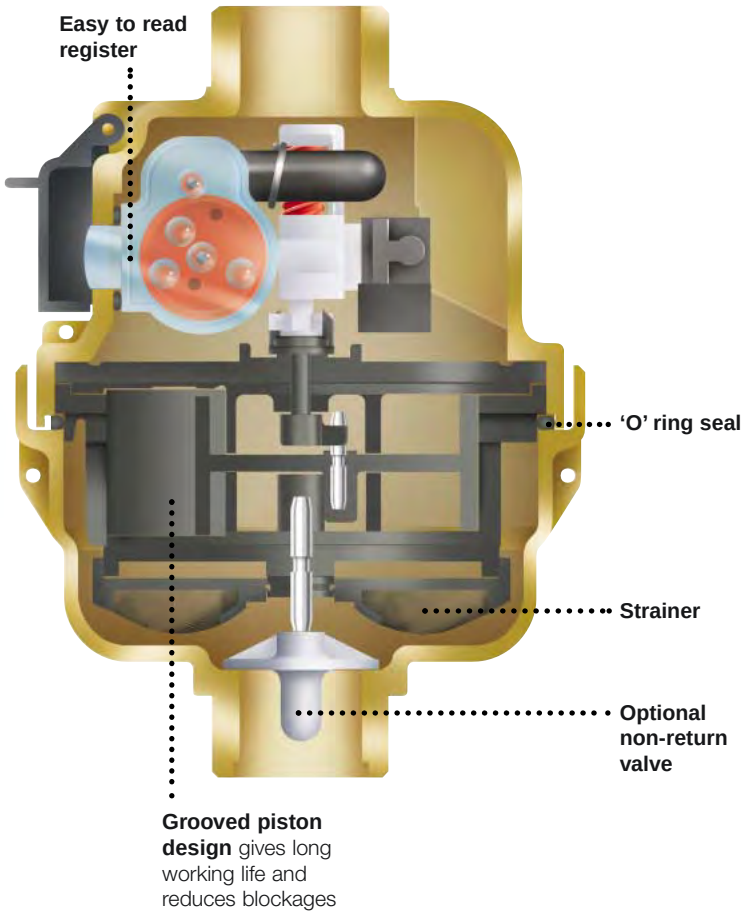
Every Kent PSM meter is individually tested over its flow range before despatch, and is manufactured from the highest quality materials ensuring maximum resistance to wear and corrosion. All Elster meters are UK WRc approved to prevent health risk.

## Vital management information tool

Valuable management information can be obtained with the aid of a probe pulse unit, available on Kent PSM meters. The unit provides important consumption and flow information on a temporary or permanent basis, allowing examination and analysis of consumption patterns and providing a valuable early detection of leaks. Volt-free probe pulsers provide output signals for interrogation by externally-powered reading devices and can be attached to previously installed Kent PSM meters with the facility to install a probe pulse unit, at any time without interrupting the water supply.




## Kent PSM meter



# Kent PSM

## Specifications Class C to BS5728 and ISO4064

| Meter size (mm) | | | 15 | 20 | 25 | 30 | 40 |
|---|---|---|---|---|---|---|---|
| Overload flow rate | qs±2% | m³/h | 3 | 5 | 7 | 12 | 20 |
| Permanent flow rate | qp±2% | m³/h | 1.5 | 2.5 | 3.5 | 6 | 10 |
| Transitional flow rate | qt±2% | l/h | 22.5 | 37.5 | 52.5 | 90 | 150 |
| Minimum flow rate | qmin±5% | l/h | 15 | 25 | 35 | 60 | 100 |
| Starting flow (approximate) | | l/h | 5.7 | 9.5 | 13.2 | 22.5 | 37.5 |
| Output pulse | | litre/pulse | 0.5 | 0.5 | 5 | 5 | 5 |
| Meter diameter | | mm | 88 | 88 | 104 | 120 | 158 |
| Meter length preferred | | mm | 165 | 190 | – | – | 300 |
| Meter length alternative | | mm | 115 or 134 | 165 | 199 | 199 | – |
| Length over connectors | | mm | 200 or 228 | 267 | 311 | 327 | 421 |
| Weight – Meter only (approximate) | | kg | 0.80 or 0.90 | 1.30 | 1.30 | 2.20 | 3.70 |

