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| Safety Data Sheet(SDS) |
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Issue date: 1st December 2019

Resvised date: -

## 1. Product and company information

## Product

Product name Product No. 70-61 Kotelyzer Gas For cold regions Net 270g (Prod code LPG20°C0.30)

## Company information

Company name Nakajima Doko corporation

Address 683, Kamagata, Ranzanmachi, Saitama 355-0225 Japan (LP Gas Power Products )

10-1, Maruyama, Fujimino-City, Saitama 356-0035 Japan (Headquarter)

Dept R&amp;D

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Use of the Product Kotelyzer

## 2. Summary of hazard and harmfulness

## GHS classification

## 【Physicochemical hazard】

|   |  |
|---|--|
| Explosive   | : Not applicable for the classification                  |
| Combustible/inflammable gas                                       | : Category 1 (Symbol: Fire, Signal word: Danger)         |
| Aerosol   | : Not applicable for the classification                  |
| Burnability/oxidized gas  | : Not classified   |
| High pressure gas   | : Liquefied gas (Symbol: Gas bomb. Signal word: Warning) |
| Inflammable liquid  | : Not applicable for the classification                  |
| Combustible solid   | : Not applicable for the classification                  |
| Self-reactive chemical substance                                  | : Not applicable for the classification                  |
| Pyrophoric liquid   | : Not applicable for the classification                  |
| Pyrophoric solid  | : Not applicable for the classification                  |
| Self-heating chemical substance                                   | : Not applicable for the classification                  |
| Combustible chemical substance through the interaction with water | : Not applicable for the classification                  |
| Oxidizing liquid  | : Not applicable for the classification                  |
| Oxidizing solid   | : Not applicable for the classification                  |
| Organic peroxide  | : Not applicable for the classification                  |
| Metal corrosive substance   | : Not classified   |

## 【Adverse human health effects】

|   |                         |
|---|-------------------------|
| Acute toxicity (oral)                   | : Can not be classified |
| Acute toxicity (dermal)                 | : Can not be classified |
| Acute toxicity (inhalation: gas)        | : Class 4               |
| Acute toxicity (inhalation: vapor)      | : Can not be classified |
| Acute toxicity (inhalation: dust, mist) | : Can not be classified |
| Skin corrosion and irritation           | : Can not be classified |

|  |  |
|--|--|
| Serious damage/irritation on an eye      | : Not classified   |
| Respiratory sensitization                | : Can not be classified  |
| Skin sensitization                       | : Can not be classified  |
| Germ cell mutagenicity                   | : Can not be classified  |
| Carcinogenicity                          | : Can not be classified  |
| Reproduction toxicity                    | : Can not be classified  |
| Target organ toxicity, single exposure   | : Class 2 Heart (Symbol: Adverse human health effect, Signal word: warning)<br>Class 3 Anesthetic action (Symbol: exclamation mark, signal word: warning)<br>Not classified Respiratory tract irritation |
| Target organ toxicity, repeated exposure | : Can not be classified  |
| Aspiration harmfulness                   | : Not applicable   |

**【Environmental harmfulness】**

|                                      |                  |
|--------------------------------------|------------------|
| Aquatic environmental acute hazard   | : Not classified |
| Aquatic environmental chronic hazard | : Not classified |
| Harmfulness to the ozone layer       | : Not applicable |

