ENGINEERING
TOMORROW

Data Sheet

Check valve
Type **NRVT**

For high pressure CO_2 application

NRVT piston type check valves is designed for installation in discharge line to prevent refrigerant migration to protect compressor and enable the pressure equalization of rotary compressor before startup. In the meanwhile this valve can be used in other installation positions of CO_2 systems such as hot gas and suction lines.

Features:

- Stable operation covering full map of compressor
- Fulfills high temperature and pressure requirements for the discharge lines used in Transcritical CO_2 systems
  - Rupture proof, optimized TIG welding
  - Specially-selected sealing material for CO_2 refrigerant
- Hermetic brass body design
- Compatible to connect both copper/stainless steel tubes
- In compliance to PED & UL regulations

Applications

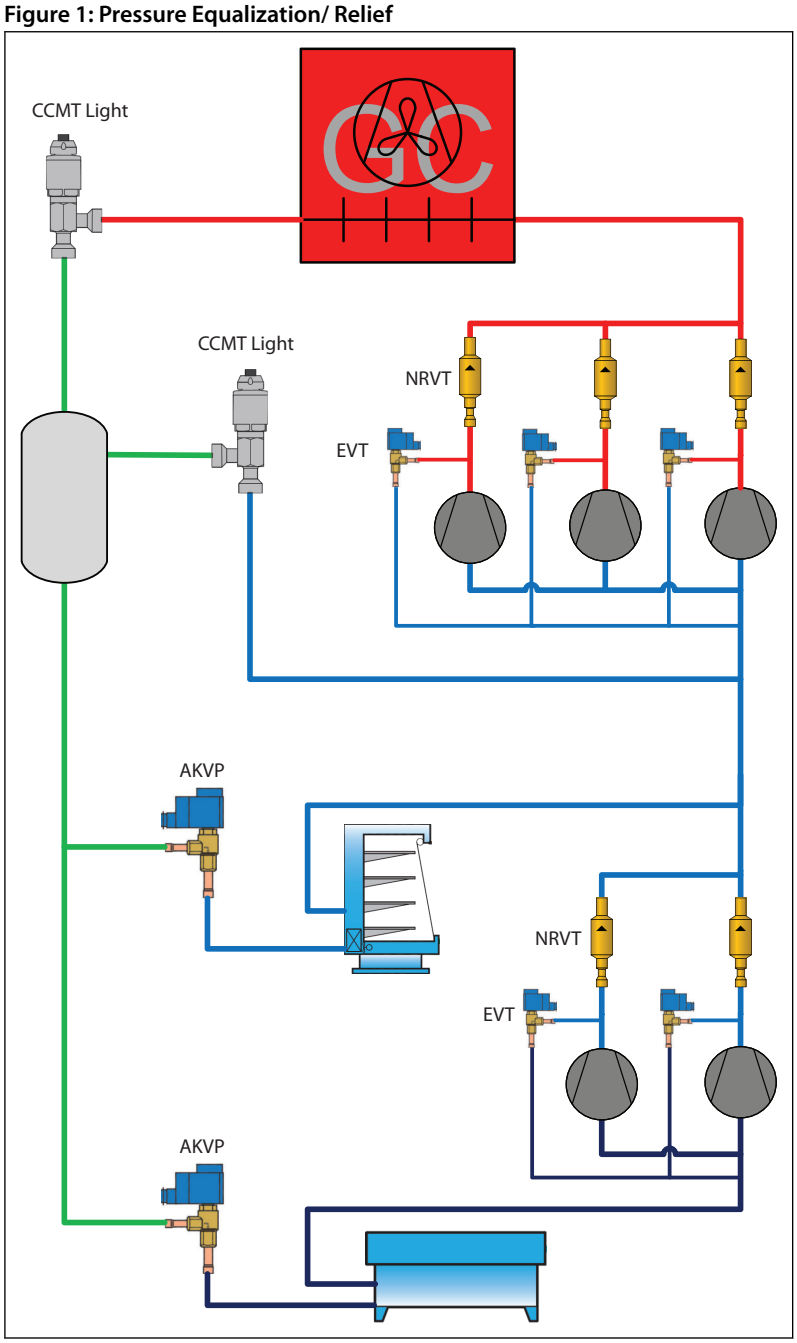
Typical applications for NRVT valves are:

