

閘刀閥使用手冊

Manual for Knife Gate Valves

NVS

NICO 耐安凡而	制定部門	檔 案 名 稱	編 號	NV-DS-011
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			閘刀閥 使用手冊	頁 次
			日 期	DEC.01.2014

耐安凡而工業股份有限公司
NICO VALVES CORP.

User Manual
Knife-Gate Valve

使用手冊
閘刀閥



核 准		審 查		制 定	
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NICO 耐安凡而	制定部門	文 件 名 稱	編 號	NV-DS-011
	研 發 課		User Manual	版 別
		頁 次		1 of 12
		日 期		DEC.01.2014

Contents 內容

1. General Precautions 一般預防措施
2. Product Description 產品說明
3. Technical standard or Code applied 應用的技術標準或法規
4. Pressure Temperature Ratings 壓力-溫度等級
5. Delivery Condition and Storage 運送要求和存放
6. Installation 安裝
7. Put into service 啟用
8. Operation 操作
9. Dangers of inappropriate use 不當操作的危險性
10. Maintenance 保養
11. Torque Data 扭力資料
12. Corrosion Data 腐蝕資料
13. Cv Value of Valve 閥之 Cv 值

ANNEX A Metal Material Corrosion Table

附件 A 金屬材料的耐蝕表

NICO 耐安凡而	制定部門	文 件 名 稱	編號	NV-DS-011
	研 發 課		版 別	A0
User Manual		頁 次	2 of 12	
	日 期	DEC.01.2014		

警告! Warning!

為避免造成人身的危害與釋放系統內流體時造成的財產損失，安裝或保養維護前請遵循以下事項：

In order to avoid personal injury to yourself or damage to property from the release of the process fluid, please follow below points before installation or maintenance.

I. 關閉所有與閥門相關的工作管線。

Shut off all operating lines to the valve.

II. 將閥門完全與系統做隔離。

Isolate the valve completely from the process.

III. 釋放系統壓力。

Release process pressure.

IV. 排空閥門裡的流體。

Drain the fluid from the valve.

NICO 耐安凡而	制定部門	文 件 名 稱	編 號	NV-DS-011
	研 發 課		版 別	A0
		User Manual	頁 次	3 of 12
			日 期	DEC.01.2014

1. General Precautions 一般預防措施

a. Material Selection: 材質選用

The possibility of material determination in service and the need for periodic inspections is depended on the contained fluid. Carbide phase conversion to graphite, oxidation of ferrite materials, decrease in ductility of carbon steels at low temperature (even in applications -29°C) are among those items. Even information about corrosion data in Annex A is provided in this user manual, the user is requested to take attention or consideration to determine the suitability of material in their application.

根據所使用的流體決定選用的材質可行性和定期檢查的需求。在低溫下(甚至是 -29°C 時),碳化物轉換為石墨、鐵基材料的氧化等..都會降低碳鋼的延展性都屬於這個範圍。甚至是使用手冊附件 A 中提到的腐蝕訊息,使用者更應注意或考慮到材料的適用性。

b. Pressure-Temperature rating 壓力-溫度等級

The Pressure-Temperature rating is considered for static pressure. Please refer to P & T rating section on section 4 for working pressure. The allowable temperature will difference in accordance with different material of gasket and packing and shall be not exceed the temperature range in order to avoid dangerous accident happening.

壓力-溫度等級需考慮的是靜態的壓力。請參考第 4 節操作壓力-溫度等級部份。允許的溫度會因墊圈與填料材質的不同而差異,不可超過設定的溫度範圍,以避免危險事故發生。

c. Throttling service 節流功能

Knife-Gate valves are generally not recommended for throttling service, where both the fluid flow and the solid particles can damage seats causing leakage. High fluid velocity or the presence of solid particles in suspension will further reduce seat life in throttling applications.

閘刀閥一般不會建議節流功能,因為流體流動和固體微粒可能會損壞閘座造成洩漏。節流功能的使用下,高流速或存在的懸浮微粒會加速減少閘座壽命。

d. Do not disassemble valve when bearing pressure. Valve has not to be equipped with pressure emission device. User should check it by other method through its piping system. Do not touch valve surface in high temperature.

不要在承受壓力時拆解閥。閥門沒有壓力排放的裝置,使用者應透過管道系統的其他方法進行檢查。在高溫時,請勿觸摸閥的表面。

e. Not using for unstable fluid.

不可用於不穩定的流體。

NICO 耐安凡而	制定部門	文 件 名 稱			編號	NV-DS-011
	研發課	User Manual			版別	A0
					頁次	4 of 12
					日期	DEC.01.2014

2. Product Description 產品說明

2.1 Property 特性

- a. Knife-Gate valves could only use at fully open and full close position to control the fluid and aren't suitable for throttling purpose to avoid high-speed fluid flow through disc and seat and then cause erosion effect, abrasion of seat and disc or vibration caused by fluid impacted disc to make disc and seat damaged.
閘刀閥只能做流體(管線)的全開與全關控制, 不建議用於流體節流的操作, 以避免流體高速流過閘門與閘座, 產生沖蝕作用, 而磨蝕閘座與閘門, 或造成流體衝擊閘門而引起震動, 使閘門與閘座損傷。
- b. The reference of CV value for all kinds of valve shall refer to table 8, section 13.
各種閥的參考 Cv 值, 如第 13 節表 8。

2.2 Product Specification 產品規格

This operation manual cover the scope of product specifications are as following table 1 :

此使用手冊涵蓋的產品規格範圍如表 1 :

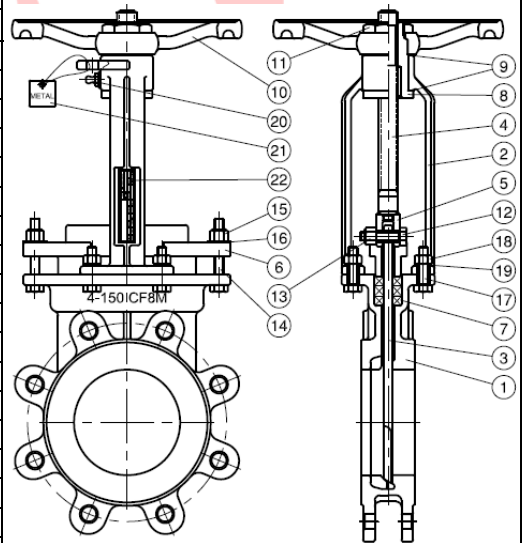
Table 1 Product covering range 表 1 產品涵蓋範圍

Type	Series		Material	Class	Size
	Metal Seat	EPDM Seat			
Knife-Gate	4150	4150-R	A126-B	150	NPS 2~24
	4154	4154-R	CF8		
	4156	4156-R	CF8M		
	4156L	4156L-R	CF3M		

2.3 Structure and Common Dimension Range 結構和共用範圍

TABLE 2-A PARTS AND MATERIAL (ASTM) 表 2-A 零件和材質(ASTM)