**GHS label factor**

|        |   |  |  |   |  |
|--------|---|--|--|---|--|
| Symbol | : |  |  |  |  |
|--------|---|--|--|---|--|

|                                    |  |
|------------------------------------|--|
| Signal word                        | : Danger   |
| Hazard and harmfulness information | : Extremely combustible/highly inflammable gas<br>High pressure gas: Risk of the explosion if heated.<br>Harmful in case of inhalation<br>Risk of the heart disorder<br>Risk of drowsiness and dizziness |

|          |   |
|----------|---|
| Cautions | : Keep away from the ignition source like heat/spark/naked fire/hot object —<br>Non-smoking. Use only outside or at the place with good ventilation.<br>Do not inhale gas/spray.<br>In case of gas leakage fire: Don't put out a fire if a leakage can't be stopped completely.<br>Remove the ignition source if it can be handled safely.<br>If feeling bad, contact the doctor.<br>In case of inhalation: Move to the place with fresh air and take the rest in the comfortable position to take the breath easily.<br>Keeping away from the sunlight, store at the place with good ventilation. The container should be sealed.<br>Store at the place where outsider can't enter.<br>Return the used container to the business operator immediately. |
|----------|---|

|                            |   |
|----------------------------|---|
| Nations/Region information | : High pressure gas regulated by High Pressure Gas Safety Law (Article 2) and also combustible gas.<br>Liquefied petroleum gas regulated by Act on the Securing of Safety and the Optimization of |
|----------------------------|---|

Transaction of Liquefied Petroleum Gas Article 2 and also combustible gas  
 Combustible gas regulated by Industrial Safety and Health Law., Annex 1 Item 5.

### 3. Composition and ingredient information

Chemical substance•Mixture : Mixture

| Chemical name or<br>General name | Concentration or<br>Concentration range<br>(Weight%) | Official gazette<br>notification reference<br>No | CAS No  |
|----------------------------------|--|--|---|
| Propane                          | 20% or more<br>30% or less                           | (2)-3  | 74-98-6                                       |
| Normal butane<br>Isobutane       | 70% or more<br>80% or less                           | (2)-4  | Normal butane 106-97-8<br>Isobutane 75-28-5   |
| Normal pentane<br>Isopentane     | 1.9% or less (Note 1)                                | (2)-5  | Normal pentane 109-66-0<br>Isopentane 78-78-4 |

(Note 1) included number of the butane concentration

### 4. First aid measure

|  |  |
|--|--|
| In case of inhalation                            | : In case of a lot of inhalation, take the measure for a deficiency of oxygen. And have the doctor's treatment as needed.  |
| In case of skin contact                          | : Have the treatment of cold burns.  |
| In case of an eye contact                        | : Wash with fresh water sufficiently.  |
| In case of ingestion                             | : The measures for inhalation and skin contact are applied.  |
| Expectable acute symptoms                        | : The skin contact of liquefied petroleum gas causes the cold burn.  |
| The most important subtle symptoms               | : In case of inhaling the high concentrated liquefied petroleum gas, people lose consciousness at one breath. If this condition persists, people will die.   |
| Protection for a person making first aid measure | : At the place where liquefied petroleum gas is leaking or gushing out, wear the protective equipment to prevent the skin contact of liquefied petroleum gas.<br>At the place where liquefied petroleum gas is leaking or gushing out, there is the possibility that oxygen concentration is getting low, so the ventilation is required.<br>If the concentration of leaked liquefied petroleum gas in the air is from about 1.8% to 9.5%, there is the risk that ignition source will cause the explosion, so the good ventilation is required. At the outside, diffuse by sprinkling water with spray nozzle etc. in order to prevent the explosion. |
| Special caution to a doctor                      | : No information   |

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 5. Fire fighting measure

|  |   |
|--|---|
| Fire extinguishing agent                   | : Small fire: carbon dioxide, ABC or BC type powder fire extinguisher<br>Big fire: sprinkling water, spraying water   |
| Fire extinguisher which should not be used | : Straight stream water   |
| Special hazard and harmfulness             | : Extremely inflammable/highly combustible gas<br>Risk of catching a fire easily.<br>If the container is heated, there is the risk that the container will explode.   |
| Specific fire fighting method              | : Cut off the gas supply. Sprinkling water with spray nozzle, cool around and try to prevent the spread of a fire.<br>Spraying water from the windward to cool the container, put out fire.<br>In case of the fire in the periphery, move the container to the safe place.<br>The leaked gas should be diffused by spraying water etc. to prevent the explosion.<br>If the leakage of gas can be stopped, put out a fire with fire extinguisher.<br>If the leakage of gas can't be stopped, don't try to put out fire and wait the fire extinction.<br>People other than the concerned party should be evacuated to the safe place. |
| Protection for a fire fighter              | : At the fire fighting, use the respirator and the protective cloth.  |

