

# CONTENTS

<b>Haiao® RO Membrane Sheet Introduction .....</b>	<b>13</b>
1. The Composite Structure of Sheet .....	13
2. The Durability of Haiao® Sheet .....	13
3. Specification of Haiao® Sheet .....	13
4. The Package/Storage/Transportation of Sheet .....	15
<b>Haiao®Domestic RO Membrane Series .....</b>	<b>16</b>
1.Specification and Performance .....	16
2.General Information: .....	17
<b>Haiao® Commercial RO Membrane Series.....</b>	<b>18</b>
1. Specification and Performance .....	18
2.General Information: .....	18
<b>Haiao®Industrial TW-4040 RO Membrane Series .....</b>	<b>20</b>
1.Testing Condition and Performance.....	20
2.Membrane Size .....	20
3. Operation Limits and Condition .....	21
<b>Haiao®Industrial TW-8040 RO Membrane Series .....</b>	<b>22</b>
1.Testing Condition and Performance.....	22
2. Membrane Size .....	22
3. Operation Limits and Condition .....	23

<b>Haiao®Industrial BW-4040 RO Membrane Series.....</b>	<b>24</b>
1. Testing Condition and Performance .....	24
2. Membrane Size .....	24
3. Operation Limits and Condition .....	25
<b>Haiao®Industrial BW-8040 RO Membrane Series.....</b>	<b>26</b>
1. Testing Condition and Performance .....	26
2. Membrane Size .....	26
3. Operation Limits and Condition .....	27
<b>Important Information for Industrial Membrane:.....</b>	<b>27</b>
1. Operation Guide: .....	27
2. General Information: .....	28

## Haiao®RO Membrane Sheet Introduction



### 1. The Composite Structure of Sheet

Haiao®membrane sheet has a composite structure which consists of four stacked layers:

- (1) Polyester reinforced non-woven fabric, approximately 100 μ M thick, providing the main strength for the diaphragm;
- (2) Polysulfone material porous intermediate support layer, approximately 40 μ M thick, providing a regular and flat surface for the separation layer;
- (3) Polyamide material ultra-thin separation layer, approximately 0.1 μ M thick, with key selective permeability;
- (4) A multifunctional protective layer composed of functional polymers with special functional groups, usually with hydrophilic groups, with a smooth surface.

### 2. The Durability of Haiao® Sheet

Haiao® ultra-thin reverse osmosis (RO) composite membrane has shown excellent performance in various application fields, widely used in municipal tap water treatment, single stage seawater desalination and brackish water desalination, chemical process and wastewater treatment, etc. This membrane has extremely high performance in terms of water flux, desalination rate, organic matter removal, and biodegradation resistance. It is suitable for the widest range of operating and cleaning pH values in the industry at present, and has extremely high compression and densification ability. The maximum operating temperature can reach 45 °C (with higher temperature resistance for thermal disinfection type components). It can withstand strong cleaning of inorganic acids and bases from pH 1 to pH 13, and is extremely resistant to wear and tear under very harsh operating conditions, Exhibiting longer and more stable trouble-free operating performance than other brands.

### 3. Specification of Haiao® Sheet

Model	Flux GFD	Rejection %	Raw Water ppm	Pressure psi	Remark
HT-TW-HT1	20-25	99	500	70	high flow (domestic element)
HT-TW-HT2	25-30	98	500	70	ultra high flow (domestic element)
HT-TW-HT3	17-20	99.3	500	70	high rejection (domestic element)
HT-BW-H1	25-30	99.3	1500	150	general municipal water (industrial element)
HT-BW-H2	30-35	99.0	1500	150	high flow municipal water (industrial element)
HT-BW-H3	25-32	99.6	1500	150	high rejection municipal water (industrial element)
HT-BW-H4	25-30	99.4	2000	225	brackish water high rejection(industrial element)
HT-BW-H5	30-35	99.2	2000	225	brackish water high flow (industrial element)
HT-BW-H6	20-25	99.7	2000	225	brackish water ultra-high rejection(industrial element)

Remark: the temperature is 25 degree, the PH value is 7.0-8.0

#### 4. The Package/Storage/Transportation of Sheet

##### 1)Package

- ◆Sheet Size: Width:1067mm; Effective width: 1016mm; Thickness: 130±5um;
- ◆Sheet packing: carton, sheet, plastic wrap, black plastic film, pearl-cotton foam, testing report.
- ◆Packing specification: 500meter/roll, 1roll/carton

##### 2)Storage

Please store the sheet based on following condition

- The storage place must be a cool and dry indoor, avoid direct sunlight
- Storage temperature range: 5-30/;
- Keep the sheet in the original packaging as much as possible and place it horizontally. The storage time is 6 months (from the date of shipment);
- After opening the original package, if all the sheet is not used up, please keep the remaining membranes airtight, protected it away from light, and use them as soon as possible.