- CO_2 MiniPack
- CO_2 CDU BLDC

Pressure Equalization/ Relief

- To start rotary BLDC compressors, it is necessary to equilize pressure between discharge and suction line.
- In single compressor solution it is possible to manage equalization via high pressure valve and bypass valve
- In system with parallel mounted compressors, **It is necessary to install on each compressor check valve in discharge line and solenoid valve to bypass high pressure to suction line**

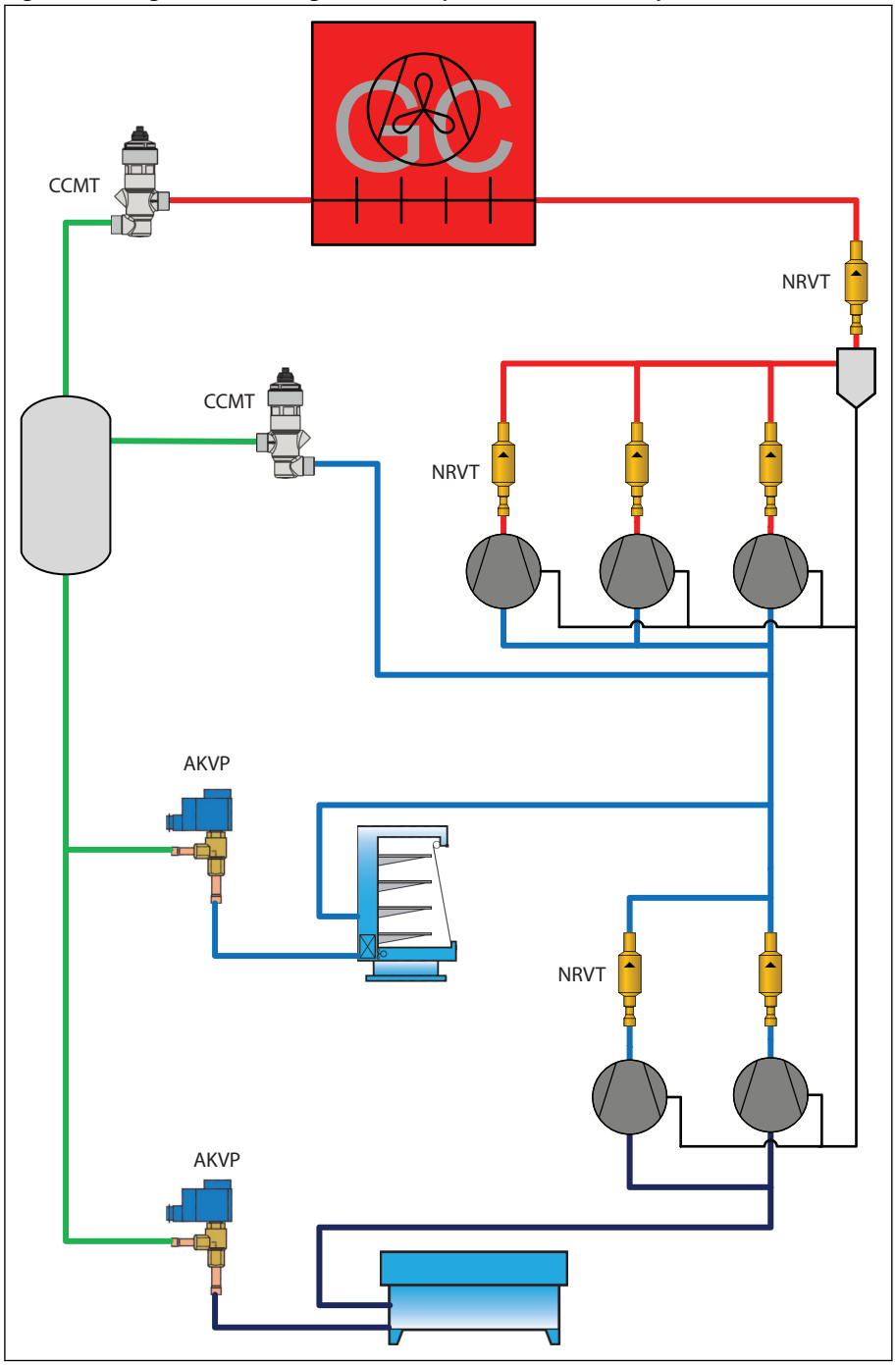
Figure 1: Pressure Equalization/ Relief



Discharge line – compressors mounted in parallel

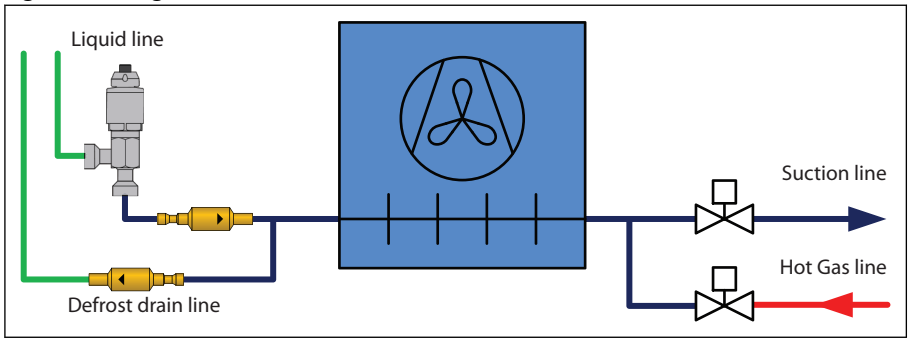