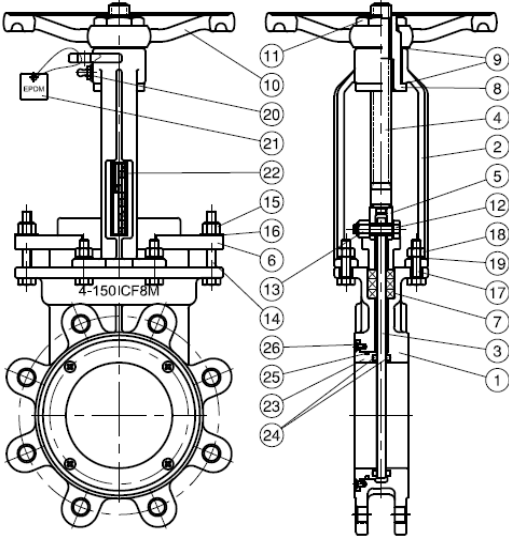
Knife-GATE VALVE – METAL SEAT					
NO.	PARTS NAME 零件名稱	MATERIALS 材質			
		4150-R	4154-R	4156-R	4156L-R
		A126-B	CF8	CF8M	CF3M
1	Body	A126-B	A351-CF8	A351-CF8M	A351-CF3M
2	Yoke	A216-WCB	A351-CF8		
3	Disc	A240-304		A240-316	A240-316L
4	Stem	A276-304			
5	Connection Block	A351-CF8			
6	Gland Flange	A216-WCB	A351-CF8	A351-CF8M	A351-CF3M
7	Packing	PTFE			
8	Stem Nut	B62			
9	Yoke Washer	A240-304			
10	Handwheel	A536			
11	Handwheel Nut	A351-CF8			
12	Disc Bolt	A193-B8			
13	Disc Lock Nut	A194-8			
14	Gland Bolt	A307-B	A193-B8		
15	Gland Lock Nut	S25C+Zn	A194-8		
16	Gland Washer	S25C+Zn	A240-304		
17	Yoke Bolt	A307-B	A193-B8		
18	Yoke Nut	S25C+Zn	A194-8		
19	Spring Washer	S25C+Zn	A240-304		
20	Nipple	Bronze	ANSI 304		
21	Seat Card	A666-304			
22	Nameplate	A666-304			



NICO 耐安凡而	制定部門	文 件 名 稱			編號	NV-DS-011
	研發課	User Manual			版別	A0
					頁次	5 of 12
					日期	DEC.01.2014

TABLE 2-B PARTS AND MATERIAL (ASTM) 表 2-B 零件和材質(ASTM)

Knife-GATE VALVE – EPDM SEAT							
NO.	PARTS NAME 零件名稱	MATERIALS 材質					
		4150-R	4154-R	4156-R	4156L-R		
		A126-B	CF8	CF8M	CF3M		
1	Body	A126-B	A351-CF8	A351-CF8M	A351-CF3M		
2	Yoke	A216-WCB	A351-CF8				
3	Disc	A240-304		A240-316	A240-316L		
4	Stem	A276-304					
5	Connection Block	A351-CF8					
6	Gland Flange	A216-WCB	A351-CF8	A351-CF8M	A351-CF3M		
7	Packing	PTFE					
8	Stem Nut	B62					
9	Yoke Washer	A240-304					
10	Handwheel	A536					
11	Handwheel Nut	A351-CF8					
12	Disc Bolt	A193-B8					
13	Disc Lock Nut	A194-8					
14	Gland Bolt	A307-B	A193-B8				
15	Gland Lock Nut	S25C+Zn	A194-8				
16	Gland Washer	S25C+Zn	A240-304				
17	Yoke Bolt	A307-B	A193-B8				
18	Yoke Nut	S25C+Zn	A194-8				
19	Spring Washer	S25C+Zn	A240-304				
20	Nipple	Bronze	ANSI 304				
21	Seat Card	A666-304					
22	Nameplate	A666-304					
23	Seat Ring	A106	A351-CF8	A351-CF8M	A351-CF3M		
24	O-Ring	EPDM					
25	O-Ring	EPDM					
26	Screws	A193-B8					



3. Technical standard or Code applied 應用的技術標準或法規

Table 3 Technical standard or Code applied 表 3 技術標準或法規

Items 項目	Standards / Codes
	415X / 415X-R
	Class 150
	NPS 2~24
Design 設計	MSS SP-81
Pressure-Temperature Rating 壓力-溫度等級	MSS SP-81
Face to Face 面間距離	MSS SP-81
Connection (Flanged type) 埠連接形式(法蘭口)	MSS SP-81 & ASME B16.5
Testing 測試	MSS SP-81
Material 材質	ASTM
Casting Surface 鑄造表面	MSS-SP-55
Marking 標示	MSS SP-81 / MSS-SP-25
Stem Screw Threads 閘杆螺紋	ASME B1.5
Bolt and Nut 螺栓和螺帽	ASME B18.2.2
Screw Threads 螺栓螺紋	ASME B1.1

4. Pressure Temperature Ratings 壓力-溫度等級

The pressure-temperature rating of valves are determined according to the MSS SP-81. User shall ensure working temperature range as marked on the valve. Following Pressure-Temperature rating table is according to MSS SP-81.

NICO 耐安凡而	制定部門	文 件 名 稱		編 號	NV-DS-011
	研 發 課	User Manual		版 別	A0
				頁 次	6 of 12
				日 期	DEC.01.2014

依據 MSS SP-81 決定閥門的使用壓力溫度等級。使用者應確保閥門上標示的操作溫度範圍；下列壓力溫度等級表依據 MSS SP-81。

Table 4 Pressure Temperature Ratings 表 4 壓力溫度對照表

Temperature 溫度		Working Pressures 操作壓力 psig		<p>However, it was not to be defined allowable high temperature in material standard ASTM A351 & A126. Products shall be restricted the temperature of gasket and packing as below: TFE: -20°F ~ 250°F (-29°C ~ 121°C)</p> <p>然而根據 ASTM A351 & A126 材質標準，並沒有定義允許的高溫。 但產品應限制用於墊圈與填料的使用溫度： TFE 類：-20°F ~ 250°F (-29°C ~ 121°C)。</p>
		A351-CF8、CF8M、CF3M & A126-B		
		Class 150		
°F	°C	NPS 2~24	NPS 30 & 36	
32~150	0 to 66	150	100	

5. Delivery Condition and Storage 運送要求和存放

Knife-Gate Valves shall stay in the closed condition during transportation.

Valves are drained of any test liquid. The flange ends are covered to prevent the introduction of foreign materials and moisture.

Valves must store in an indoor warehouse to avoid dusts and other foreign object.

Do not expose in an open space without flange end cover. Do not take off the packing under an unnecessary situation.

在運輸過程中，閘刀閥應保持關閉狀態；閥內不應存在任何測試液體；

法蘭埠應覆蓋好，以防止異物和水分進入。

閥門必須存放在室內倉庫，以避免粉塵或其它異物；不要讓法蘭埠在沒有覆蓋下暴露於開放的空間；在不必要的情況下，不要將產品從包裝中取出。

6. Installation 安裝

6.1 Cleaning 清潔

Prior to pipe connection, remove sand, mud, molten spatter deposits and any other foreign materials from the interior of the pipes to be connected to the valve.

Inspect valve body port and related equipment if there is any damage that occurred during shipping. Then, make sure body interior is clean.

在連接管道之前，必須清除和閥門相連的管道內部沙子、泥巴、飄散的粉塵和其它任何的異物；並檢查閥門埠與相關設備上是否有任何運送過程的損傷，需確認閥體內部是乾淨的。

6.2 Valve Installation 閥門安裝

a. Direction 流向

The resilient seat knife gate is a bi-directional valve and could be applied with the flow in any direction. The valve with metal-seated is the unidirectional valve (or one-flow-direction valve) and need to make sure pipe

NICO 耐安凡而	制定部門	文 件 名 稱			編 號	NV-DS-011
	研 發 課	User Manual			版 別	A0
					頁 次	7 of 12
					日 期	DEC.01.2014

line flow direction, S or SEAT on the body when installing metal-seated valve. S and SEAT will be on the downstream side of port.

彈性閥座的開刀閥是雙向閥，適用於任一方向的流體；

金屬密封的閥門則必須特別注意，它是單向閥(或是單一流體方向的閥)，金屬密封的閥門安裝時要確認流體方向與閥體上的密封側指示(S 或 SEAT)，密封側須確定在流體的下游端。

- b. Hand wheel could not to be used as hanging position when installation.

安裝時，不可以手輪作為吊掛位置。

- c. Not using valve as the anchor of the pipeline.

切勿以閥作為管線的支撐點。

- d. The raised face flange of Knife Gate is manufactured with MSS SP-81 & ASME B16.5

開刀閥的凸面法蘭是依據 MSS SP-81 & ASME B16.5 規範生產。

- e. The gasket material used between the body and the pipe line flanges shall be changed as per customer's requirement. But we recommend using PTFE gasket.

