

Contributing to a sustainable future mobility society

Introduction of e-Mobily-related products

Att. No.382E 12-2025



The NOK Group contributes to an electrified society

NOK is Japan's first oil seal manufacturer.

NOK's advanced technology

The functional parts of NOK produced are:
used in automobiles, housing equipment,
and other equipment to support society.

Backed by NOK's technology

We provide products based on
sealing technology and polymer blend
processing technology.

We will also develop technologies
in a timely manner.

We will contribute to higher functionality
and performance by developing new items
with a view to the future.

We aim to contribute to
the future mobility society.



MEKTEC CORPORATION
FLEXIBLE PRINTED CIRCUITS



EAGLE INDUSTRY CO., LTD.
MECHANICAL SEALS PRODUCTS



NOK KLUBER CO., LTD
SPECIAL LUBRICANTS



UNIMATEC CO., LTD.
SYNTHETIC RUBBER, FINE CHEMICALS

The automotive industry is undergoing major changes toward a carbon-neutral, electrified society.

Environmental issues currently occurring on a global scale

- Global warming due to CO₂ emissions and rising sea levels
- Air pollution
- Depletion of natural resources and energy issues etc.



• Sustainable development
• SDG s
• Carbon neutrality



• Strengthening of regulations in various countries that are environmentally friendly
• Favorable treatment for EV vehicles
• Utilization of next-generation energy



• Technological innovation
• CASE

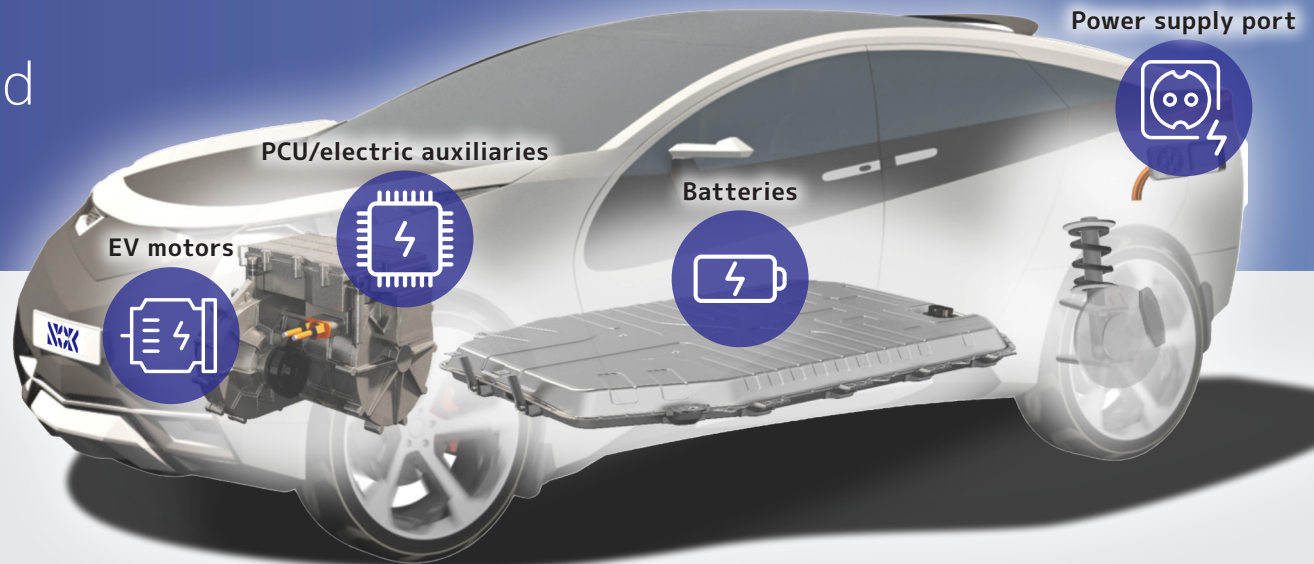
▶ 100 year period of major change

Challenges in electrification

	Issues in electrification	NOK solutions
EV	<ul style="list-style-type: none"> ■ Support for high-speed motor rotation ■ Smaller and lighter batteries ■ Battery safety ■ Thermal management ■ Corresponding to shaft voltage ■ Further quietness 	<ul style="list-style-type: none"> ⇒ High-speed rotary oil seal ⇒ FPC for voltage monitoring system ⇒ Flame-retardant rubber, explosion-proof valve ⇒ Heat conduction member ⇒ Conductive seal ⇒ Vibration and sound isolation technologies
FCV	<ul style="list-style-type: none"> ■ Can be used in hydrogen environments ■ Improved durability ■ Improved power generation efficiency ■ Improved productivity 	<ul style="list-style-type: none"> ⇒ Hydrogen-resistant rubber and grease ⇒ Low-elution materials ⇒ Humidification membrane module ⇒ Fuel cell gasket

To solve various electrification issues
NOK's advanced technology will provide the best solution

In the e-Mobility field Main products



PLAY MOVIE ▶

"The NOK for e-Mobility"



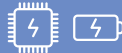
Support for low friction and high peripheral speed



- ▶ [Low-friction oil seal](#)
- ▶ [self-lubricating rubber](#)
- ▶ [High-speed rotary oil seal](#)



Anti-Vibration/
Soundproofing



- ▶ [High-Performance Anti-Vibration Rubber](#)



Space saving and weight reduction



- ▶ [Space-saving rubber-bonded gaskets](#)
- ▶ [Multichannel switching valve seal](#)
- ▶ [Automotive FPC](#)



Heat Insulation/
Flame Retardation



- ▶ [flame retardant rubber](#)
- ▶ [Flame Retardant Insulating Rubber](#)



Displacement
Absorption



- ▶ [cushion rubber](#)
- ▶ [Pipe fitting seal \(pipe connector seal\)](#)