- If using an individual oil separator for each compressor – for **protection against back condensation of refrigerant**in the separator with the compressor shut-off.
- If the **cylinder heads** of the compressors **can cool down** below the condensing temperature at standstill
- Check valve for a common oil separator (installation position towards the condenser):
  – If there is a **danger of back condensation from the condenser** or liquid receiver
  – Systems with long shut-off periods

Figure 2: A diagram of Discharge line – compressors mounted in parallel



Hot Gas Defrost

Figure 3: A diagram of Hot Gas Defrost



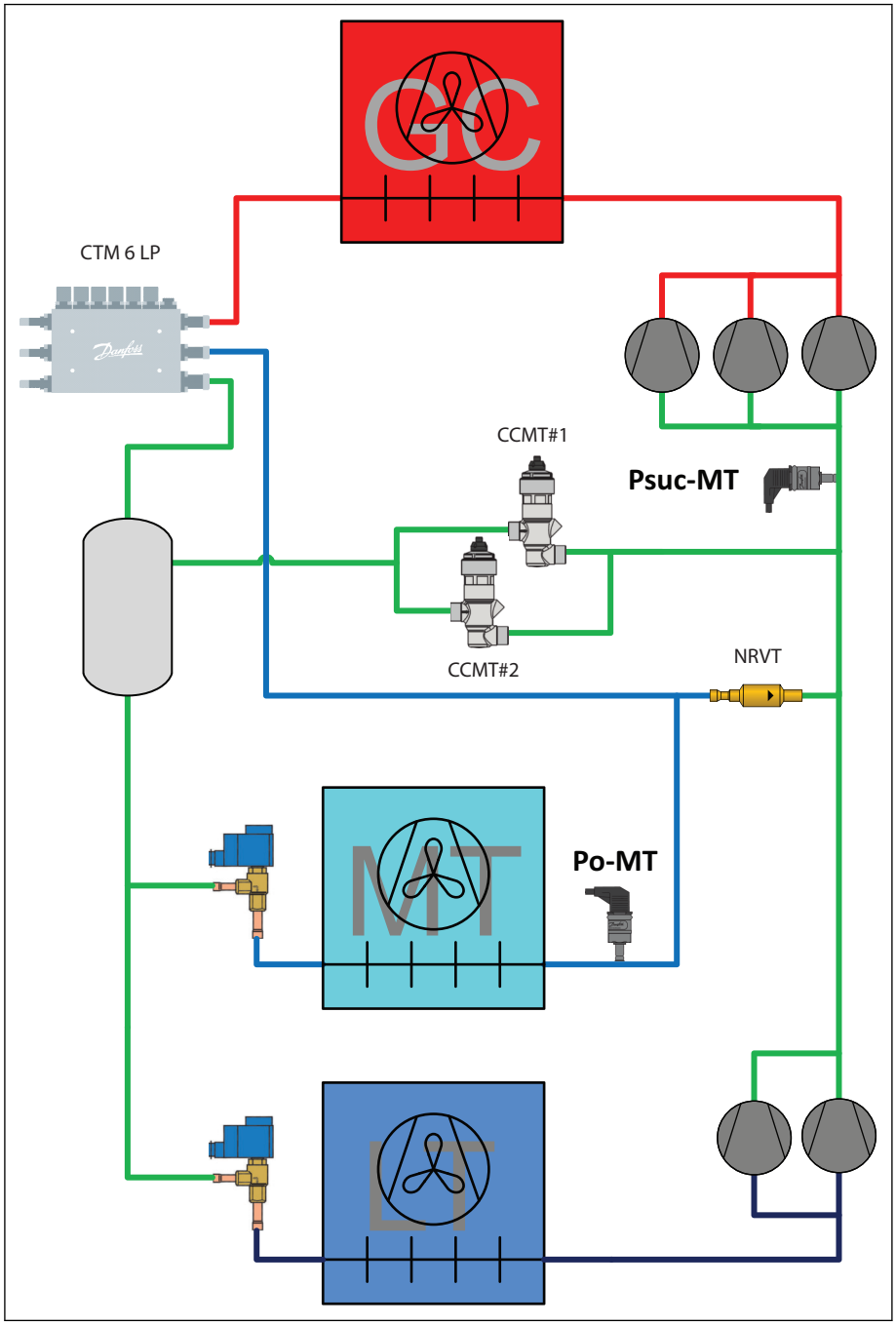
Low Pressure lift Multi Ejector / cold & warm ambient temperature