閥門與管線法蘭連接處的墊片材質，可依客人的需求做改變，不過我們建議使用 PTFE。

- f. The body tapped hole depth may be slightly different for each valve due to castings, machining tolerances and flange thickness. The use of cap screws or bolts may lead to body deformation and then affect valve operation due to over tighten. So, please Do not use it.

由於鑄造、加工和法蘭厚度的公差因素，每個閥體上的螺栓孔深度可能會有些許的差異；使用帶頭螺栓可能會因過度的鎖緊，使的閥體變形影響到閥門的開啟，所以請勿使用。

- g. Fittings 配件

Select correct dimension of bolts to fasten the flange with pipeline. Following table 5 show fitting information which according to ASME B16.5.

選擇正確規格的螺栓以連接管線上的法蘭埠。依據 ASME B16.5，下方表 5 列顯示配件的資料。

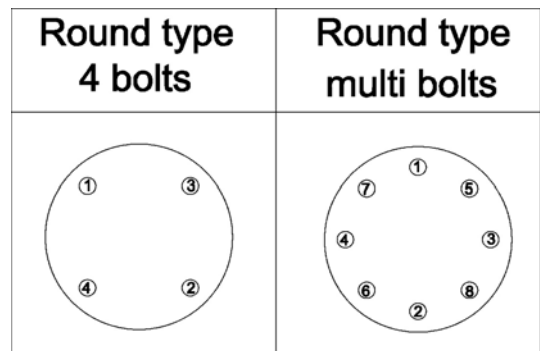
Table 5 Dimension Of Bolts 表 5 螺栓規格

ASME Class 150						
Nominal Pipe Size 公稱管徑		Diameter of Bolts 螺栓直徑		Number of Bolts 螺栓數量	Length of Bolts 螺栓長度	
					Bolts 全牙螺栓	
NPS	DN	Inch	Pitch		Inch	mm
2	50	5/8	11	4	2 1/4	57
2 1/2	65	5/8	11	4	2 1/4	57
3	80	5/8	11	4	2 1/2	64
4	100	5/8	11	8	2 1/2	64
5	125	3/4	10	8	2 3/4	70
6	150	3/4	10	8	3	76
8	200	3/4	10	8	3	76
10	250	7/8	9	12	3 1/2	89
12	300	7/8	9	12	3 1/2	89
14	350	1	8	12	3 3/4	95
16	400	1	8	16	4	102
18	450	1 1/8	8	16	4 1/4	108
20	500	1 1/8	8	20	4 1/2	114
24	600	1 1/4	8	20	4 3/4	121

NICO 耐安凡而	制定部門	文 件 名 稱 User Manual	編號	NV-DS-011
	研發課		版別	A0
			頁次	8 of 12
			日期	DEC.01.2014

To tighten the bolts of the flange end, the force must distribute on the every single bolt evenly and using cross over method. (Bolts could not tighten by one time). See the drawings on right side and tighten torque please refer to torque data in table 6, section 11.

鎖緊法蘭埠上的螺栓，應使用平均的扭力在每一個螺栓上。鎖緊螺栓時，需以對稱方式依序鎖緊(不可一次就將一個螺栓鎖緊)，請見右方的圖示，鎖緊之扭力請參閱第 11 節表 6 扭力資料的資訊。



- h. Place the valve between the flanges carefully. Loosely assemble (Not lock tightly) the valve by putting in the bottom 2~3 studs into valve flange, then insert the gaskets carefully. The bottom studs will help to locate the gasket and hold it in correct position.

謹慎地將閥門放置於管線法蘭之間，先鬆動地安裝(請勿鎖緊)底部的 2~3 根螺栓鎖入閥門法蘭，接著小心地將墊片放入，底部的螺栓會幫助墊片定位，並保持它在正確的位置。

- i. Knife Gate valve could be installed in the pipe line in any direction. The normal method is with handwheel vertical above the body. Other positions are also allowable, but it may result in uneven wear on valve. Whatever any type of actuator, all resilient-seat Knife Gate valves require the resilient seat to be lubricated. When upstream pressure against the resilient sealing seat, at the same time the valve up, the sealing face with no suitable lubrication will damage after few strokes. CRC or WD40 (lubrication oil) could be sprayed on the both sides of body and disc before installing in the pipe. It shall be sprayed after few strokes in order to provide sufficient lubrication. This should be repeated every 2 or 3 strokes. This is very important to the life and performance of the seat. In operation, the fluid during the process will supply sufficient lubrication normally.

開刀閥可以安裝在任何方向的管線上，通常安裝的方式是手輪是垂直於閥體的上方，但其它的方向位置的安裝也是允許的，只是會導致閥門不平均的磨損。

無論加裝任何形式的驅動器，所有彈性閥座的開刀閥需要塗上潤滑油在彈性閥座上。

當閥門的彈性密封面受到上游端的壓力時，同時閥門開啟上升，閥門如果沒有適當的潤滑油潤滑，在開關作動幾次後就會傷害閥門的密封面。

在安裝上管線前，可使用 CRC 或 WD-40 潤滑油噴塗在閥腔及閥板的兩側上，開關作動後再噴塗，這樣才可以有足夠的潤滑；這個操作需被重複的做 2~3 次，這對閥門的使用壽命及密封性是相當重要的。安裝後的使用操作中，製程中的流體會提供足夠的潤滑。

- j. Connection leakage test 連接洩漏測試

After installation, the testing pressure of pipe system shall not exceed the pressure shown in Table 4.

安裝於管線後，管道系統的測試壓力，不得超過 Table 4 提及的壓力。

- k. After the valve has been installed, cycle the valve one time completely. Open the valve by turning the handwheel counterclockwise, reverse the operation for closing. (Note: This will react if any damage occurred during shipping or installation.) And turn the handwheel counterclockwise several turns to make valve partial

NICO 耐安凡而	制定部門	文 件 名 稱	編 號	NV-DS-011
	研 發 課		User Manual	版 別
		頁 次		9 of 12
		日 期		DEC.01.2014

opening. After this, prepare for system operation.

閥門安裝後，將其完整地運轉一次，以逆時針的方向旋轉手輪開啟閥門，再反向操作關閉。(注意：這可以檢查出因運送過程或是安裝過程中是否造成的損傷)。

以逆時針方向旋轉手輪數圈，讓閥門呈部分開啟的狀態，在運轉閘刀閥之後，準備系統運作。

- l. Open the valve slowly, adding system pressure gradually, allowing installation personnel to check any gland packing leakage. If necessary, making adjustment again.

將閥門向上慢慢打開，漸漸地增加系統的壓力，讓安裝人員確認格南填料(Gland Packing)是否有嚴重的洩漏，必要時做調整再鎖緊。

- m. After system is up to required pressure, open the knife Gate valve fully by turning the handwheel counterclockwise and then close the valve fully by turning the handwheel clockwise. This process will result in O-Ring sealing with the body in resilient seat Knife Gate valves. No need to do this step for metal-seated valve.

當系統壓力到達需求壓力時，以逆時針方向將閘刀閥全開，再依順時鐘方向將閥門全關；在彈性閥座的閘刀閥上，這個過程會使的密封圈(O-Ring)更能跟閥體密合。金屬密封的閘刀閥不需這個步驟。

- n. Knife Gate valve shall be used in a full open or a full closed position. This should not be used for throttling unless specifically designed for throttling.

閘刀閥須保持在全開或是全關的位置，閘刀閥不應用在節流，除非原本就設計成節流的功能。

7. Put into Service 啟用

- 7.1 Once pipe installation is completed, open all valves completely and flush the piping with air, water or steam.

After flushing, close the valves completely and check their function. If the valves can't be closed, disassemble the valve and do further inspection.

一旦管線安裝完畢後，打開所有閥門，使用氣體、水或蒸氣清洗管線。

沖洗後，須完全關閉閥門並確認功能是否正常；若閥門無法關閉，須執行閥門的拆卸和檢查。

- 7.2 After installation, the testing pressure of piping system shall not exceed the pressure shown in Table 4.

安裝於管線後，管道系統的測試壓力，不得超過 Table 4 提及的壓力。

8. Operation 操作

Generally, Knife gate Valves are equipped with hand-wheel. Close the valve by turning the hand-wheel in clockwise direction.