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 6. Measure for the leakage

|   |   |
|---|---|
| Caution to a human body, protective equipment and emergency measure | : If the ignition source is within the concentration from about 1.8% to 9.5% in the air, there is the possibility of the explosion, so don't come close if the safety isn't confirmed.<br>If the leaked liquid is vaporized, the volume is 250 times and the oxygen concentration will get lowered, so the good ventilation is required to prevent the suffocation risk.<br>The direct contact of liquefied petroleum gas with the body causes the cold burns by the heat of vaporization. Use the dry leather glove as needed.<br>Use the antistatic wears, shoes and leather gloves. Use the respirator and the protective cloth as needed. |
| Caution to the environment  | : No confirmed environmental information on this substance.   |
| Containment, purification method and equipment                      | : Stop the leakage if it's not dangerous.<br>If possible, rotate the leaking container to be able to discharge in air, not in liquid.<br>Prevent the evaporation and spray water to stop the diffusion of evaporation.<br>Ground all of the instruments used to handle the leaking stuff.   |
| Preventive measure for the secondary disaster                       | : Remove the ignition source. Cut off the gas supply.<br>Stop the leakage point.<br>Because the specific gravity of liquefied petroleum gas is heavier than air, the ventilation and diffusion are required.  |

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 7. Handling and storage consideration

Handling

- Technical measure : Don't handle a container in a violent manner, such as falling etc. Except for the special use, don't use from a container directly. The pressure adjuster surely should be used.  
Using foam liquid like soap water etc., confirm that there is no leakage at a joint part, hose, plumbing and instrument.
- Local exhaust\*whole exhaust : Ventilate well to avoid the imperfect combustion.
- Safe handling precautions : Take proper measures if used at the place where the retention of a liquefied petroleum gas can be caused.  
: Liquefied petroleum gas can be explosive compounded gas mixed with air or oxygen. Pay attention carefully to the leakage. Because the explosive range in the air is at about 1.8%~9.5%, the lower explosive limit is low and the hazard is big. Because of the strong inflammable gas, don't use the fire nearby.  
De-touchable protective cap of a container should be attached except for the usage time.  
Don't consume all of gas in the container and save the residual pressure.
- Avoid a direct contact : Refer to 「10 Stability and Reactivity」.
- Storage
- Safe storage condition : The container should be kept at the good drainage, good ventilated and dry place. Avoid the direct sunshine from a container and keep the temperature below 40°C. Store at the place where outsider can't enter.  
If the container is stored at the storage area, display the label 'inflammable gas' and 'LP gas'.  
If the container storage is prepared, avoid the contact with poisonous and oxygen gas container.  
If the container storage is prepared, don't put a fire, inflammable and ignitable materials within 2 meters of the circumference of the storage except for the case that the required barrier is prepared.  
Return the used container to the business operator.
- Safe container package material : The container for the liquefied petroleum gas regulated by High Pressure Gas Control Law is required.

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8. Exposure prevention and protective measure

Allowable concentration

- Japan Society for Occupational Health (2016 May edition) : Propane Not set up  
Normal butane 500ppm (Note 1)  
Isobutane 500ppm (Note 1)  
Normal pentane 300ppm (Note 1)  
Isopentane Not set up
-

(Note 1) The average exposure concentration in 1 day should not be above this value.