Optimal solution for **smaller** commercial refrigeration systems

- In colder ambient conditions system operates as a standard booster system
- Ejector is simply controlling the high pressure as a high pressure valve according to the optimal COP Gas Cooler pressure algorithm
- Pressure in the receiver as pressure difference between the receiver and Po-MT evaporator suction pressure
- Receiver pressure controlled by first gas by-pass valve CCMT#1, second gas by-pass valve CCMT#2 is closed
- **Check valve on MT evaporator suction line is open**

- In warmer ambient conditions temperature out of the gas cooler is high and corresponding optimal pressure in gas cooler is high too, so ejector can lift **all gas mass flow from MT evaporators** through the ejector to the receiver
- **Check valve in suction line between compressors and MT evaporators is closed due to pressure difference**
- The pressure in the receiver is result of the ejector performance.
- Both gas by-pass valves CCMT#1 & CCMT#2 are open to minimize pressure loses
- MT compressors are controlled based on Po-MT pressure sensor and Psuc-MT is protection

Figure 4: Low Pressure lift Multi Ejector / cold & warm ambient temperature



Product specification

Technical data

Table 1: Technical data

Technical data	Values
Refrigerants	R 744 (CO_2)
Refrigerant oil	POE, PAG
Max. working pressure	140 bar / 2031 psig
Media temperature range	-40 °C – 150 °C / -40 °F – 302 °F
Flow direction	Single-flow
Valve direction	Sraightway
Serviceable	non-serviceable

Identification

Relevant product data is available on the product and box label. An example of a box label and product label are shown, including an explanation of the content.

Table 2: Box label & product label (example)

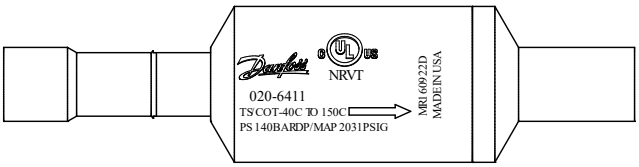
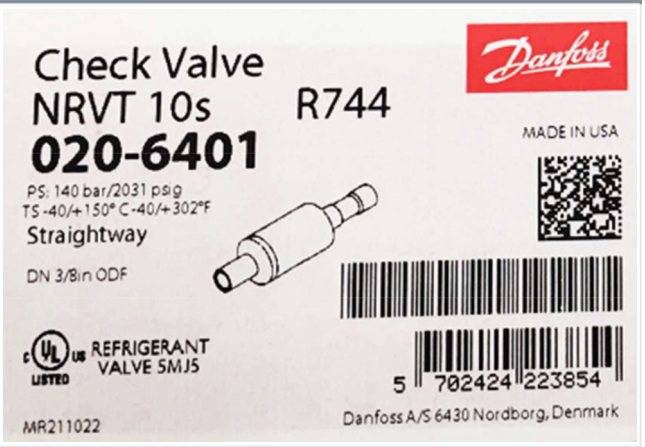
Product engraving	Packaging label
	