For the operation torque value of Knife Gate valve in each size, please refer to table 7. Excessive operating force will not make sealing performance better, but may damage the structure of the valve.

一般來說，閘刀閥都配有手輪。從手輪上方以順時針方向轉動手輪關閉閥門。

各尺寸閘刀閥的建議操作扭力值，請參照 表 7；過大的操作力量並不會讓密封止漏效果更好，反而可能損壞閥門的結構。

NICO 耐安凡而	制定部門	文 件 名 稱	編 號	NV-DS-011
	研 發 課		User Manual	版 別
		頁 次		10 of 12
		日 期		DEC.01.2014

9. Dangers of inappropriate use 不當操作的危險性

It's prohibited to use the product exceed its allowed range, such as pressure, temperature and fluid.

In the case of any inappropriate using, even if product has no immediate damage condition, user shall change the product to avoid any danger in the future.

禁止在超出產品允許的範圍下使用閥門，如壓力、溫度和流體。在任何不當使用後，如果產品沒有出現立即的損害狀況，使用者應更換產品，以避免未來發生的危險。

10. Maintenance 保養

10.1 Maintenance frequency 保養頻率

The maintenance frequency is determined upon the application of valve. User shall consider the maintenance time interval depend on the kinds of fluid, flow velocity, operation frequency, high-pressure and high-temperature effect etc. Disc shall be operated from fully open to closed position one time at least six month.

保養頻率取決於如何使用閥。使用者應根據流體種類、流速、操作頻率、高壓和高溫的影響等等...考慮保養的間隔時間；最好能夠每6個月至少操作閥門全開至全關位置一次。

10.2 Parts inspection, maintenance and replacement 檢查、保養及更換零件

10.2.1 Normal maintenance of the Knife Gate valve only includes tightening gland packing periodically.

If any leakage occurs on gland packing, tighten the packing gland bolt closest to the leak simply. (It will be needed 2~3 bolts for larger valves.) After the leakage has stopped, tighten all packing gland bolts 1/4 turn. Do not over tighten. The other normal maintenance is to grease stem nut by using grease gun located on the yoke. 閘刀閥平常的維護只需要定期的鎖緊格南填料；如格南填料的部位發生洩漏，只需簡單地將接近洩漏處的螺栓鎖緊(大尺寸的閥門可能需要鎖2~3個螺栓)。停止洩漏後，將所有的格南螺栓鎖緊1/4圈，不要加鎖過緊；另一個平常的維護是使用油槍從閥軛上的油嘴潤滑閥桿螺帽(Stem Nut)。

10.2.2 After a period of time, it may be necessary to replace the packing. This can be finished as per above warning procedures. Standard repacking kits are available through distributor. Repacking the valve includes the following steps:

經過一段時間，可能需要更換填料，這可以根據上列的注意事項來完成，標準的填料配件可以在經銷商取得。重新安裝填料的步驟如下：

- a) Remove gland lock nuts and washers on packing.
移除填料上的格南防鬆螺帽及華司。
- b) Raise disc to the full open position.
升起刀板(Disc)至全開的位置。
- c) Pull up gland flange to the top of the disc and then fix it.
拉起格南壓板至刀板的最頂端並將其固定。

NICO 耐安凡而	制定部門	文 件 名 稱 User Manual	編 號	NV-DS-011
	研 發 課		版 別	A0
			頁 次	11 of 12
			日 期	DEC.01.2014

d) Use a packing hook to remove all old packing.

用填料鉤將舊的填料移除。

e) Clean stuffing box carefully. If oil, grease, wax or graphite impregnated packing were ever used, it might need solvent to clean the stuffing box.

謹慎地清潔填料室，如果曾經使用油、油脂、臘或石墨浸漬的填料，就可能需要溶劑來清潔填料室。

f) Purchase precut packing kits from distributor or cut each coil carefully by wrapping the packing without tightening up. Use clean and sharp knife to cut each ring with square cut individually.

可以從經銷商購買預先裁減好的成套填料配件或是小心裁剪整捲填料但不拉緊，以乾淨鋒利的刀子將每環用方型裁切的方式單獨裁切下來。

g) Insert one packing into stuffing box for each time. Use flat packing tool to tamp each ring lightly.

Packing joints need to be located with 180° apart in order to reduce leakage. Use the same method to insert each layer.

每次只放置一圈填料進填料室。用平整的填料工具將每個填料輕輕地搗實，填料連接處需隔 180 度分開放置，以降低洩漏量，每一層以相同的方式陸續放入。

h) Put down gland flange and then tighten bolts for both sides till gland flange bottoms out.

To tighten gland nut, please see information for Torque Data in table 6 section 11.

將格南壓板放下並將兩端的螺栓鎖緊直到格南壓板鎖緊。

為了鎖緊格南螺帽，請參閱第 11 節表 6 扭力資料的資訊。

10.3 Trouble shooting 故障排除

a. Handwheel is too tight or stuck. 手輪過緊或卡住

It means stem screw threads and stem nut need lubrication and it preferably implement one time every six months.

表示閥杆螺紋及軛套筒需潤滑，最好每六個月實施一次。

b. Packing leakage 填料洩漏

Tighten gland nut. If it still could not reduce leakage, packing might be hardened, worn or disc damaged. And need replacing the part.

發生時，請將格南螺帽平均再鎖緊；如果還是無法減低洩漏，可能是填料硬化、磨損或閥板損壞，需更換零件。

c. Possible leakage cause on sealing surface listed as below 密封面洩漏，可能原因如下：

1) If it has foreign material or impurities on the sealing surface, disc shall be operating fully open and close one time in order to clean impurities attaching on the sealing surface.

密封面上有異物或雜質－此時請將閥門 disc 全開及全關操作一次，以清除停留在密封面的雜質。

2) If sealing surface scratches or corrosion – we don't recommend customer to repair it by themselves.

Please disassemble the valve and then send back to distributor for repairing.

NICO 耐安凡而	制定部門	文 件 名 稱 User Manual	編號	NV-DS-011
	研發課		版別	A0
			頁次	12 of 12
			日期	DEC.01.2014

密封面刮傷或腐蝕—此部分不建議客戶自行處理，請將閘門卸下後送回經銷商維修。

11. Torque Data 扭力資料

Table 6 Proposed locking torque value for each nut 表 6 各規格螺帽建議之鎖緊扭力數值

Nominal Size		1/4-20UNC	5/16-18UNC	3/8-16UNC	7/16-14UNC	1/2-13UNC	9/16-12UNC	5/8-1UNC	3/4-10UNC	7/8-9UNC
A193-B8	ft-lb	3	6	10	16	24	35	48	85	206
	Kg-cm	37	77	137	219	334	481	664	1180	2849
	N-m	4	8	13	21	33	47	65	116	279
Nominal Size		1-8UNC	1 1/8-8UN	1 1/4-8UN	1 3/8-8UN	1 1/2-8UN	1 5/8-8UN	1 3/4-8UN	1 7/8-8UN	2-8UN
A193-B8	ft-lb	206	302	425	577	761	981	1239	1539	1884
	Kg-cm	2849	4182	5877	7976	10523	13562	17135	21286	26058
	N-m	279	410	576	782	1032	1330	1680	2087	2555

Table 7 Closing torque for each size 表 7 各規格閘門關閉之扭力值

公稱口徑	NPS	2	2 1/2	3	4	5	6	8	10	12	14	16	18	20	24
	DN	50	65	80	100	125	150	200	250	300	350	400	450	500	600
Torque (In-lb)		35.72	44.65	44.65	62.51	71.44	89.3	133.95	196.46	205.39	250.04	285.76	357.2	482.22	660.82
手輪直徑(In) H.w. Dia.		7.5	7.5	7.5	8.7	11.4	11.4	13.8	13.8	15.7	15.7	19.7	19.7	19.7	19.7
關閉閘門的出力(lb) Total force of closing valve		4.8	6.0	6.0	7.2	6.3	7.8	9.7	14.3	13.0	15.9	14.5	18.1	24.5	33.6