Measures Against Electromagnetic Noise and Electrocorrosion



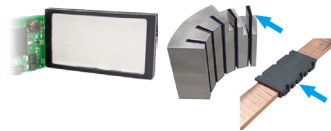
- ▶ [Conductive Ring](#)



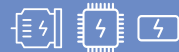
Thermal Conduction



- ▶ [Thermally conductive material](#)



Salt compatible



- ▶ [Aluminum anti-corrosion seal and grease](#)
- ▶ [Aluminum anti-corrosion coated seal](#)



Pressure adjustment and explosion proof



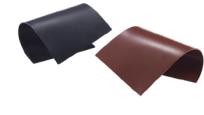
- ▶ [Pressure control valve series](#)



High voltage compatible



- ▶ [Tracking Resistant Rubber](#)



Low Friction

Low Friction Technology

- ▶ Reduces friction and sliding heat, resulting in low fuel consumption and electricity costs



Contributes to the global environment with low friction technology

Four friction reduction technologies

Shape design technology

Material design technology

Surface function design technology

Grease technology



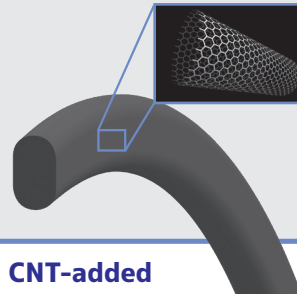
Oil seal

For rotating parts such as motors
Reduces friction loss while maintaining sealing performance!



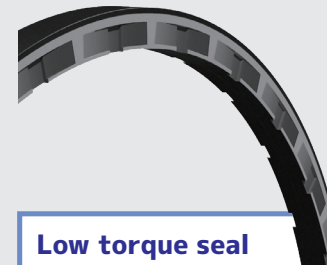
Thin film surface treated O-ring

Achieves smooth insertion during O-ring assembly!
In addition, reduces machine downtime!



CNT-added Oval ring

Sealing performance is maintained under high-pressure reciprocating environments in hydraulic circuits. Friction loss is reduced!



Low torque seal ring for rotation

Maintains hydraulic pressure at the rotating part in the hydraulic circuit
Reduces friction loss!



Rotating and rocking rod seals

Friction loss is reduced while sealing performance is maintained in rotating and swinging parts under high pressure!

Low Friction

Self-lubricating rubber

- Reduces friction in harsh lubrication environments, contributing to energy conservation, low fuel consumption, and low electricity costs

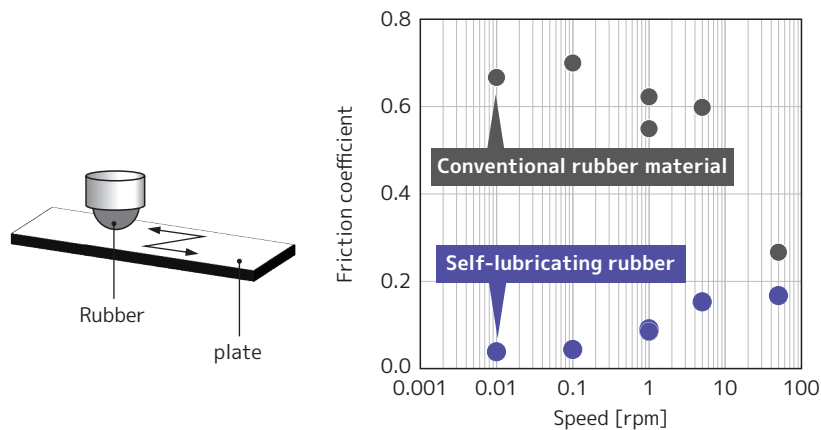


EV Motor

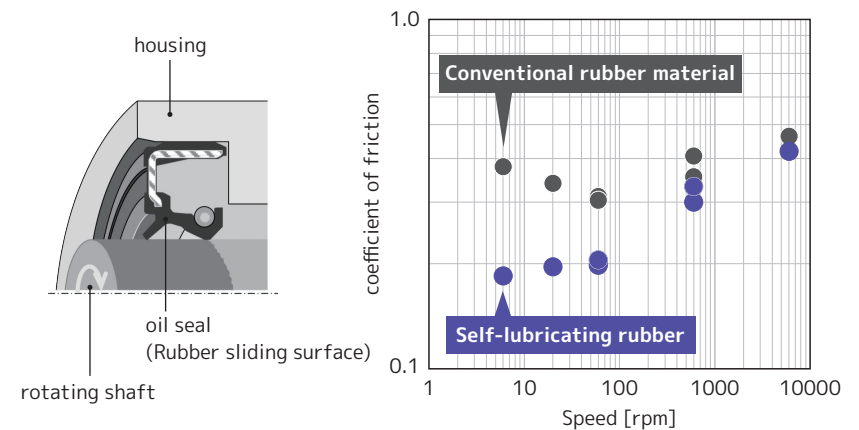
Lubricating oil is maintained at the sliding surface by incorporating rubber.