##### 3)Transportation

- Keep the sheet roll horizontally, pay attention to the shelving of the roll.
- Avoid rain and direct sunlight during transportation;
- Handle with care during transportation to avoid violent impact to prevent the sheet roll from falling and causing damage to the sheet.

## Haiao®Domestic RO Membrane Series

### 1.Specification and Performance



Model	Pressure (PSI /bar)	Feed Water (PPM)	Flow GPD (L/H)	Salt Rejection (%)
ULP-1812-50	60(4.1)	500	50(7.9)	98
ULP -1812-75	60(4.1)	500	75(11.8)	98
ULP -2012-100	60(4.1)	500	100(15.77)	98
ULP -2012-150	70(4.8)	500	150(23.66)	97
ULP -2012-200	70(4.8)	500	200(31.54)	97
ULP -2812-200	100(6.9)	500	200(31.54)	97
ULP -3012-300	100(6.9)	500	300(47.31)	96
ULP -3012-400	100(6.9)	500	400(63.08)	96
ULP -3012-500	100(6.9)	500	500(78.85)	96
ULP -3012-600	100(6.9)	500	600(94.63)	96
ULP -3013-400	100(6.9)	500	400(63.08)	96

ULP -3013-500	100(6.9)	500	500(78.85)	96
ULP -3013-600	100(6.9)	500	600(94.63)	96
ULP -3213-800	100(6.9)	500	800(126.17)	97
ULP -3213-1000	100(6.9)	500	1000(157.71)	97

• Production flow and salt (NaCl) rejection based on : water temperature 25°C, 7.5±0.5 inflow pH and 35 % recovery rate.

- Single membrane element production flow may vary ±20%.

### 2.General Information:

- When the membrane element is used for the first time, the initial full tank of product water should be drained.
- Once the component is wet, it should remain wet at all times.
- If the user does not strictly follow the operating limits and guidelines set in this specification, the limited warranty will become invalid.
- When the system is shut down for a long time, it is recommended to immerse the membrane element in the protective solution in order to prevent the growth of microorganisms. Standard preservation solution containing 1.5%(weight) sodium bisulfite (food grade).
- The user shall be responsible for the effects of the use of incompatible chemicals and lubricants on the components.



## Haiao®Commercial RO Membrane Series



### 1. Specification and Performance

Model	Pressure (PSI /bar)	Feed Water (PPM)	Flow GPD (L/H)	Salt Rejection (%)
ULP-3020	100(6.9)	1500	420(66.24)	97
ULP -2521	150(10.3)	1500	350(55.2)	99
ULP -2540	150(10.3)	1500	900(141.94)	99.2
ULP -4021	150(10.3)	1500	950(149.82)	99

■ Production flow and salt (NaCl) rejection based on : water temperature 25°C, 7.5±0.5 inflow pH and 35 % recovery rate

● Single membrane element production flow may vary ±20%

### 2.General Information:

#### Operation Guide:

To prevent potential membrane damage during startup, shutdown, cleaning or other processes, any sudden pressure or cross-flow changes in the coil element should be avoided. During startup, we recommend the following process for moving from a stationary state to a running state:

- (1) The feed water pressure should gradually rise within the time range of 30 ~ 60 seconds.
- (2) Rise to the designed cross-flow velocity value should be gradually reached within 15 ~ 20 seconds.
- (3) The product water should be drained within the first hour.

#### Notice:

- (1) Once the component is wet, it should remain wet at all times.
- (2) If the user does not strictly follow the operating limits and guidelines set in this specification, the limited warranty will become invalid.
- (3) When the system is shut down for a long time, in order to prevent the growth of microorganisms, it is recommended to immerse the membrane element in the protective solution. Standard preservation solution contains 1.5%(weight) sodium bisulfite (food grade).
- (4) The user shall be responsible for the effects of the use of incompatible chemicals and lubricants on the components.
- (5) The maximum allowable pressure drop of a single pressure vessel is 50psi(3.4bar).
- (6) Avoid back pressure on the water side of the product at any time.