American Industrial Hygiene Association  
TLV-TWA 2016 edition

: Propane Not set up

Normal butane 1000ppm (Note 2)

Isobutane 1000ppm (Note 2)

Normal pentane 1000ppm (Note 3)

Isopentane 1000ppm (Note 3)

(Note 2) Any average value of the exposure concentration for 15 minutes should not be above this value.

(Note 3) The average value of the exposure concentration for 1 day should not be above this value.

(Note 4) This value is calculated by the way that the total value of the sum of the exposure concentration and its lasting hour is divided by the total hours.

Facility measure

: Ventilate well if used inside.

At the place where there is the risk that the liquefied petroleum gas is leaked and the gas retention occurs, install the alarm system whose gas leaking alarm goes off at the below 0.5% of the gas concentration in the air (about one fourth of the lower explosive limit).

Protective equipment

Respiratory protective equipment

: Use the respirator as needed.

Hand protective equipment

: Use the dry leather glove as needed.

Eye protective equipment

: Use the protective glass as needed.

Skin and body protective equipment

: Use the cloth and helmet in accordance with the usage form as needed.

#### 9. Physical and chemical characteristics

Appearance (physical condition, shape and color etc.): Under atmospheric pressure···Gas, colorless transparent·no odor  
Inside the pressured container···Liquid ·colorless transparent

Odor: No odor

pH: No data

Chemical characteristics: As shown in the annexed table

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**10. Stability and reactivity**

|  |   |
|--|---|
| Reactivity, chemical stability           | : Stable at the normal condition.   |
| Hazard and harmfulness                   | : Highly reactive to the oxidizing agent.   |
| reactive possibility                     | Propane; highly explosive to chlorine dioxide.<br>Butane; mixed gas with nickel carbonyl and oxygen causes the explosion.                               |
| Condition to be avoided                  | : If the ignition source is within the combustible (explosion) range, the combustion and explosion will be caused. So this condition should be avoided. |
| Material to be avoided                   | : This product can be solved in alcohol and ether, and can dissolve petroleum, animals & plants oil, natural rubber.                                    |
| Incompatible material                    | : Strong oxidizer   |
| Hazard and harmful decomposition product | : The lack of enough air leads to the imperfect combustion, which generates toxic carbon monoxide.  |

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**11. Information on the harmfulness**

|   |  |
|---|--|
| Acute toxicity (inhalation: gas)                          | : Isobutane falls under Class 4. And Class 4 as the result of the calculation of the acute toxicity value and the estimated acute toxicity value of all of the ingredients.  |
| Skin corrosion and irritation                             | : Skin corrosion and irritation is 「Can not be classified」 because all of the ingredients are 「Not classified」 or 「Can not be classified」.   |
| Serious damage or irritation on an eye                    | : 「Not classified」 as the result of the calculation of the concentration of all of ingredients though Isobutane falls under 「Not classified」, Normal butane falls under 「Class 2B」 and Isopentane falls under 「Class 2」.   |
| Respiratory or skin sensitization                         | : 「Respiratory or skin sensitization」 is 「Can not be classified」 because all of the ingredients is 「Can not be classified」.  |
| Germ cell mutagenicity                                    | : 「Germ cell mutagenicity」 is 「Can not be classified」 because all of the ingredients is 「Can not be classified」.   |
| Carcinogenicity   | : 「Carcinogenicity」 is 「Can not be classified」 because all of the ingredients is 「Can not be classified」.  |
| Toxic to reproduction                                     | : 「Toxic to reproduction」 is 「Can not be classified」 because all of the ingredients is 「Can not be classified」.  |
| Special target organ systemic toxicity, single exposure   | : Isobutane falls under 「Class 2 (heart)」. And 「Class 2 (heart)」 as the result of the calculation of the concentration limit of all of the ingredients.<br>All of the ingredients falls under 「Class 3 (anesthetic action)」.<br>Though normal pentane and isopentane falls under 「Class 3 (respiratory irritation)」, 「Not classified」 as the result of the calculation of the concentration of all of ingredients. |
| Special target organ systemic toxicity, repeated exposure | : 「Special target organ systemic toxicity」 is 「Can not be classified」 because all of ingredients is 「Can not be classified」.   |
| Aspiration harmfulness                                    | : Normal pentane and isopentane falls under 「Class 1」. But the aspiration harmfulness is the regulation of the harmfulness of the liquid or individual   |

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accidental aspiration, so liquefied petroleum gas is not applicable.