12. Corrosion Data 腐蝕資料

Corrosion data in ANNEX A is just for information only. 附件 A 的腐蝕資料僅供參考。

13. Cv valve of Valve 閘之 Cv 值

The Cv value for each size, please refer to table 8. 各規格的 Cv 值，請參考 表 8。

Table 8 The Cv value for each size 表 8 各規格之 Cv 值

公稱口徑	NPS	2	2 1/2	3	4	5	6	8	10	12	14	16	18	20	24
	DN	50	65	80	100	125	150	200	250	300	350	400	450	500	600
Cv (gal./min)		298	466	694	1234	2053	2873	5109	8622	12416	17651	23055	30603	37782	57349

附表 A

金屬材料的耐蝕表

耐蝕等級		腐蝕率(mm/Y)		摘要														
A		0.125 以內		腐蝕率極小，最適於閥本體及零件材料														
B		0.125~1.25		較此種材料耐腐蝕性佳的材料價格昂貴，且實用上不可能時，在容許某種程度之腐蝕之部份使用之														
C		1.25 以上		意即不可能使用														
腐蝕劑	腐蝕條件		碳鋼	鑄鐵	不鏽鋼					青銅	鎳	蒙納合金	HastelloyB	HastelloyC	Inconel	鈦	鋅	
	濃度 (%)	溫度 (°C)			SUS304	SUS316	SUS440C	SUS630 (17-4 PH)	20CR-30NI									
丙酮	100	常溫	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
		100	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
乙炔 (註1)	100	常溫	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
		100	A	A	A	A	A	A	A	---	---	---	A	A	A	---	---	
乙醛		常溫	A	A	A	A	A	A	A	A	A	A	---	A	---	A		
苯胺	100	常溫	A	A	A	A	A-B	A-B	A	C	A-B	A-B	A	A	A	A	A	
亞硫酸氣	乾	常溫	A	A	A	A	A	A	A	---	---	---	A	---	A	A	---	
		100	A	A	A	A	A	A	A	---	---	---	A	---	A	A	---	
	濕	5	常溫	C	C	A	A	A	---	A	---	C	---	A	A	A	B	---
		全濃度	100	C	C	B	B	C	---	A	B	C	C	A	A	A	C	---
乙醇	全濃度	常溫	A-B	A-B	A	A	A	A	A	A	A	A	A	A	A	A	A	
甲醇	全濃度	常溫	A-B	A-B	A	A	A	A	A	A	A	A	A	A	A	A	A	
安香醇	全濃度	常溫	C	C	A-B	A-B	A-B	A-B	A-B	A-B	A-B	A-B	A	A	A-B	A	A	
氯	100 (無水)	常溫	A	A	A	A	A	A	A	A	A-B	A-B	A	A	A	---	---	
氯溼蒸氣		常溫	A	A	A	A	A	A	A	C	C	C	A	A	A	A	---	
		70	B	B	A	A	---	---	A	C	C	C	A	A-B	A	A	---	
硫 (溶蝕)	100		A	A	A	A	A	A	A	C	A	A	A	---	A	---	---	
乙烷			A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
乙烯			A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
乙二醇		30	A	A	A	A	A-B	A	A	A-B	---	---	A	A	---	A	A	
氯化鋅 (註2)	5	常溫	C	C	C	B	C	C	A	B	A-B	A-B	A-B	A-B	---	A	A	
		沸騰	C	C	C	C	C	C	A	B	---	A-B	A-B	A-B	---	A	A	
氯化鋁	5	常溫	C	C	A	A	---	A	A	C	B	A-B	A	---	A-B	A	A	
氯化氯		1	常溫	C	C	A	A	C	---	A	B	A	A	A	A	A	A	
		10	沸騰	C	C	C	B	C	---	A-B	C	A-B	A-B	A	A-B	A-B	A	
		28	沸騰	C	C	C	B	C	---	A-B	C	A-B	A-B	A	A	A-B	---	
		50	沸騰	C	C	C	B	C	---	A-B	C	A-B	A-B	A	---	A-B	---	
氧化硫 (乾)			C	C	C	C	C	A-B	A-B	A-B	A-B	A	A-B	A-B	---	---		
氧化乙醇	5	常溫	C	C	A	A	B	---	A	A-B	A	A	A	A	A	A		
氧化乙烯 (註3)	100	常溫	A	A-B	A	A	A	A	A	A	A	A	A	A	A	A		
氧化鈣	0-60	常溫	A-B	A-B	A-B	A-B	A-B	A-B	A-B	A	A	A	A	A	A	A		
氧化銀		常溫	C	C	C	C	C	C	B	C	A-B	A-B	A-B	C	---	A		
氧化氯/鎢	5	常溫	C	C	C	B	C	C	A-B	C	C	C	A-B	A-B	C	---		
氧化氯二鐵	5	常溫	C	C	C	B	C	C	A-B	C	C	C	A-B	A-B	C	A		
氧化鈉			C	C	B	A-B	B	B	A	A-B	A	A	A	A	A	A		
鹽酸	1-5	<30	C	C	C	B	C	C	B	B	B	B	A	A	B	A-B		
		<50	C	C	C	C	C	C	B	C	B	B	B	A	B	A		
		沸騰	C	C	C	C	C	C	C	C	C	C	C	A	C	A		
	5-10	<30	C	C	C	C	C	C	B	B	B	B	A	A	B	A		
		<70	C	C	C	C	C	C	C	C	C	C	B	A	C	A		
	10-20	沸騰	C	C	C	C	C	C	C	C	C	C	C	A	C	A		
		<30	C	C	C	C	C	C	C	C	C	B	A	A	B	A		
		<70	C	C	C	C	C	C	C	C	C	C	B<50°C	A	C	A		
	>20	沸騰	C	C	C	C	C	C	C	C	C	C	C	B	C	B		
		<30	C	C	C	C	C	C	C	C	C	C	C	A	C	A		
<80		C	C	C	C	C	C	C	C	C	C	C	A	C	A			
氯	乾	沸騰 (註4)	C	C	C	C	C	C	C	C	C	C	B	C	C	B		
		<30	A	A	A	A	A	A	A	A	A	A	---	A	A	C		
	濕	<30	C	C	C	C	C	C	---	A	---	---	---	---	---	A		

NICO 耐安凡而	制定部門	文 件 名 稱 User Manual	編號	NV-DS-011
	研 發 課		版 別	A0
			頁 次	1 of 12
			日 期	DEC.01.2014

海水 (註5)		常溫	C	C	A	A	C	A	A	A	---	A	A	A	---	A	A
過氧化氫	<30	常溫	---	---	A	A	A-B	A-B	A	C	A	A	A	A	A	A	A

NVS

NICO 耐安凡而	制定部門	文 件 名 稱 User Manual	編號	NV-DS-011
	研 發 課		版 別	A0
			頁 次	1 of 12
			日 期	DEC.01.2014