## Specifications Class D to BS5728 and ISO4064

| Meter size (mm) | | | 15 | 15 | 20 |
|---|---|---|---|---|---|
| Overload flow rate | qs±2% | m³/h | 2 | 3 | 5 |
| Permanent flow rate | qp±2% | m³/h | 1 | 1.5 | 2.5 |
| Transitional flow rate | qt±2% | l/h | 11.5 | 17.25 | 28.75 |
| Minimum flow rate | qmin±5% | l/h | 7.5 | 11.25 | 18.75 |
| Starting flow (approx) | | l/h | 3.4 | 3.4 | 5.7 |
| Output pulse | | litre/pulse | 0.5 | 0.5 | 0.5 |
| Meter diameter | | mm | 88 | 88 | 88 |
| Meter length preferred | | mm | - | 165 | 190 |
| Meter length alternative | | mm | 134 | 115 or 134 | 165 |
| Length over connectors | | mm | - | 200 or 228 | 267 |
| Weight – Meter only (approximate) | | kg | 1.02 | 1.08 | 1.27 |

## Specifications Class K

| Meter size (mm) | | | 15 | 20 | 25 | 30 | 40 |
|---|---|---|---|---|---|---|---|
| Overload flow rate | qs±2% | m³/h | 3.5 | 5 | 7.5 | 12 | 20 |
| Permanent flow rate | qp±2% | m³/h | 2.73 | 2.85 | 4.55 | 6.8 | 10 |
| Transitional flow rate | qt±2% | l/h | 22.5 | 37.5 | 52.5 | 90 | 150 |
| Minimum flow rate | qmin±5% | l/h | 15 | 25 | 35 | 60 | 100 |
| Starting flow (approximate) | | l/h | 3.4 | 3.4 | 5.7 | 13.6 | 20 |
| Meter length | | mm | 115 or 134 | 165 | 199 | 198 | 300 |
| Meter radius | | mm | 43 | 43 | 52 | 60 | 79 |
| Length over connectors | | mm | 200 or 228 | 267 | 311 | 327 | 421 |
| Nominal pipe size | | mm | 15 | 20 | 25 | 30 | 40 |
| Weight – Meter only (approximate) | | kg | 0.80 or 0.90 | 1.30 | 1.30 | 2.2 | 3.7 |

**Pressure equipment directive 97/23/EC**

This product is applicable in networks for the supply, distribution and discharge of water and associated equipment and is therefore exempt.

*George Kent (Malaysia) Berhad*

**George Kent (Malaysia) Berhad** (1945-X)
Lot 1115, Batu 15, Jalan Dengkil,
P.O. Box 55, 47100 Puchong,
Selangor Darul Ehsan, Malaysia.

Tel: 603 - 8064 8000 | Fax: 603 - 80615906 / 80613295
Email: enquiry@georgekent.net
Website: www.georgekent.net

# V110 Class C Volumetric cold water meters

| | | | | | |
|---|---|---|---|---|---|
| **Permanent flow rate** | **qp** | **m³/h** | 1.5 | 2.5 | 3.5 |
| **Size** | | **mm** | 15 | 20 | 25 |

- Volumetric rotary-piston principle of measurement ensures registration even at the very lowest rates of flow with maintained accuracy over the flow range
- Unique grooved piston design (15mm and 20mm)
- Can be installed in horizontal, vertical or inclined pipelines without affecting accuracy
- The co-polymer resin manufactured body allows its use with absolute confidence where waters with aggressive or dezincification properties exist
- Requires no calibration throughout its lifespan
- 'O' ring seal placed between the measuring chamber and meter body ensures that internal leaks which could by-pass the measuring chamber are eliminated
- Use of advanced engineered plastics for the measuring chamber minimises wear and maintains reliability under all operating conditions
- Large surface area fine filter prevents damage by gathering solid particles. Due to its design, a partially obstructed filter will not affect the meter's accurate registration

## Compliance with standards

Performance figures for the V110 range meet the requirements of the following:

- ISO4064
- EEC Directive 75/33/EEC
- BS5728 Class C

## Register

The register is fully-sealed, vacuum filled, with a simple straight-reading presentation. The number rollers are totally immersed in a non-toxic liquid which acts as a lubricant. The sac attached to the register casing acts as a balancing membrane and ensures the pressure of the liquid in the register is the same as that of the water inside the meter. The register is placed in a window inside the meter body in the direction of flow for easy reading.