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## 12. Environmental influence

information

Aquatic environmental acute harmfulness : Normal pentane and isopentane falls under 「Class 2」, but 「not classified」 as the result of calculation of concentration of all of ingredients.

Aquatic environmental chronic harmfulness : Isopentane falls under 「Class 2」, but 「not classified」 as the result of calculation of concentration of all of ingredients.

Harmfulness to ozone layer : Because no substances regulated by Appendix A to E in Montreal Protocol are included, so 「Not applicable」.

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## 13. Disposal consideration

Residual waste

: Don't discharge in liquid in the air.

If the product is necessarily discharged in gas, do it gradually at the good ventilated outside where there is nothing to start a fire, confirming that the concentration on the ground is less than 0.5%.

The disposal shouldn't be done with the container.

Contaminated container and package

: The vacant and not-necessary container should be returned to the distributor.

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## 14. Transportation consideration

International regulations

UN No

: 1965

English name

: HYDROCARBON GAS MIXTURE, LIQUIFIED, N, O, S

UN harmful and hazard class

: 2.1

Secondary class

: -

Sea pollutant

: Not applicable

Sea regulation information

: Comply with IMO (International Maritime Organization).

Air regulation information

: Comply with ICAO (International Civil Aviation Organization) and IATA (International Air Transport Association)

Domestic regulation

Land regulation information

: Comply with High Pressure Gas Control Law and Road Traffic Law.

Sea regulation information

: Comply with Ship Safety Law and Act on Port Regulation.

Air regulation information

: Comply with Civil Aeronautics Law.



Specific safety measures and conditions : Avoid falling, dropping, shocking the container.  
 for transportation Take temperature-rise preventive measures to keep the temperature of the container below 40°C.  
 If the container is transported by a vehicle, the sign of 'High Pressure Gas' should be displayed at the place easily to recognize and must carry a fire extinguisher and disaster-prevention tools. And carry 'Yellow Card'.

## 15. Applicable law

| Law  | Main items  |
|--|---|
| Industrial Safety and Health Law   | Harmful material whose product name should be displayed on the container (Article 57)   |
|  | Harmful material whose product name etc. should be notified (Article 57-2)  |
|  | Issue of the document etc. (Article 57-2)   |
|  | Research etc. which the business operator should do regarding to the stuff and notifiable object regulated by the government ordinance (Article 57-3)   |
|  | Hazard stuff•combustible gas (Enforcement order Annexed table Article1 Item5)   |
| High Pressure Gas Control Law  | High pressure gas (Article2 Item3)  |
|  | Combustible gas (Security Regulation for General High-Pressure Gas (Article2 Item1)   |
|  | Container storage place and container etc. for filling.<br>(Liquefied petroleum gas safety regulation Article 6, Clause 2 Item 7)                       |
|  | Security measure related with the movement and technical standard<br>(Liquefied petroleum gas safety regulation Article47, 48, 49)                      |
| Act on the Securing of Safety and the Optimization of Transaction of Liquefied Petroleum Gas | Liquefied Petroleum Gas (Law Article2)  |
| Ship Safety Law  | High Pressure Gas<br>Regulations for the carriage and storage of dangerous goods in ship Article2, Article3<br>Notification of hazard material Annexed1 |
| Air Safety Law   | High Pressure Gas<br>(Ordinance for Enforcement of Aviation Law Article194 Hazard stuff Annexed1)   |