According to the results of each friction test of conventional rubber material and self-lubricating rubber, self-lubricating rubber suppresses the rise of friction

Pin-on-plate test (reciprocating motion)



Oil seal shape test (rotation)



Support for high peripheral speeds

High-speed rotary oil seal

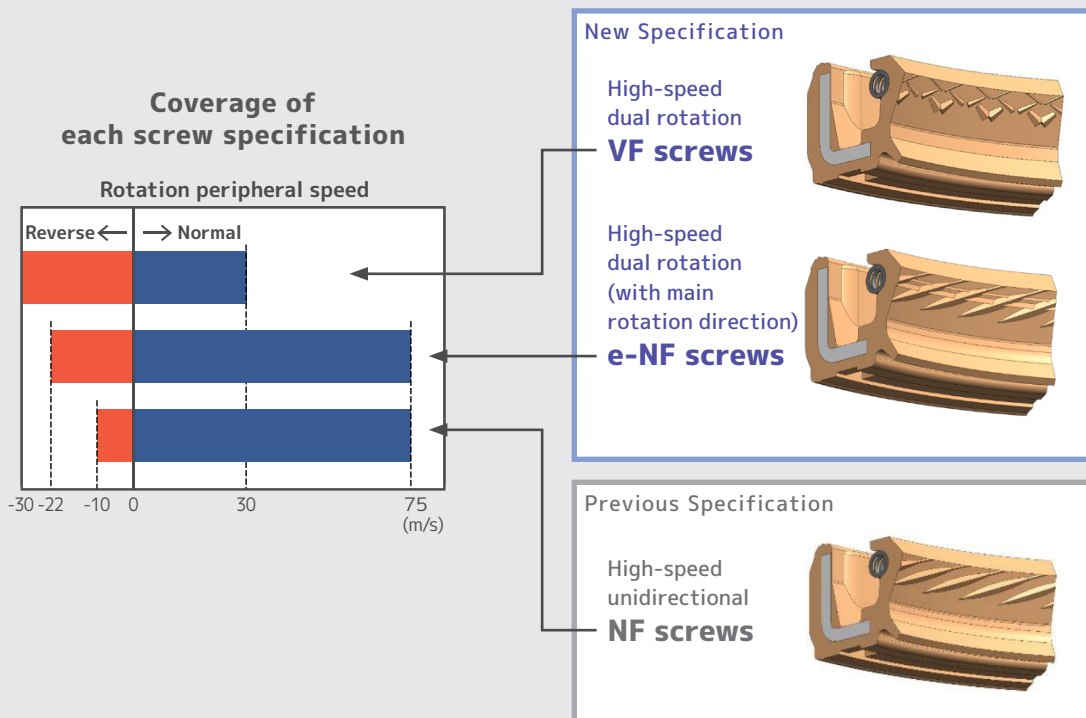
- Support for high speed, normal/reverse rotation Contributes to low fuel consumption and cost



EV Motor

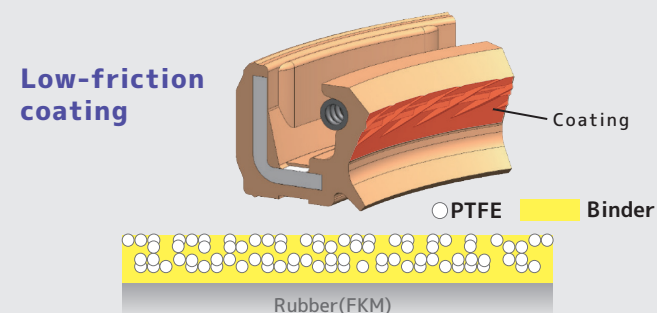
Supports high-speed forward and reverse rotation

New specification VF screws and e-NF screws ensure peripheral speed even in reverse rotation

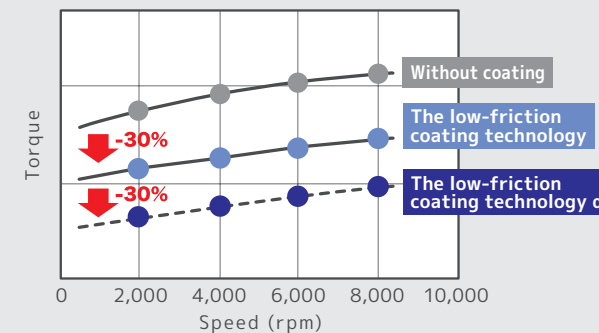


Supports low fuel consumption and electricity costs

Reduces friction and sliding heat by adding low-friction coating



Torque test with and without coating



Measures against electromagnetic noise and electric corrosion

Conductive ring

- ▶ Space saving and cost reduction (compared to conventional structure)

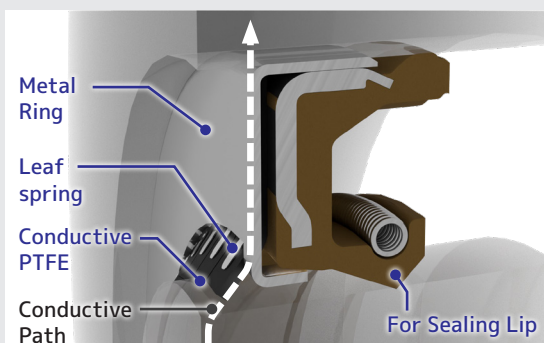


EV Motor

Noise and electric corrosion suppression

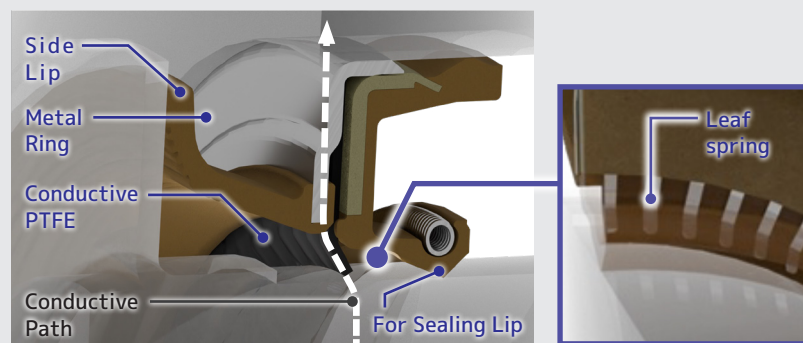
Conducting the shaft and housing to suppress electromagnetic noise and electric corrosion of the bearing due to electrification of the motor drive shaft