**Remerk:** Use of this product by itself does not guarantee effective removal of sporocysts and pathogens from water. The effective removal of sporocysts and pathogens depends on the design and operation of the system.

## Haiao®Industrial ULP-4040 RO Membrane Series



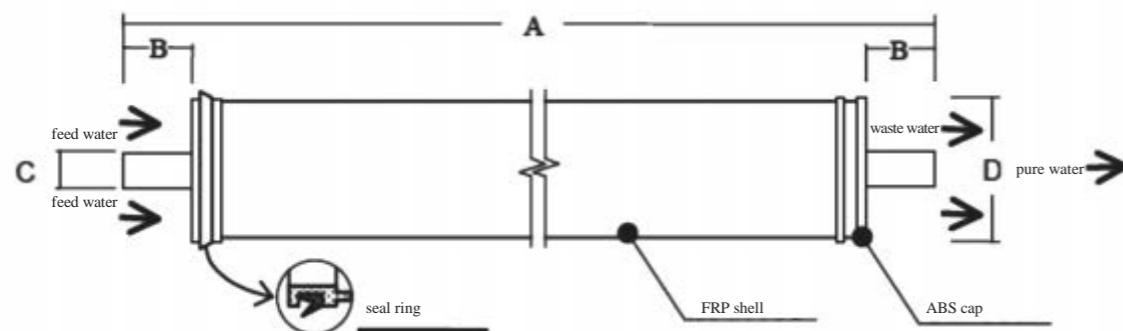
### 1. Testing Condition and Performance

Model	Sheet area ft <sup>2</sup> ( m <sup>2</sup> )	Pressure psi(MPa)	Flow GPD (m <sup>3</sup> /d)	Salt Rejection (%)
ULP-4040-HR	90(8.4)	150(1.03)	2400(9.1)	99.3
ULP-4040-HF	90(8.4)	150(1.03)	2700(10.2)	99.0
ULP-4040-FR	90(8.4)	150(1.03)	1900(7.2)	99.5

a. The flow and rejection are based on following testing condition: 1500ppm softened tap water, temperature 25°C、pH7.5-8、recovery rate 15% and above testing pressure

b. One single membrane flow may fluctuate within±15%

### 2. Membrane Size



Model inch(mm)	A	B	C	D
4040	40.0(1016)	1.05(26.7)	0.75(19)	3.9(99)

### 3. Operation Limits and Condition

Operation Limits	Membrane type	Polyamide composite membrane
	Maximum feed water temperature	45°C
	Maximum operating pressure	600psi (4.14MPa)
	Maximum feed water flow	14GPM (3.2m <sup>3</sup> /h)
	Minimum concentrated water flow	3GPM (0.7m <sup>3</sup> /h)
	pH range during operation	3-10
	pH range during chemical cleaning	2-12
	Maximum feed water SDI15	5
	Maximum influent turbidity /NTU	1
	Free chlorine tolerance (mg/L)	0.1
Maximum pressure drop of one element	15 (0.1) psi (MPa)	

## Haiao®Industrial ULP-8040 RO Membrane Series



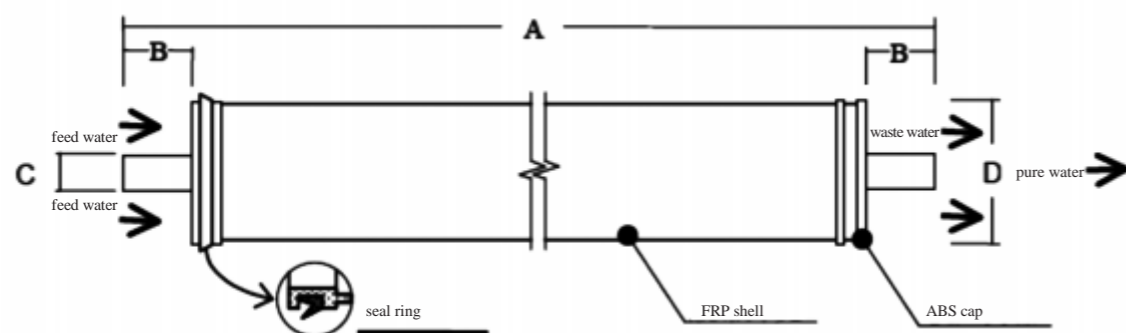
### 1. Testing Condition and Performance

