

# SEPARATION TECHNOLOGIES

## ION EXCHANGE RESINS

# DUOLITE A 161 PLUS

## ENGINEERING DATA SHEET COUNTER-CURRENT REGENERATION



**Duolite a 161 PLUS is a macroporous type 1 strong base Anion Exchange Resin.** These data provide information to calculate the silica leakage and operating capacity of Duolite A 161 PLUS used with Counter-current regeneration. The general properties of Duolite A 161 PLUS are described in the Product Data Sheet.

### SILICA LEAKAGE

The average silica leakage is obtained by multiplying the basic leakage value from Table 1 by the correction factors A,B and C from Tables 2 to 4

$$\text{Leak} = \text{Leak}_0 \times A \times B \times C$$

**TABLE 1 : Basic Silica Leakage versus NaOH regenerant level**

NaOH g / L	Leakage ppm SiO <sub>2</sub> (Leak <sub>0</sub> )
40	0.012
50	0.010
60	0.008
70	0.006
80	0.005
100	0.003
120	0.002

**TABLE 2 : Leakage Correction Factor A versus Silica to Total AnionsRatio.**

SiO <sub>2</sub> %	Factor A
1	0.2
5	0.5
10	1.0
25	2.5
50	5.0
75	10.0
90	14.0

**TABLE 3 : Leakage Correction Factor B versus water Temperature**

Water °C	Factor B
5	0.7
10	0.8
15	1.0
25	1.5
35	2.3
45	3.3

**TABLE 4 : Leakage Correction Factor C versus Regenerant Temperature**

NaOH °C	Factor C
10	1.65
15	1.37
25	1.00
35	0.76
45	0.58
50	0.50

**TABLE 5 : Suggested Operating Conditions**

Maximum operating temperature. ____	60°C ( OH <sup>-</sup> ) 90°C ( Cl <sup>-</sup> )
Minimum bed depth _____	1000 mm ( preferably > 1400 mm )
Service flow rate _____	5 to 40 BV* / hr
Maximum linear velocity _____	50 m / hr
Regenerant _____	NaOH
Level _____	40 to 120 g / L
Flow rate _____	2 to 8 BV/ hr (minimum contact time : 30 minutes)
Concentration _____	3% to 5%
Slow rinse _____	Minimum 2 BV at regeneration flow rate
Fast rinse _____	Same as service flow rate.

\* 1 BV ( Bed Volume ) = 1 m<sup>3</sup> solution per m<sup>3</sup> resin

**Influent Limitations**

Free chlorine - Nil  
 Turbidity - < 1 NTU  
 Iron & heavy metal - < 0.1 ppm

**OPERATING CAPACITY**

The operating capacity of Duolite A 161 PLUS is obtained by multiplying the basic capacity value from Table 6 by the correction factors D to G from Tables 7 to 10.

$$\text{Cap} = \text{Cap}_0 \times \text{D} \times \text{E} \times \text{F} \times \text{G}$$

**TABLE 6 : Basic capacity versus NaOH regenerant level ( Counter - current regeneraion )**

NaOH g / L	Capacity eq / L (Cap <sub>0</sub> )
40	0.56
50	0.60
60	0.63
70	0.66
80	0.68
100	0.71
120	0.74

**TABLE 8 : Capacity Correction Factor E versus CO<sub>2</sub> to Total Anions Ratio.**

CO <sub>2</sub> %	Factor E
0	0.97
20	1.00
30	1.02
50	1.05
75	1.08
99	1.12

**TABLE 9 : Capacity Correction Factor F versus Silica to Total Anions Ratio and NaOH Temperature.**

% SiO <sub>2</sub>	Factor F	
	25° C	35° C
5	0.98	0.99
25	0.93	0.96
50	0.83	0.90
75	0.80	0.88
90	0.73	0.82

**TABLE 7 : Capacity Correction Factor D versus Sulphate to Total Anions Ratio.**

SO <sub>4</sub> %	Factor D
0	0.92
25	0.96
50	1.00
75	1.04
99	1.08

**TABLE 10 : Capacity Correction Factor G versus Silica Endpoint ( D SiO<sub>2</sub> = difference between average leakage and endpoint )**

SiO <sub>2</sub> ( ppb )	Factor G
50	0.90
100	0.95
200	1.00
300	1.04

**SAFE HANDLING INFORMATION**

A material Safety Data Sheet, Material handling & storage sheet are available for Duolite products. To obtain a copy contact Auchtel representative

**CAUTION**

Acid and basic regenerant solutions are corrosive and should be handled in a manner that will prevent eye and skin contact. Nitric acid and other strong oxidizing agents can cause explosive type reactions when mixed with Ion Exchange Resins. Proper design of process equipment to prevent rapid buildup of pressure is necessary if use of an oxidizing agent such as nitric acid is contemplated. Before using strong oxidizing agents in contact with Ion Exchange Resins, consult sources knowledgeable in the handling of these materials.