Oil Seal + Conductive PTFE



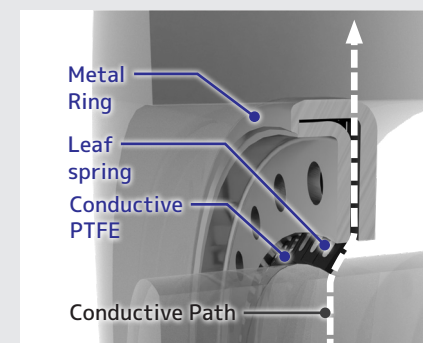
- Integrated oil seal
- Low resistance

Differential Side Oil Seal + Conductive PTFE



- Integrated oil seal
- Space saving
- Low resistance

Conductive PTFE



- Can be used in oil environment
- Low resistance

Can be used in both oil and dry environments

Countermeasures against salt damage

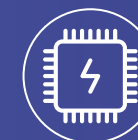
Gasket grease that enhances salt water corrosion resistance of aluminum casing seal surface

Aluminum anti-corrosion seal and grease

► Reduces cost and man-hours compared to existing rust prevention treatments



EV Motor



PCU/
Electric Auxiliary
Devices



Batteries

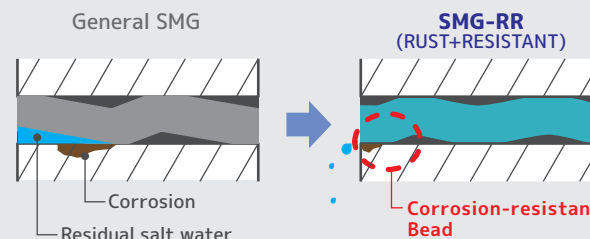
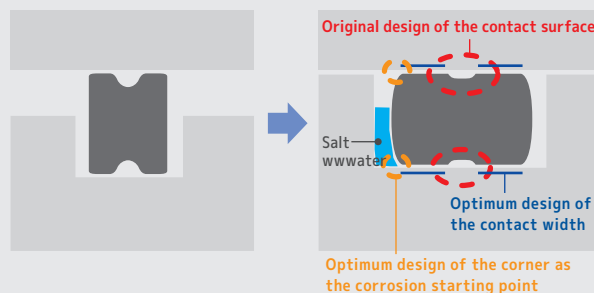
Seal for Anti-corrosive seal & grease for aluminum parts



Anti-corrosive seal & grease
for aluminum parts rubber gasket



Anti-corrosive seal & grease
for aluminum parts Rubber-coated metal gaskets



Longer life of the unit is achieved by a shape design that extends corrosion life

Grease for Anti-corrosive seal & grease for aluminum parts

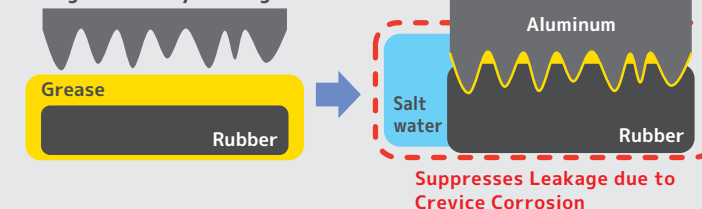


KLÜBERGREASE LFT 71-402
For NBR/HNBR/ACM

NOXLUB AU 0710
For EPDM/VMQ/FKM



Leakage control by seal + grease



Anti-corrosive seal & grease for aluminum parts
can be used in combination with various gaskets
to further suppress crevice corrosion of aluminum

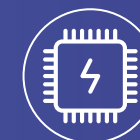
Response to salt damage

Aluminum anti-corrosion coated seal

► Additional coating for unique cross section further improves salt water corrosion resistance



EV Motor



PCU/
Electric Auxiliary
Devices



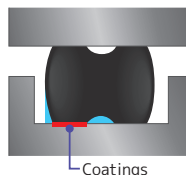
Batteries



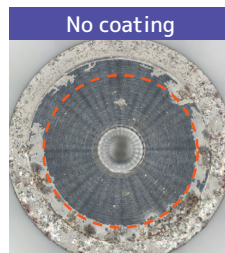
Rubber gasket
for aluminum corrosion protection

Comparison of saltwater corrosion resistance

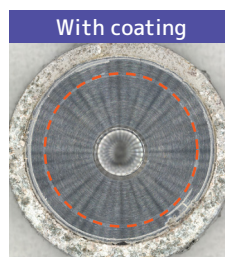
By coating
Achieves about 3.4 times
saltwater corrosion resistance



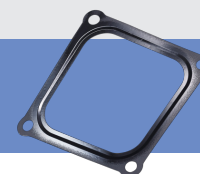
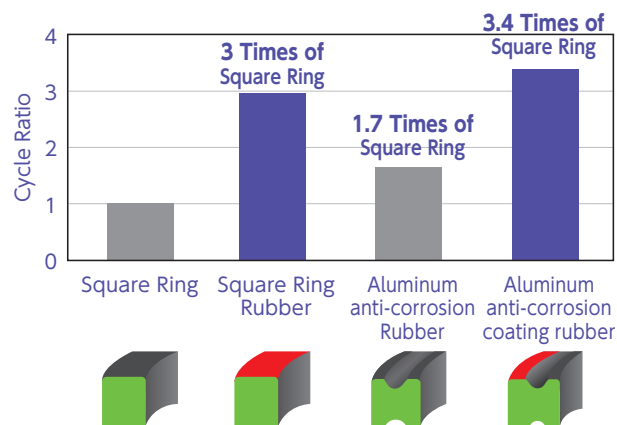
Coatings



No coating



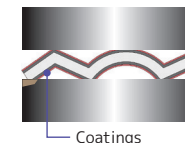
With coating



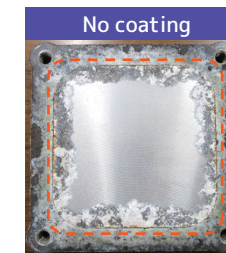
Rubber-coated metal gaskets
for Aluminum Corrosion Protection