## Tamperproof

The V110 offers outstanding resistance to illegal tampering. Its unique conical body-half design means it cannot be disassembled while in service and the mechanically-driven register cannot be interfered with magnetically. An individual serial number is heat printed on each body.

## Optional features

- Internal disc-type reverse flow restrictor can be included as an optional feature. This reduces the possibility of water being run back illegally.

## Remote-reading

The V110 operates as a standard meter until the need arises, and then by simply removing a plastic plug and inserting a magnetically-operated signal sensor, it can be converted for remote read.
It can be converted on location whilst still in use without any disconnection, risk of component damage or need to re-calibrate.
The pulse provided by the probe can be used to step a remote register or in the longer term, the output can also be interfaced with a module which could be interrogated by a computer or other device.
The V110 model is particularly suitable for incorporation in energy management systems.

# V110

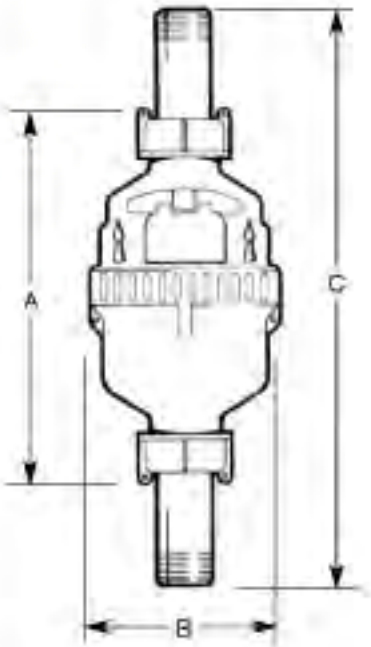
## Performance BS5728, ISO4064 Class C

| Size of meter | | mm | 15 | 20 | 25 |
|---|---|---|---|---|---|
| Meter thread size | | inches | G¾B | G1B | G1¼B |
| Permanent flow rate | qp±2% | m³/h | 1.5 | 2.5 | 3.5 |
| Overload flow rate | qs±2% | m³/h | 3.0 | 5.0 | 7.0 |
| Transitional flow rate | qt±2% | l/h | 22.5 | 37.5 | 52.5 |
| Minimum flow rate | qmin±6% | l/h | 15.0 | 25.0 | 35.0 |
| Starting flow approximately | | l/h | 6.7 | 9.5 | 16.2 |
| Headloss at qp | | bar | 1.0 | 1.0 | 1.0 |
| Headloss at qp | | bar | 0.25 | 0.25 | 0.25 |
| Meter resets to zero at | | m³ | 10000 | 10000 | 100000 |
| Minimum indicated digit value | | litre | 0.1 | 0.1 | n/a |
| Output pulse | | litre/pulse | 5 | 5 | n/a |

Notes:
Maximum working pressure 10 bar (16 bar on 15mm size).
Maximum working temperature 50°C.

## Dimensions

| Meter length – A | mm | 115 | 134 | 165 | 199 |
|---|---|---|---|---|---|
| Meter diameter – B | mm | 99 | 99 | 99 | 114 |
| Length over connectors – C | mm | 220 | 228 | 267 | 312 |
| Nominal pipe size | mm | 15 | 15 | 20 | 25 |
| Weight of meter and connections | kg | 0.43 | 0.45 | 0.47 | 0.75 |




## Installation

Care should be taken during installation to ensure that the meter and its connectors are not subjected to elongation, compression or bending forces.
Allowance should be made for expected expansion and contraction of adjacent pipework.
High installation stresses may eventually give rise to joint leakage or even permanent damage to the meter or its connections.

## Materials

All Elster meters are manufactured from highest quality materials ensuring maximum resistance to wear and corrosion and are UK WRc approved.

**Pressure equipment directive 97/23/EC**
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