Model	Sheet area ft <sup>2</sup> ( m <sup>2</sup> )	Pressure psi(MPa)	Flow GPD (m <sup>3</sup> /d)	Salt Rejection (%)
ULP-8040-HR	400(37)	150(1.03)	10500(39.5)	99.3
ULP-8040-HF	400(37)	150(1.03)	11000(41.6)	99.0
ULP-8040-FR	365(33.9)	150(1.03)	10500(39.5)	99.5

a. The flow and rejection are based on following testing condition: 1500ppm softened tap water, temperature 25°C、pH7.5-8、recovery rate 15% and above testing pressure

b. One single membrane flow may fluctuate within±15%

### 2. Membrane Size



Model inch(mm)	A	B	C
8040	40.0(1016)	1.125(29)	7.9(201)

### 3. Operation Limits and Condition

Operation Limits	Membrane type	Polyamide composite membrane
	Maximum feed water temperature	45°C
	Maximum operating pressure	600psi (4.14MPa)
	Maximum feed water flow	85GPM (19m <sup>3</sup> /h)
	Minimum concentrated water flow	12GPM (2.7m <sup>3</sup> /h)
	pH range during operation	3-10
	pH range during chemical cleaning	2-12
	Maximum feed water SDI15	5
	Maximum influent turbidity /NTU	1
	Free chlorine tolerance (mg/L)	0.1
Maximum pressure drop of one element	15 (0.1) psi (MPa)	



## Haiao® Industrial LP-4040 RO Membrane



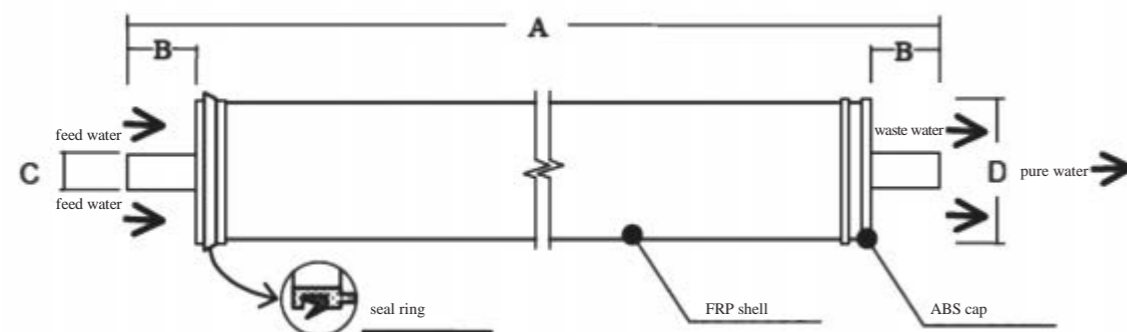
### 1. Testing Condition and Performance

Model	Sheet area ft <sup>2</sup> ( m <sup>2</sup> )	Pressure psi(MPa)	Flow GPD (m <sup>3</sup> /d)	Salt Rejection (%)
LP-4040-HR	90(8.4)	225(1.55)	2400(9.1)	99.7
LP-4040-HF	90(8.4)	225(1.55)	2700(10.2)	99.5
LP-4040-FR	90(8.4)	225(1.55)	1900(7.2)	99.8

a. The flow and rejection are based on following testing condition: 2000ppm softened tap water, temperature 25°C、pH7.5-8、recovery rate 15% and above testing pressure

b. One single membrane flow may fluctuate within±15%

### 2. Membrane Size



Model inch(mm)	A	B	C	D
4040	40.0(1016)	1.05(26.7)	0.75(19)	3.9(99)

### 3. Operation Limits and Condition

Operation Limit3. Operation Limits and Conditions	Membrane type	Polyamide composite membrane
	Maximum feed water temperature	45°C
	Maximum operating pressure	600psi (4.14MPa)
	Maximum feed water flow	14GPM (3.2m <sup>3</sup> /h)
	Minimum concentrated water flow	3GPM (0.7m <sup>3</sup> /h)
	pH range during operation	3-10
	pH range during chemical cleaning	2-12
	Maximum feed water SDI15	5
	Maximum influent turbidity /NTU	1
	Free chlorine tolerance (mg/L)	0.1
Maximum pressure drop of one element	15 (0.1) psi (MPa)	