Comparison of saltwater corrosion resistance

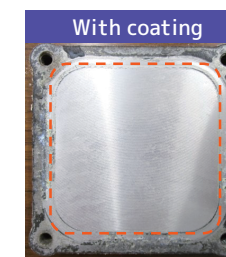
By coating
Achieved about 3.8 times
saltwater corrosion resistance



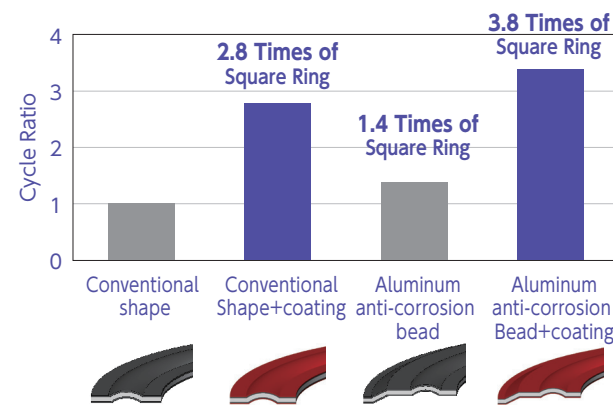
Coatings



No coating



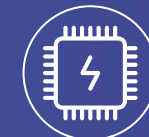
With coating



Space-saving and lightweight

Space-saving rubber-bonded gaskets

► Space saving compared to conventional design

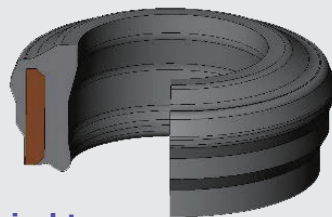


PCU/
Electric Auxiliary
Devices



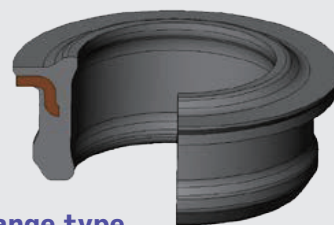
Batteries

Bonded gasket capable of reducing size and weight of unit



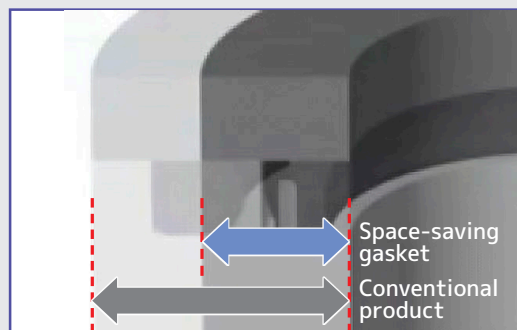
Cylindrical type

Patent No. 6502318



Flange type

Patent No. 6591569



Space and total cost reduction without compromising sealing performance

Realization of low fuel consumption

Weight reduction

Change in
housing material

Compact design

Thermal management

Energy management

Mechanical resistance
loss reduction

Conflicting

Variance and
Creep
Follow-up
Expansion

Small section
design

Thermal management

High-pressure seal

Low reaction force

Distinguishing between
front and back

Countermeasures against
contamination

Insertion



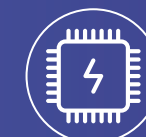
Compatibility

Expected characteristics of bonded gaskets

Space-saving and lightweight

Multichannel switching valve seal

- ▶ Miniaturization of unit by combining sealing performance and low torque



PCU/
Electric Auxiliary
Devices

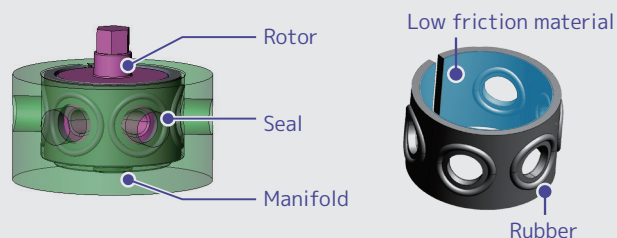


Batteries

Proposed optimal seal products for multi-channel switching valves

- PTFE (Fluororesin) and rubber molded integrally
- Offered products tailored to cooling modules
- NOK's proprietary analysis technology provides optimum seal structure

Roller Type



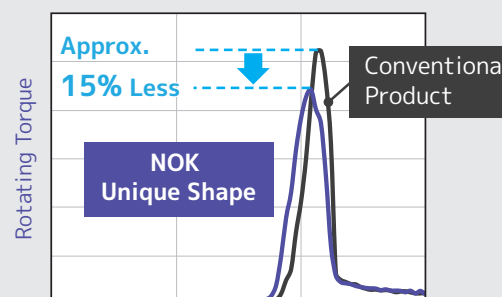
Disk Type



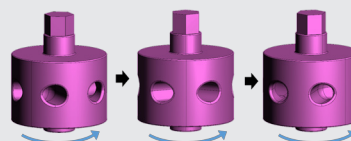
Unique shape achieves high seal performance and low torque, contributing to unit miniaturization

Torque performance

- Approximately 10% reduction in torque compared to conventional products
- Contributes to unit miniaturization