## 16. Other information

## Reference

1. Training text (revised edition) about MSDS manual for compound substance(chemical substance) corresponding to GHS, Japan Industrial Safety and Health Association
2. Japan Industrial Safety and Health Association, Japan Advanced Information Center of Safety and Health  
<http://www.jaish.gr.jp/>
3. GHS classification manual issued at 2006. Feb. 10th, GHS concerned government agency liaison conference version
4. International Chemical Safety Card(ICSC) Japanese version, National Institute of Health Sciences (NIHS)
5. Ministry of Health, Labor and Welfare, <http://anzeninfo.mhlw.go.jp/index.html>
6. Global Harmonized System of Classification and Labeling of Chemicals (GHS) revised 4<sup>th</sup> edition, the United Nations (translated by Ministry of Economy, Trade and Industry)
7. JIS Z 7253:2012「Method of communication on chemical hazardous based on GHS—Label, display at the workplace and safety sheet SDS」, Japanese Standard Association
8. JIS Z 7252:2014「Chemical substance classification method based on GHS」, Japanese Standard Association

Safety Data Sheet provides the information as the reference to secure the safety handling regarding the hazard and harmful chemical substance with the business operator. The business operator should use this SDS as the reference understanding that the proper measure according to the individual handling record should be taken under the user's responsibility. So this SDS itself is not the guarantee of the safety.

(Annexed table) Physical characteristics

| Chemical name                                    | Propane  | Normal butane                                    | Iobutane   | Normal pentane                                   | Isopentane                                       |
|--|--|--|--|--|--|
| Melting*Freezing point                           | -189.7°C   | -138°C   | -159.4°C   | -129.67°C<br>(Melting point)                     | -159.9°C   |
| Boiling, initial boiling point and boiling range | -42°C<br>(Boiling point)                         | -0.5°C   | -11.7°C  | 36.06°C  | 27.8°C   |
| Ignition point                                   | -104°C   | -60°C<br>(Sealed)                                | <-56°C   | -40°C  | <-51°C<br>(Sealed)                               |
| Combustion range<br>(Explosive range)            | Lower limit<br>2.1vol%<br>Upper limit<br>9.5vol% | Lower limit<br>1.8vol%<br>Upper limit<br>8.4vol% | Lower limit<br>1.8vol%<br>Upper limit<br>8.4vol% | Lower limit<br>1.4vol%<br>Upper limit<br>8.0vol% | Lower limit<br>1.4vol%<br>Upper limit<br>7.6vol% |
| Vapor pressure (40°C)                            | 840kPa(20°C)                                     | 213.7kPa<br>(21.1°C)                             | 348kPa   | 53.3kPa<br>(18.5°C)                              | 79kPa<br>(20°C)                                  |
| Specific gravity of Gas<br>(Air=1)               | 1.6  | 2.1  | 2.01   | 2.5  | 2.5  |
| Specific gravity of liquid<br>(Density)          | 0.5853<br>(-45°C/4°C)                            | 0.6  | 0.551(25°C)                                      | 0.62638<br>(20°C/4°C)                            | 0.6  |

## GHSL30E-F-5

|  |                           |               |              |                          |                           |
|--|---------------------------|---------------|--------------|--------------------------|---------------------------|
| Solubility   | 62.4mg/L<br>(25°C, water) | 61mg/L (20°C) | 53.5mg/L     | 360mg/L<br>(16°C, water) | 48.0mg/L<br>(25°C, water) |
| n-Octanol/<br>Water partition coefficient<br>(log Pow) | Log Pow=2.36              | Log Pow=2.89  | Log Pow=2.76 | Log Pow=2.36             | Low Pow=2.30              |
| Natural ignition<br>temperature                        | 450°C                     | 365°C         | 460°C        | 260°C                    | 420°C                     |
| Other data (Molecular<br>weight)                       | 44.1                      | 58.1          | 58.1         | 72.15                    | 72.15                     |