NVS

腐蝕劑	腐蝕條件		碳 鋼	鑄 鐵	不鏽鋼					青 銅	鎳	蒙 納 合 金	HastelloyB	HastelloyC	Inconel	鈦	鋅
	濃度 (%)	溫度 (°C)			SUS304	SUS316	SUS440C	SUS630 (17-4 PH)	20CR-30NI								
氫			A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
水銀			A	A	A	A	A	A	A	C	A-B	A-B	A	A	A	---	---
硬脂酸(濃)		50	---	C	A	A	A-B	A-B	A	C	A-B	A-B	A	A	A-B	A	---
焦油			A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
碳酸鈉	全濃度	常溫	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
亞硫酸鈉	20	常溫	C	C	A-B	A-B	---	---	A	---	---	---	A	A	---	---	---
松節油			B	B	A	A	---	---	A	A	---	B	A	A	A	A	A
三氯乙烯			A-B	A-B	A	A	A	A	A	A	A	A	A	A	A	A	A
二氧化碳	乾	常溫	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
	濕		C	C	A	A	A	A	A	B	---	---	---	A	A	A	A
二硫化碳			A	A	A	A	B	---	A	C	---	B	A	A	A	A	A
吡啶甲酸			C	C	A-B	A-B	A-B	A-B	A	C	C	C	C	A	A-B	---	---
氟酸	(註6)		C	C	C	C	C	C	C	C	C	C	A-B	A	B	C	C
	(註7)		C	C	C	A	C	C	C	C	C	C	A	A	A-B	C	C
氟氧烷	乾		A-B	A-B	A	A	A	A	A	A	---	A	A	A	---	A	---
	濕		B	B	B	A	---	---	A	A	---	A	A	A	---	A	---
丙烷			A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
丁烷			A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
汽油			A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
硼酸			C	C	A	A	B	A	A	A-B	A-B	A-B	A	A	A-B	A	A
氯化砷			B	B	A	A	A	A	A	A	A	A	A	A	A	A	A
牛奶			---	---	A	A	---	---	A	---	---	---	A	A	---	---	---
丁酮			A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
硫化氫	濃		B-C	C	A-B	A-B	---	---	B	C	C	---	---	A	B	A	---
硫酸	≤0.25	≤30	C	C	A	A	C	A-B	A	A-B	C	A	A	A	---	---	A
		≤60	C	C	A	A	C	A-B	A	A-B	C	A	A	A	---	---	A
		沸騰	C	C	---	---	C	---	A	C	C	A	A	A	---	---	A
	0.5-5	≤30	C	C	B	B	C	---	A	C	C	C	A	A	C	C	A
		≤60	C	C	C	B	C	---	A	C	C	C	A	A	C	C	A
		沸騰	C	C	C	C	C	C	A	C	C	C	A	A	C	C	A
5-25	≤30	C	C	C	B-C	C	C	A	C	C	C	A	A	C	C	A	
	≤50	C	C	C	C	C	C	A	C	C	C	A	A	C	C	A	
	沸騰	C	C	C	C	C	C	A	C	C	C	A	B	C	C	A	
	≤30	C	C	C	C	C	C	A	C	C	C	A	A	C	C	A	
	≤50	C	C	C	C	C	C	A	C	C	C	A	A	C	C	A	
	沸騰	C	C	C	C	C	C	C	C	C	C	B	C	C	C	---	
50-60	≤30	C	C	C	C	C	C	A	C	C	C	A	A	C	C	A	
	≤60	C	C	C	C	C	C	B	C	C	C	A	A	C	C	A	
	沸騰	C	C	C	C	C	C	C	C	C	C	B	B	C	C	A-B	
	≤30	C	C	C	C	C	C	A	C	C	C	A	C	C	C	A-B	
	≤60	C	C	C	C	C	C	B	C	C	C	A	A	C	C	A-B	
	沸騰	C	C	C	C	C	C	C	C	C	C	B	B	C	C	C	
75-95	≤30	B	---	B	B	C	C	A	C	C	C	A	C	---	---	A	
	≤50	C	---	C	B	C	C	B	C	C	C	A	---	---	---	A	
	沸騰	C	---	C	C	C	C	C	C	C	C	---	---	---	---	---	
	≤30	A>98%	---	A>98%	A>98%	---	---	A	---	C	C	A	---	---	---	---	
	≤50	B>98%	---	B>98%	B>98%	C	C	A-B	---	C	C	A	A	---	---	---	
	沸騰	---	---	---	---	---	---	C	---	C	C	C	B-C	---	---	---	
硫酸鋅	5	常溫	---	---	A	A	---	---	A	A	A-B	A-B	A	C	A-B	---	---
	飽和	常溫	---	---	A	A	---	---	A	A	---	---	A	A	A-B	---	---
	25	沸騰	---	---	A	---	---	---	A	B	---	---	A	A	---	---	---
硫酸氫	1-5	常溫	---	---	A	A	---	---	A	---	A	A	A	A	A	A	A
硫酸銅	<25	<100	---	---	---	---	---	---	A	---	---	---	---	A	---	A	A
磷酸	≤65	≤30	C	C	A<50%	A	---	---	A	---	---	---	A	A	A<50%	---	A
		≤70(註8)	C	C	A	A	---	---	A	---	---	A	A	A	---	A<25%	A
		沸騰	C	C	A-B	A	---	---	A	---	---	---	A	A	---	---	A<50%
	65-85	≤30	C	C	C	A	---	---	A	---	---	B	A	---	---	---	---
		≤90	C	C	C	A	---	---	A	---	---	B	A	---	---	---	---
		沸騰	C	C	C	C	---	---	A	---	---	C	A-B	---	---	---	---

- 註：
1. 使用銅及銅合金時若有水份存在會發生爆炸。
 2. SUS304、SUS316 可能發生孔蝕或應力腐蝕破裂。
 3. 如有水份時，不鏽鋼及碳鋼變成 C 級。
 4. 鉍 30% 以上，沸騰狀態下變成 B 或 C 級。
 5. 不鏽鋼有發生孔蝕之處。

NICO 耐安凡而	制定部門	文 件 名 稱	編 號	NV-DS-011
	研 發 課		User Manual	版 別
		頁 次		1 of 12
		日 期		DEC.01.2014

6. 混入空氣時之數據。

7. 無空氣混入時之數據。

8. 蒙納合金，無空氣混入時之數據。

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Annex A

METAL CORROSION TABLE

Corrosion level		Corrosion rate (mm/Y)		Summary														
A		0.125 Less		Corrosion rate is very small, the valve body and the most suitable parts and materials														
B		0.125~1.25		Good corrosion resistance of this material than the material is expensive and not practical when on, allowing some degree of corrosion in the part of the use of														
C		1.25 Above		This means not using														
Corrosive	Corrosion conditions		Carbon Steel	Cast iron	Stainless steel					Bronze	Nickel	Monotype alloy	HastelloyB	HastelloyC	Inconel	Titanium	Zirconium	
	Concentration (%)	Temperature (°C)			SUS304	SUS316	SUS440C	SUS630 (17-4 PH)	20CR-30NI									
Acetone	100	Room temperature	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
		100	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
Acetylene (Note 1)	100	Room temperature	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
		100	A	A	A	A	A	A	A	---	---	---	A	A	A	---	---	
Acetaldehyde		Room temperature	A	A	A	A	A	A	A	A	A	A	---	A	---	A	---	
Aniline	100	Room temperature	A	A	A	A	A-B	A-B	A	C	A-B	A-B	A	A	A	A	A	
Sulfite oxygen	Dry	Room temperature	A	A	A	A	A	A	A	---	---	A	A	---	A	A	---	
		100	A	A	A	A	A	A	---	---	A	A	---	A	A	---		
	Wet	5	Room temperature	C	C	A	A	A	---	A	---	C	---	A	A	A	B	---
		Full concentration	100	C	C	B	B	C	---	A	B	C	C	A	A	A	C	---
Ethanol	Full concentration	Room temperature	A-B	A-B	A	A	A	A	A	A	A	A	A	A	A	A	A	
Methanol	Full concentration	Room temperature	A-B	A-B	A	A	A	A	A	A	A	A	A	A	A	A	A	
An aromatic	Full concentration	Room temperature	C	C	A-B	A-B	A-B	A-B	A-B	A-B	A-B	A-B	A	A	A-B	A	A	
Ammonia	100(Anhydrous)	Room temperature	A	A	A	A	A	A	A	A	A-B	A-B	A	A	A	---	---	
Ammonia wet steam oxygen		Room temperature	A	A	A	A	A	A	A	C	C	C	A	A	A	A	---	
		70	B	B	A	A	---	---	A	C	C	C	A	A-B	A	A	---	
Sulfur (dissolved)	100		A	A	A	A	A	A	A	C	A	A	A	---	A	---	---	
Ethane			A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
Ethylene			A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
Glycol		30	A	A	A	A	A-B	A	A	A-B	---	---	A	A	---	A	A	
Zinc chloride (Note 2)	5	Room temperature	C	C	C	B	C	C	A	B	A-B	A-B	A-B	A-B	---	A	A	
		Boiling	C	C	C	C	C	C	A	B	---	A-B	A-B	A-B	---	A	A	
Alumina	5	Room temperature	C	C	A	A	---	A	A	C	B	A-B	A	---	A-B	A	A	
Ammonia oxidation	1	Room temperature	C	C	A	A	C	---	A	B	A	A	A	A	A	A	A	
		Boiling	C	C	C	B	C	---	A-B	C	A-B	A-B	A	A-B	A-B	A	A	
	28	Boiling	C	C	C	B	C	---	A-B	C	A-B	A-B	A	A	A-B	---	A	
		Boiling	C	C	C	B	C	---	A-B	C	A-B	A-B	A	---	A-B	---	---	
Sulfur dioxide (dry)			C	C	C	C	C	C	A-B	A-B	A-B	A-B	A	A-B	A-B	---	---	
Oxidation of ethanol	5	Room temperature	C	C	A	A	B	---	A	A-B	A	A	A	A	A	A	A	
Ethylene oxide (Note 3)	100	Room temperature	A	A-B	A	A	A	A	A	A	A	A	A	A	A	A	---	
Calcium oxide	0-60	Room temperature	A-B	A-B	A-B	A-B	A-B	A-B	A-B	A	A	A	A	A	A	A	A	
Silver Oxide		Room temperature	C	C	C	C	C	C	B	C	A-B	A-B	A-B	C	---	A	---	
Oxidation of ammonia / W	5	Room temperature	C	C	C	B	C	C	A-B	C	C	C	A-B	A-B	C	---	A	
Ammonia oxidation of iron	5	Room temperature	C	C	C	B	C	C	A-B	C	C	C	A-B	A-B	C	A	C	
Sodium oxide			C	C	B	A-B	B	B	A	A-B	A	A	A	A	A	A	A	
Hydrochloric acid	1-5	<30	C	C	C	B	C	C	B	B	B	B	B	A	A	B	A-B	A
		<50	C	C	C	C	C	C	C	B	C	B	B	B	A	B	B	A
		Boiling	C	C	C	C	C	C	C	C	C	C	C	C	A	C	C	A
	5-10	<30	C	C	C	C	C	C	C	B	B	B	B	A	A	B	B	A
		<70	C	C	C	C	C	C	C	C	C	C	C	B	A	C	C	A
		Boiling	C	C	C	C	C	C	C	C	C	C	C	C	A	C	C	A
	10-20	<30	C	C	C	C	C	C	C	C	C	C	B	A	A	B	C	A
		<70	C	C	C	C	C	C	C	C	C	C	C	B<50C	A	C	C	A
		Boiling	C	C	C	C	C	C	C	C	C	C	C	C	B	C	C	B
	>20	<30	C	C	C	C	C	C	C	C	C	C	C	C	A	C	C	A
		<80	C	C	C	C	C	C	C	C	C	C	C	C	A	C	C	A
		Boiling (Note 4)	C	C	C	C	C	C	C	C	C	C	C	C	B	C	C	B