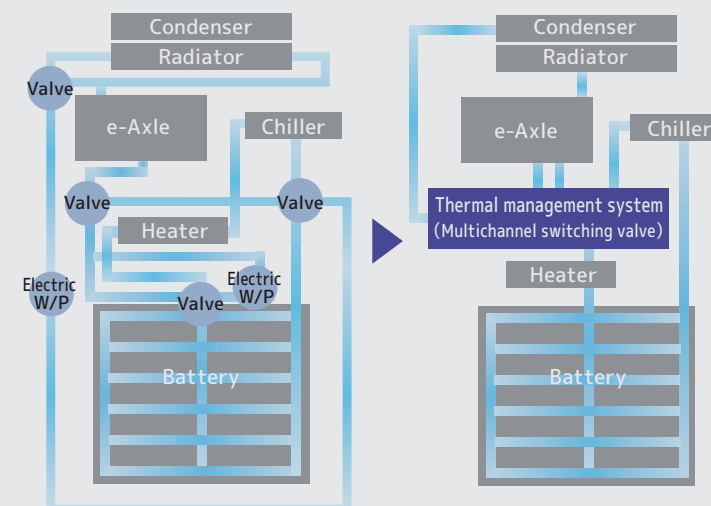


Rotating Position



Example of thermal management system

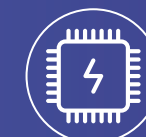
- Space saving and weight reduction by reducing piping, valves, and W/P
- Limited heat energy can be used without waste



Space-saving and lightweight

Automotive FPC

- ▶ Space saving compared to conventional design, FPC connection contributes to miniaturization of case



PCU/
Electric Auxiliary
Devices

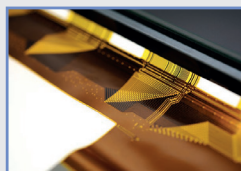


Batteries

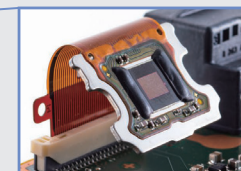
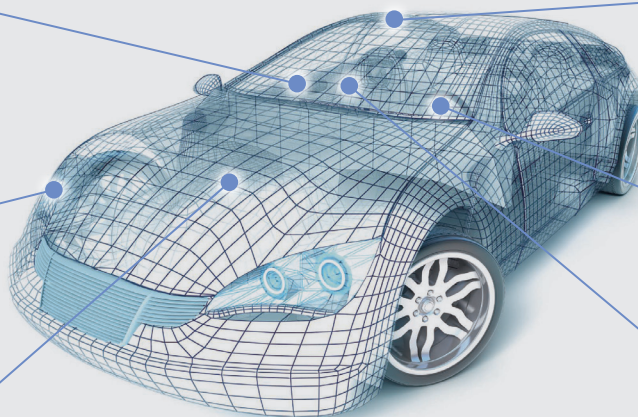
Thin, light and durable flexible printed circuit boards (FPC)



INFOTAINMENT



For LCD connection



For image sensors



SENSOR



LIGHTING



For daytime running lights



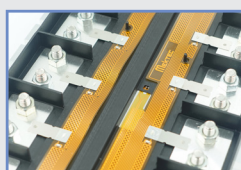
For column switches



SWITCHES



POWERTRAIN



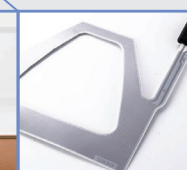
For battery voltage
monitoring



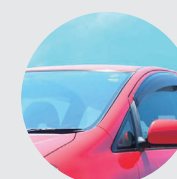
High heat resistance and
high current FPC



For window
connectors



For camera heaters



OTHERS

Total cost reduction
Integrated board and wiring



Weight
reduction

High heat
resistance

Space saving

Three-dimensional
wiring

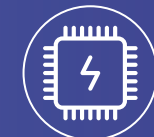
Improved
reliability

Component
mounting

Vibration and soundproofing

High-performance vibration-proof rubber

► Reduction of sound and vibration caused by e-Mobility



PCU/
Electric Auxiliary
Devices



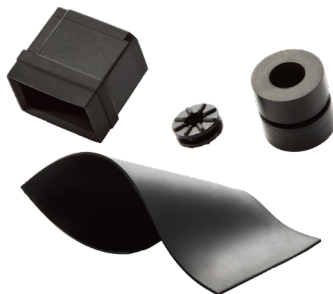
Batteries

Providing optimal NVH solutions to solve vibration and noise problems

NOK's 3 proprietary technologies

Optimal shape design technology

Designing and proposing optimal product shapes based on a wide range of vibration and soundproofing technologies



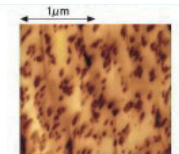
High-performance rubber material technology

We offer a wide range of materials, including High damping rubber, which has excellent damping performance

Submicron range



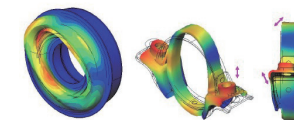
Design of rubber properties



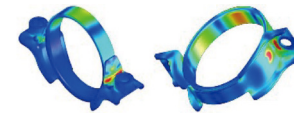
Optimal shape design technology

Designing and proposing optimal product shapes based on a wide range of vibration and soundproofing technologies