Table 3: Product engraving

Information	Explanation
Danfoss	Danfoss Logo
NRVT	Product type
020-6411	Code number for ordering
PS 140 BAR DP/MAP 2031 PSIG	Max. working pressure
TS/COT -40C TO 150C	Media temperature range
MR	Place of manufacture
160922D	Production date: DDMMYYS DD=Day MM=Month YY=Year S=Shift of production (D=Day, N=Night)
MADE IN USA	Country of origin
UL logo	Approval

Table 4: Packaging label

Information	Explanation
Check valve	Product Description
NRVT 10s	Product type and size
020-6401	Code number
R744	Refrigerant

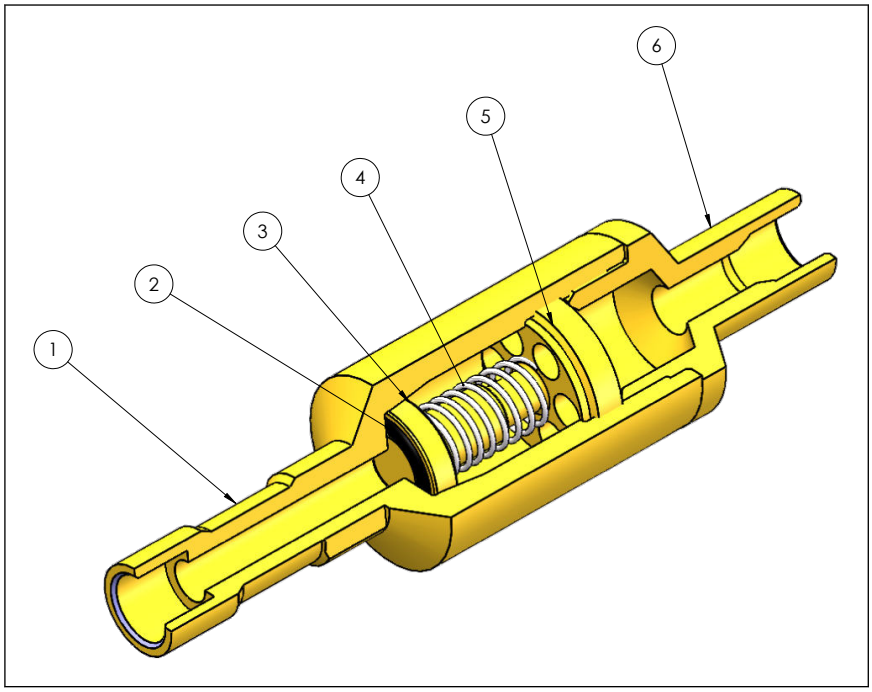
Information	Explanation
Straightway	Direction
DN 3/8 in ODF	Connection
PS 140bar/MWP 2031psig	Max Working Pressure
TS -40/+150°C -40 + 302°F	Media temperature range
MR	Place of manufacture
211022	Production date: DDMMYY
MADE IN USA	County of origin
Data Matrix	Content of traceability data matrix code (IDKey)
EAN code	Barcode for individual code no. identification according to EAN standard
Danfoss A/S, 6430 Nordborg, Denmark	Address

Design and materials

The pressure of the fluid passing through a refrigeration system opens the valve, while any reverse flow closes the valve.

In NRVT check valve a sealing disc is activated by the spring to close or open the valve, and the force of the spring determines the Min. opening pressure. When the refrigerant flows through the valve and the differential pressure of the flow is higher than the Min. opening pressure, the piston will move towards the stop face and compress the spring, then the valve will open.