*The suggestions and data in this bulletin are based on information we believe to be reliable. They are offered in good faith, but without guarantee, as conditions and methods of use of our products are beyond our control. We recommend that the prospective user determine the suitability of our materials and suggestions before adopting them on a commercial scale. The Company maintains a policy of continuous development and reserve the right to amend any specification without notice. DUOLITE is a trademark of Rohm and Hass Company, Philadelphia, U.S.A. and Auchtel Products Ltd. are users of the same in India.*

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## DUOLITE A 161 PLUS

ENGINEERING DATA SHEET  
CO-CURRENT REGENERATION



Duolite A 161 PLUS is a macroporous type 1 strong base Anion Exchange Resin. These data provide information to calculate the silica leakage and operating capacity of Duolite A 161 PLUS used with Co-current regeneration.

The properties of Duolite A 161 PLUS are described in the Product Data Sheet.

### SILICA LEAKAGE

The average silica leakage is obtained by multiplying the basic leakage value from Table 1 by the correction factors A, B & C from Tables 2 to 4

$$\text{Leak} = \text{Leak}_0 \times A \times B \times C$$

**TABLE 1 : Basic Silica Leakage versus NaOH regenerant level**

NaOH g / L	Leakage ppm SiO <sub>2</sub> (Leak <sub>0</sub> )
40	0.095
50	0.079
60	0.064
80	0.037
100	0.028
120	0.021
150	0.016
200	0.014

**TABLE 2 : Leakage Correction Factor A versus Silica to Total Anions Ratio.**

SiO <sub>2</sub> %	Factor A
1	0.1
5	0.5
10	1.0
25	2.5
50	5.0
75	7.5
90	9.0

**TABLE 3 : Leakage Correction Factor B versus water Temperature**

Water °C	Factor B
5	0.7
10	0.8
15	1.0
25	1.5
35	2.3
45	3.3

**TABLE 4 : Leakage Correction Factor C versus Regenerant Temperature**

NaOH °C	Factor C
10	1.65
15	1.37
25	1.00
35	0.76
45	0.58
50	0.50

**TABLE 5 : Suggested Operating Conditions**

Maximum operating temperature _____	60°C ( OH <sup>-</sup> ), 90°C ( Cl <sup>-</sup> )
Minimum bed depth _____	700 mm
Service flow rate _____	5 to 40 BV* / hr
Maximum linear velocity _____	50 m /hr
Regenerant _____	NaOH
Level _____	40 to 200 g/L
Flow rate _____	2 to 8 BV/ hr ( minimum contact time 30 minutes)
Concentration _____	3% to 5 %
Slow rinse _____	Minimum 2 BV at regeneration flow rate
Fast rinse _____	Same as service flow rate.

\* 1 BV ( Bed Volume ) = 1 m<sup>3</sup> solution per m<sup>3</sup> resin

**Influent Limitations**

Free chlorine	- Nil
Turbidity	- < 2 NTU
Iron & heavy metal	- < 0.1 ppm

**OPERATING CAPACITY**

The operating capacity of Duolite A 161 PLUS is obtained by multiplying the basic capacity value from Table 6 by the correction factors D to G from Tables 7 to 10.

$$\text{Cap} = \text{Cap}_0 \times \text{D} \times \text{E} \times \text{F} \times \text{G}$$

**TABLE 6 : Basic capacity versus NaOH regenerant level ( co-current regeneration)**

NaOH g/L	Capacity eq/L (Cap <sub>0</sub> )
40	0.50
50	0.53
60	0.56
80	0.63
100	0.68
120	0.72
150	0.75
200	0.765

**TABLE 8 : Capacity Correction Factor E versus CO<sub>2</sub> to Total Anions Ratio.**

CO <sub>2</sub> %	Factor E
0	0.97
20	1.00
30	1.02
50	1.05
75	1.08
99	1.12

**TABLE 9 : Capacity Correction Factor F versus Silica to Total Anions and NaOH Temperature.**

% SiO <sub>2</sub>	Factor F		
	25° C	35° C	50° C
5	0.98	1.02	1.05
25	0.91	0.96	1.00
50	0.79	0.87	0.98
75	0.74	0.81	0.91
90	0.71	0.79	0.90

**TABLE 7 : Capacity Correction Factor D versus Sulphate to Total Anions Ratio.**

SO <sub>4</sub> %	Factor D
0	0.92
25	0.96
50	1.00
75	1.04
99	1.08

**TABLE 10 : Capacity Correction Factor G versus Silica Endpoint ( D SiO<sub>2</sub> = difference between average leakage and endpoint )**

D SiO <sub>2</sub> ( ppb )	Factor G
50	0.90
100	0.95
200	1.00
300	1.04

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