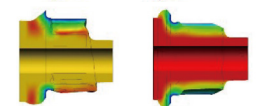
Eigenvalue analysis



Stress analysis



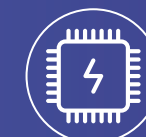
Prediction of spring characteristics



Displacement Absorption

Large deformation cushioning rubber **cushion rubber**

► Achieves both large deformation and low reaction force

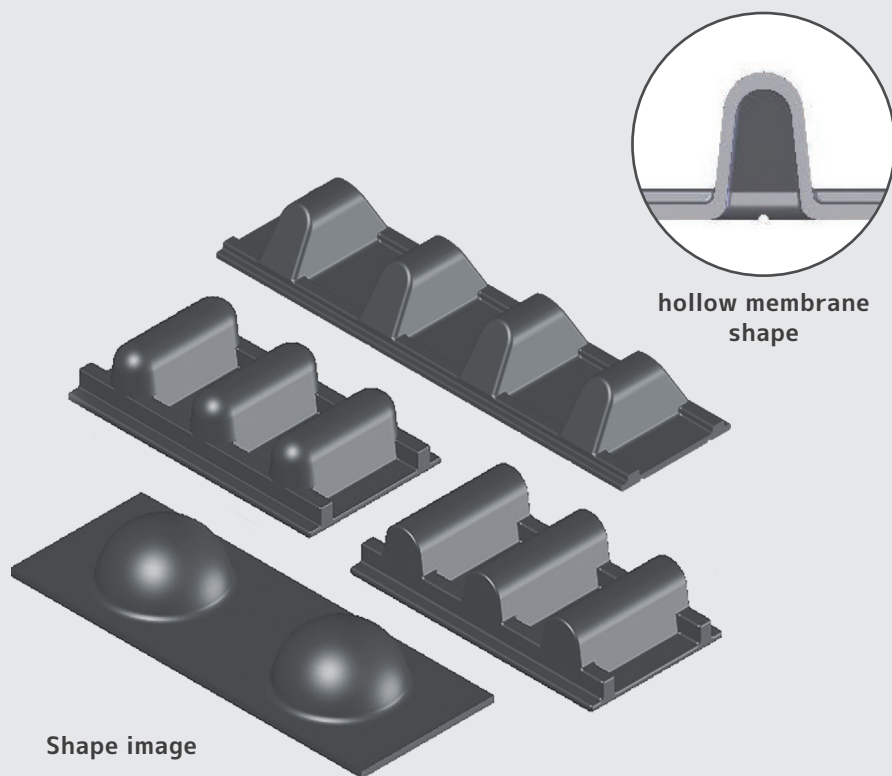


PCU/
Electric Auxiliary
Devices

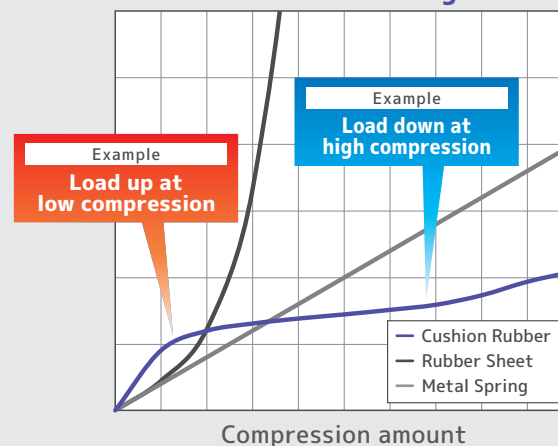


Batteries

Cushioning material with hollow structure that fills gaps between units and prevents rattling



Load characteristics image



NOK's technological superiority points ○: Excellent, △: Fair, ×: Poor

Features	Rubber sheet	Metal spring	Sponge	Cushion Rubber
① Large Deformation	×	○	○	○
② Low Reaction Force	×	○	○	○
③ Load Control	△	△	△	○
④ ①②③ Combination	×	×	△	○

Displacement Absorption

Pipe fitting seal (pipe connector seal)

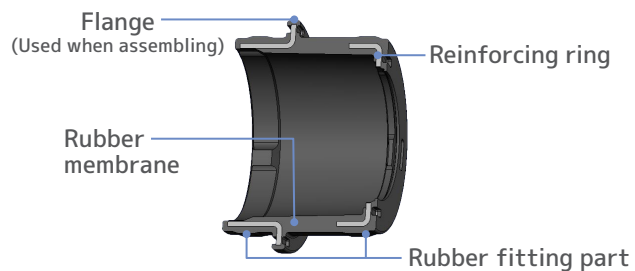
- Seals specialized for eccentricity following between piping



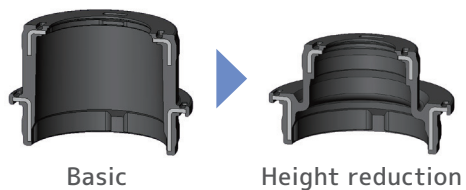
EV Motor

Since it is an integrated molded product, it can be mounted simply by press-fitting into the joint of eccentric piping.

Integral molding structure of rubber and metal tube

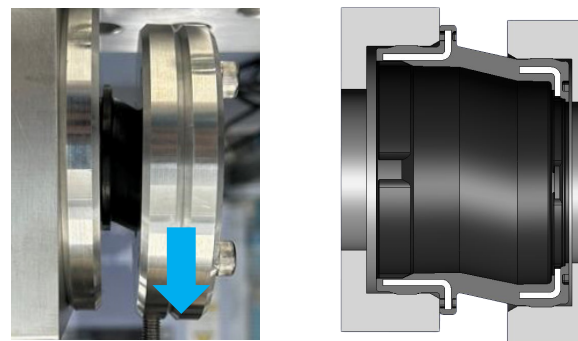


Can be customized to meet your needs



Evaluation of eccentricity followability

Evaluation of leakage pressure when internal pressure is applied with eccentricity. No leakage even at 0.5 MPa air pressure and 5 mm eccentricity.

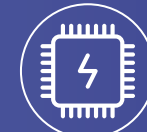


Improvement of seal reliability with rubber fitting design technology equivalent to oil seals

Heat conduction

Thermally conductive material

- Thermal management component that efficiently transmits heat with original concept




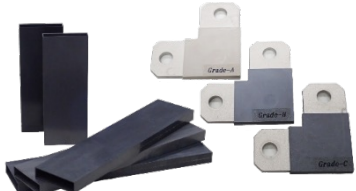
PCU/
Electric Auxiliary
Devices

Batteries

Power Supply
Port

「QLEASE」series

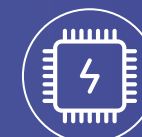
New concept heat conduction member that differs from conventional heat dissipation sheets by improving heat transfer and adhesion. Utilizing NOK's technology accumulated over the years, the heat is efficiently transmitted by eliminating the insulation layer of air between the heat source and heat dissipation member as much as possible.