Ammonia	Dry	<30	A	A	A	A	A	A	A	A	A	A	A	A	---	A	C	A
	Wet	<30	C	C	C	C	C	C	---	A	---	---	---	---	---	---	A	---
Sea (Note 5)		Room temperature	C	C	A	A	C	A	A	A	---	A	A	A	A	---	A	A
Peroxide		<30	Room temperature	---	---	A	A	A-B	A-B	A	C	A	A	A	A	A	A	A

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Corrosive	Corrosion conditions		Carbon Steel	Cast iron	Stainless steel					Bronze	Nickel	Monotype alloy	HastelloyB	HastelloyC	Inconel	Titanium	Zirconium
	Concentration (%)	Temperature (°C)			SUS304	SUS316	SUS440C	SUS630 (17-4 PH)	20CR-30NI								
Caustic	<10	<30	A	A	A	A	A	A	A	B	A	A	A	A	A	A	A
		<90	A-B	A-B	A	A	A	A	A	B	A	A	A	A	A	A	A
		Boiling	--	--	A	A	A	A	A	B	A	A	A	A	A	A	A
	10-30	<30	A	A	A	A	A	A	A	B	A	A	A	A	A	A	A
		<100	A	A	A	A	A	A	A	C	A	A	A	A	A	A	A
		Boiling	--	--	B	B	--	--	A	C	A	A	A	A	A	--	--
	30-50	<30	A	A	A	A	A	A	A	C	A	A	A	A	A	--	--
		<100	B	B	A	A	--	B	A	C	A	A	A	A	A	--	--
		Boiling	--	--	--	--	--	--	--	C	A	A	A	A	A	--	--
	50-70	<30	C	C	B	B	--	--	B	C	A	A	A	A	A	--	--
		<80	C	C	--	--	--	--	--	C	A	A	A	A	A	--	--
		Boiling	C	C	--	--	--	--	--	C	A	A	A	A	A	--	--
70-100	≤260	--	--	B	B	--	--	B	--	A	B	B	B	B	--	--	
100	≤480	--	--	C	C	--	--	C	--	A	B	B	B	B	--	--	
Arsenic acid	<10	Room temperature	C	C	A	A	C	B	A	C	--	A-B	A	A	A-B	--	A
Citric acid	5	<70	C	C	A-B	A	A	A	A	C	A-B	A-B	A	A	A	A	A
	15	Room temperature	C	C	A-B	A	B	A-B	A	C	A-B	A-B	A	A	A	A	A
		Boiling	C	C	A-B	A	B	--	A	C	A-B	A-B	A	A	A-B	A	A-B
Concentrated	Boiling	C	C	C	B			A	C	--	--	A	A	--	A	--	
Carbonic acid			A	A	A	A	A	A	C	A	A	A	A	A	A	--	--
Branded acid	5	<66	C	C	B	B	C	--	A-B	C	C	C	--	A-B	A-B	A	A
	10	Boiling	C	C	C	C	C	--	--	C	C	C	--	A-B	B	A	A
	Concentrated	Boiling	C	C	C	C	C	--	--	C	C	C	--	--	--	A	A
Sodium chromate			--	--	A	A	--	A	--	A	A	A	--	--	A	--	--
Acetic acid	<10	≥30	C	C	A	A	A-B	A	A	B-C	A	A	A	A	A	A	A
		Boiling	C	C	A	A	--	--	A	B-C	--	A-B	A	A	A	A	A
	10-20	<60	C	C	A	A	--	--	A	--	A	--	--	A	--	A	A
		Boiling	C	C	A	A	--	--	A	--	--	--	--	A	--	A	A
	20-50	<60	C	C	A	A	--	--	A	--	A	A	A	A	--	A	A
		Boiling	C	C	A	A	--	--	A	--	--	--	A	A	--	A	A
	50-99.5	<60	C	C	A	A	--	--	A	--	--	--	A	A	--	A	A
		Boiling	C	C	A	A	--	--	A	--	--	--	A	A	--	A	A
Anhydrous	Room temperature	C	C	A-B	A	--	--	A	--	--	--	A	A	--	A	A	
Sodium acetate			A-B	A-B	A-B	A-B	A-B	A-B	A-B	A-B	A-B	A-B	A-B	A-B	A-B	A	A
Two sub-oxide Na	<20	Room temperature	C	C	C	B	C	C	B	C	C	C	--	A	C	A	A
Carbon tetrachloride			B	B	A	A	B	A	A	A	A	A	A	A	A	A	A
Nitric acid	5	Room temperature	C	C	A-B	A-B	A-B	A-B	A	--	C	A-B	A	A	A	A-B	A
	10	Room temperature	C	C	A-B	A-B	A-B	A-B	A	--	C	A-B	A	A	A	C	A
		Boiling	C	C	C	A-B	C	C	A	--	C	A-B	B	A	A	C	A
Nitric acid	≤0.5	≤30	C	C	A	A	A	A	A	C	C	C	C	A	A	A	A
		≤60	C	C	A	A	A	A	A	C	C	C	C	A	A	A	A
		Boiling	C	C	A	A	A	A	A	C	C	C	C	A	A	A	A
	0.5-20	≤30	C	C	A	A	A	A	A	C	C	C	C	A	A	A	A
		≤60	C	C	A	A	A	A	A	C	C	C	C	A	--	A	A
		Boiling	C	C	A	A	--	--	A	C	C	C	C	A	--	A	A
	20-40	≤30	C	C	A	A	A	A	A	C	C	C	C	A	A	A	A
		≤60	C	C	A	A	--	--	A	C	C	C	C	A	--	A	A
		Boiling	C	C	A	A	--	--	A	C	C	C	C	--	--	C	A
	40-70	≤30	C	C	A	A	A	A	A	C	C	C	C	--	--	A	A
		≤60	C	C	A	A	--	--	A	C	C	C	C	--	--	A	A
		Boiling	C	C	B	B	--	--	B	C	C	C	C	--	--	C	A
	70-80	≤30	C	C	B	A	A-B	A-B	A	C	C	C	C	--	--	A	A
		≤60	C	C	A	A	--	--	B	C	C	C	C	--	--	A	A
		Boiling	C	C	C	C	--	--	C	C	C	C	C	--	--	C	A
	80-95	≤30	C	C	A	A	--	--	A	C	C	C	C	--	--	A	A
		≤60	C	C	A	A	--	--	B	C	C	C	C	--	--	A	A
		Boiling	C	C	C	C	--	--	C	C	C	C	C	--	--	--	--
>95	<30	A	--	A	A	--	--	A	--	--	--	--	--	--	A	A	
Silver nitrate			C	C	A	A	A-B	A-B	A	C	C	C	A-B	A-B	--	A	A