## Haiao® Industrial LP-8040 RO Membrane Series



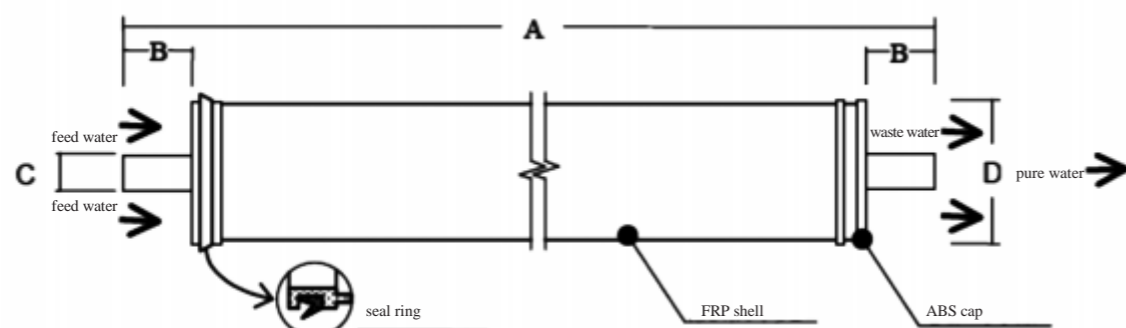
### 1. Testing Condition and Performance

Model	Sheet area ft <sup>2</sup> ( m <sup>2</sup> )	Pressure psi(MPa)	Flow GPD (m <sup>3</sup> /d)	Salt Rejection (%)
LP-8040-HR	400(37)	225(1.55)	11000(41.6)	99.7
LP-8040-HF	400(37)	225(1.55)	12000(45.4)	99.5
LP-8040-365FR	365(33.9)	225(1.55)	9600(36.3)	99.8
LP-8040-400FR	400(37)	225(1.55)	10500(39.7)	99.8
LP-8040-440FR	440(40.9)	225(1.55)	11500(43.5)	99.8

a. The flow and rejection are based on following testing condition: 2000ppm softened tap water, temperature 25°C、pH7.5-8、recovery rate 15% and above testing pressure

b. One single membrane flow may fluctuate within±15%

### 2. Membrane Size



Model inch(mm)	A	B	C
8040	40.0(1016)	1.125(29)	7.9(201)

### 3. Operation Limits and Condition

Operation Limits	Membrane type	Polyamide composite membrane
	Maximum operating pressure	45°C
	Maximum feed water flow	600psi (4.14MPa)
	Minimum concentrated water flow	85GPM (19m <sup>3</sup> /h)
	pH range during operation	12GPM (2.7m <sup>3</sup> /h)
	pH range during chemical cleaning	3-10
	Maximum feed water SDI15	2-12
	Maximum influent turbidity /NTU	5
	Free chlorine tolerance (mg/L)	1
	Maximum pressure drop of one element	0.1
Maximum operating pressure	15 (0.1) psi (MPa)	

### Important Information for Industrial Membrane:

(1) When the membrane system is ready to be put into operation, it is very necessary to correctly start the reverse osmosis water treatment system in order to prevent the damage of the membrane elements by water overflow or hydraulic impact. Following the correct startup sequence helps ensure that the system operating parameters meet the design specifications so that the water quality and quantity of the system meet the stated design goals.

(2) Before starting the startup procedure of the membrane system for the first time, the pre-processing system debugging, membrane component loading, instrument calibration and other system inspection of the membrane system should be completed.

#### 1. Operation Guide:

To prevent potential membrane damage during startup, shutdown, cleaning or other processes,

---

---

any sudden pressure or cross-flow changes in the coil element should be avoided. During startup, we recommend the following process for moving from a stationary state to a running state:

- (1) The feed water pressure should gradually rise within the time range of 30 ~ 60 seconds.
- (2) Rise to the designed cross-flow velocity value should be gradually reached within 15 ~ 20 seconds.
- (3) The product water should be drained within the first hour.

## **2. General Information:**

- (1) Once the component is wet, it should remain wet at all times.
- (2) If the user does not strictly follow the operating limits and guidelines set in this specification, the limited warranty will become invalid.
- (3) When the system is shut down for a long time, in order to prevent microbial growth, it is recommended to immerse the membrane element in the protective solution. Standard preservation solution contains 1.5%(weight) sodium bisulfite (food grade).
- (4) The user shall be responsible for the effects of the use of incompatible chemicals and lubricants on the components.
- (5) The maximum allowable pressure drop of a single pressure vessel is 50psi(3.4bar).
- (6) Avoid back pressure on the water side of the product at any time.

**Note:** Use of this product by itself does not guarantee effective removal of sporocysts and pathogens from water. The effective removal of sporocysts and pathogens depends on the design and operation of the system.