Figure 5: Design and materials

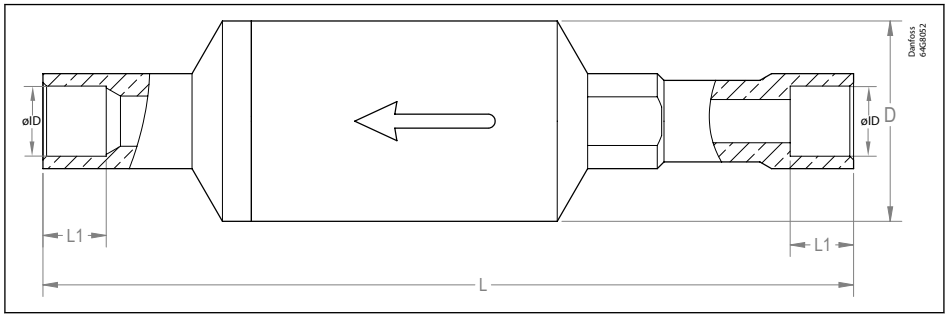


Position	Description	Material
1	Valve body	Brass
2	Piston	Brass
3	Spring	Stainless steel
4	Piston guide	Brass
5	Stop face	Brass
6	Tailpiece	Brass

Dimensions and Weights

You will find downloadable dimension drawings for individual code numbers on Danfoss store as part of the Visuals tab for individual code numbers.

Figure 6: Dimensions and Weights



SI Unit								
Type	Connection Size øID		øID tolerance	L	L1	øD	Net weight	Code no.
	[in.]	[mm]	[mm]	[mm]	[mm]	[mm]	[kg]	
NRVT 10s	3/8	9.525	+0.051/+0.152	110.5	8.6	26.4	0.2	020-6401
NRVT 10sH							0.2	020-6411
NRVT 12s	1/2	12.7		110.5	10.4	26.4	0.2	020-6402
NRVT 12sH							0.2	020-6412
NRVT 16s	5/8	15.875		132.1	12.7	34.9	0.38	020-6403
NRVT 16sH							0.39	020-6413

US Unit								
Type	Connection Size øID		øID tolerance	L	L1	øD	Net weight	Code no.
	[in.]	[mm]	[in.]	[in.]	[in.]	[in.]	[lbs]	
NRVT 10s	3/8	9.525	+0.002/+0.006	4.35	0.34	1.075	0.46	020-6401
NRVT 10sH							0.46	020-6411
NRVT 12s	1/2	12.7		4.35	0.41	1.075	0.45	020-6402
NRVT 12sH							0.45	020-6412
NRVT 16s	5/8	15.875		5.2	0.50	1.375	0.85	020-6403
NRVT 16sH							0.86	020-6413

Ordering

Table 5: Ordering

Valve type	Multi pack Code no.	Solder ODF × ODF		Kv	Cv	Min. OPD Δp				Max. working pres-sure:	Media temperature range	PED cat-egory
						Start open		Fully open				
		[in.]	[mm]	[m3/h]	[gal/min]	[bar]	[psi]	[bar]	[psi]	PS/MWP		
NRVT 10s	020-6401	3/8	-	1.1	1.3	0.02	0.29	0.19	2.76	140 bar / 2031 psig	-40 °C – 150 °C / -40 °F –302 °F	Art. 4.3
NRVT 12s	020-6402	1/2	-	2.2	2.6	0.01	0.15	0.05	0.73			
NRVT 16s	020-6403	5/8	-	3.8	4.4	0.01	0.15	0.04	0.58			
NRVT 10sH	020-6411	3/8	-	1.0	1.2	0.30	4.35	1.43	20.74			
NRVT 12sH	020-6412	1/2	-	2.1	2.4	0.20	2.90	1.00	14.50			
NRVT 16sH	020-6413	5/8	-	3.5	4.1	0.26	3.77	0.83	12.04			

NOTE:
For the sale to United states, please consult Danfoss

Certificates, declarations, and approvals

The list contains all certificates, declarations, and approvals for this product type. Individual code number may have some or all of these approvals, and certain local approvals may not appear on the list.

Some approvals may change over time. You can check the most current status at danfoss.com or contact your local Danfoss representative if you have any questions.

Certificates, declarations, and approvals

Table 6: Certificates, declarations, and approvals

File name	Document type	Document topic	Approval authority
033F4003	Manufacturers Declaration	PED	Danfoss
033F4010	Manufacturers Declaration	RoHS	Danfoss
SA7200	Mechanical - Safety Certificate	UL	UL

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