Potassium argon	5	Room temperature	A-B	A-B	A	A	A-B	A	A	B	A	A	A-B	A	A-B	A	A
	27	Boiling	A-B	A-B	A	A	A-B	---	A-B	B	A	A	A-B	A-B	A-B	C	A
	30	Boiling			B	A	---	---	A-B	---	A	A	A-B	A-B	A-B	C	A
Argon magnesium oxide (concentration)		Room temperature	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A

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Corrosive		Corrosion conditions		Carbon Steel	Cast iron	Stainless steel					Bronze	Nickel	Monotype alloy	HastelloyB	HastelloyC	Inconel	Titanium	Zirconium
		Concentration (%)	Temperature (°C)			SUS304	SUS316	SUS40C	SUS630 (17-4 PH)	20CR-30NI								
Argon				A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Mercury				A	A	A	A	A	A	A	C	A-B	A-B	A	A	A	---	---
Stearic acid (concentrated)		50		---	C	A	A	A-B	A-B	A	C	A-B	A-B	A	A	A-B	A	---
Tar				A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Carbon acid sodium	Full concentration	Room temperature		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Sodium sulfite	20	Room temperature		C	C	A-B	A-B	---	---	A	---	---	---	A	A	---	---	---
Turpentine				B	B	A	A	---	---	A	A	---	B	A	A	A	A	A
Trichloroethylene				A-B	A-B	A	A	A	A	A	A	A	A	A	A	A	A	A
Carbon dioxide	Dry	Room temperature		A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
	Wet			C	C	A	A	A	A	A	B	---	---	---	A	A	A	A
Carbon disulfide				A	A	A	A	B	---	A	C	---	B	A	A	A	A	A
Picolinate				C	C	A-B	A-B	A-B	A-B	A	C	C	C	C	A	A-B	---	---
Hydrofluoric acid	(Note 6)			C	C	C	C	C	C	C	C	C	A-B	A	B	C	C	C
	(Note 7)			C	C	C	A	C	C	C	C	C	A	A	A-B	C	C	C
Fluorine-Siloxane	Dry			A-B	A-B	A	A	A	A	A	A	---	A	A	A	---	A	---
	Wet			B	B	B	A	---	---	A	A	---	A	A	A	---	A	---
Propane				A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Butane				A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Gasoline				A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Boric acid				C	C	A	A	B	A	A	A-B	A-B	A-B	A	A	A-B	A	A
Arsenic trifluoride				B	B	A	A	A	A	A	A	A	A	A	A	A	A	A
Milk				---	---	A	A	---	---	A	---	---	---	A	A	---	---	---
Butanone				A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Argon sulfide	Concentrated			B-C	C	A-B	A-B	---	---	B	C	C	---	---	A	B	A	---
Sulfuric acid	≤0.25	≤30		C	C	A	A	C	A-B	A	A-B	C	A	A	A	---	---	A
		≤60		C	C	A	A	C	A-B	A	A-B	C	A	A	A	---	---	A
		Boiling		C	C	---	---	C	---	A	C	C	A	A	A	---	---	A
	0.5-5	≤30		C	C	B	B	C	---	A	C	C	C	A	A	C	C	A
		≤60		C	C	C	B	C	---	A	C	C	C	A	A	C	C	A
		Boiling		C	C	C	C	C	C	A	C	C	C	A	A	C	C	A
	5-25	≤30		C	C	C	B-C	C	C	A	C	C	C	A	A	C	C	A
		≤50		C	C	C	C	C	C	A	C	C	C	A	A	C	C	A
		Boiling		C	C	C	C	C	C	B-80°C	C	C	C	C	A	B	C	C
	25-50	≤30		C	C	C	C	C	C	A	C	C	C	A	A	C	C	A
		≤50		C	C	C	C	C	C	A	C	C	C	A	A	C	C	A
		Boiling		C	C	C	C	C	C	C	C	C	C	B	C	C	C	---
	50-60	≤30		C	C	C	C	C	C	A	C	C	C	A	A	C	C	A
		≤60		C	C	C	C	C	C	B	C	C	C	A	B	C	C	A
		Boiling		C	C	C	C	C	C	C	C	C	C	B	C	C	C	A-B
	60-75	≤30		C	C	C	C	C	C	A	C	C	C	A	A	C	C	A-B
		≤60		C	C	C	C	C	C	B	C	C	C	A	B	C	C	A-B
		Boiling		C	C	C	C	C	C	C	C	C	C	B	C	C	C	A
	75-95	≤30		B	---	B	B	C	C	A	C	C	C	A	---	---	---	A
		≤50		C	---	C	B	C	C	B	C	C	C	A	---	---	---	A
Boiling			C	---	C	C	C	C	C	C	C	C	---	---	---	---	---	
95-100	≤30		A>98%	---	A>98%	A>98%	---	---	A	---	C	C	A	A	---	---	---	
	≤50		B>98%	---	B>98%	B>98%	C	C	A-B	---	C	C	A	A	B-C	---	---	---
	Boiling		---	---	---	---	---	---	C	---	C	C	C	C	---	---	---	---
Zinc sulfate	5	Room temperature		---	---	A	A	---	---	A	A	A-B	A-B	A	A	A-B	---	---
	Saturation	Room temperature		---	---	A	A	---	---	A	A	---	---	A	A	A-B	---	---
	25	Boiling		---	---	A	---	---	---	A	B	---	---	A	A	---	---	---
Ammonium sulfate	1-5	Room temperature		---	---	A	A	---	---	A	---	A	A	A	A	A	A	A
Copper sulfate	<25	<100		---	---	---	---	---	---	A	---	---	---	---	A	A	A	A
Phosphate	≤65	≤30		C	C	A<50%	A	---	---	A	---	---	---	A	A	A<50%	---	A
		≤70 (Note 8)		C	C	A	A	---	---	A	---	---	---	A	A	---	A<25%	A
		Boiling		C	C	A-B	A	---	---	A	---	---	---	A	A	---	---	A<50%
	65-85	≤30		C	C	C	A	---	---	A	---	---	B	A	---	---	---	---
		≤90		C	C	C	A	---	---	A	---	---	B	A	---	---	---	---
Boiling		C	C	C	C	---	---	A	---	---	C	A-B	---	---	---	---	---	

Note :

1. Use of copper and copper alloy water when there is an explosion may occur if.
2. SUS304, SUS316 possible pitting or stress corrosion cracking.
3. For water, the stainless steel and carbon steel into a C-class.
4. Tantalum 30%, boiling into a state B or C grade.
5. Pitting of stainless steel have occurred into account.
6. The data is mixed with air.
7. When no air mixed with the data.
8. Monotype alloys, no air when mixed with the data

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