	Thermally conductive material			
	Rubber type	Clay Type	Cross Type	Resin Type
Schematic				
Hardness	Medium Hardness *Durometer A60	Soft (Low)	Soft & Hard (Low)	Hard (High) *Rockwell R110
Thermal conductivity	+	+++	++	++++
Degree of adhesion (integral molding)	++(+++)	+++	+++	+(++)
Handle ability	+++	++	+++	+++
Heat resistance	+	++	++	+++

Heat conduction

Clay-like thermally conductive material

- Fits freely in complex and uneven spaces to achieve a high heat dissipation effect



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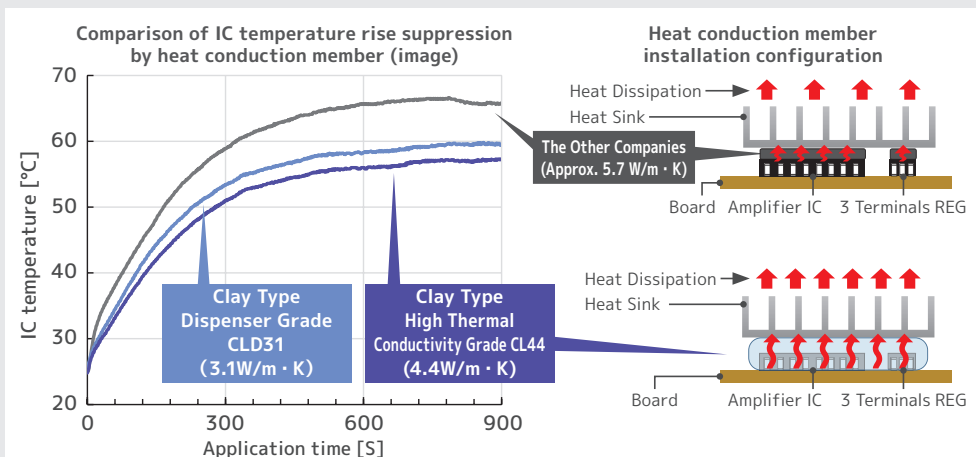
Batteries



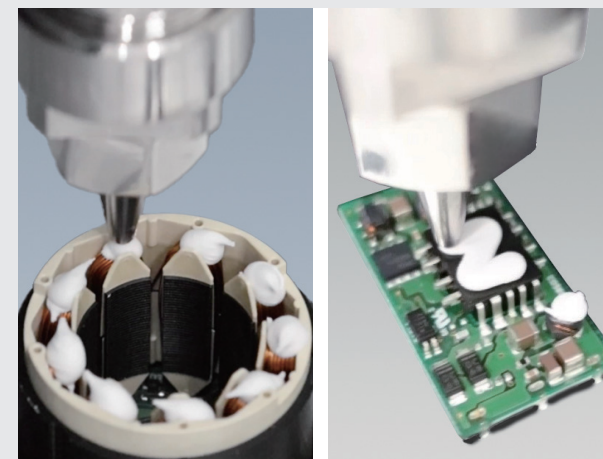
Power Supply
Port

Soft clay type, available in three grades according to application

High heat conduction grade for parts requiring higher heat dissipation



Dispenser grade contributing to automation



Item		Product grade	
		Dispenser Grade CLD31 (Developed Product)	High Thermal Conductivity Grade CL 44 (Developed Product)
Hardness (unworked penetration)		220	120
Thermal Conductivity	W/m · K	3.1	4.4
Dielectric Breakdown Strength (AC)	kV/mm	4.5	8.4
Low-Molecule Siloxane (D3 to D10)	ppm	56	44

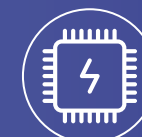
*Clay-like thermally conductive material complies with REACH regulations and complies with the RoHS Directive.

*CL44 and CLD31 are products under development. Specifications are subject to change without notice.

Heat conduction

Thermally conductive rubber

- High Heat Dissipation Effect
Achieved with Rubber Shaped Along Heating Element



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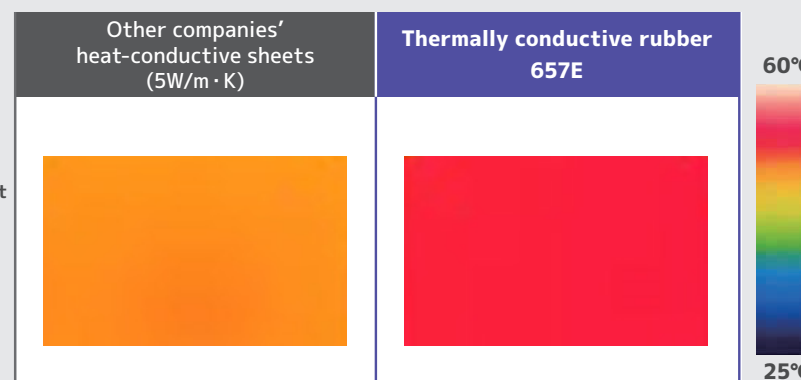
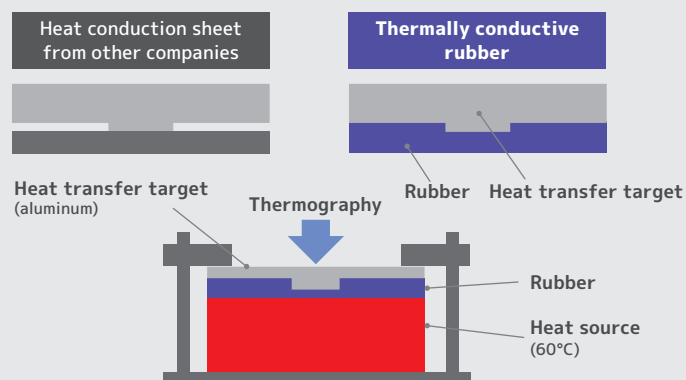
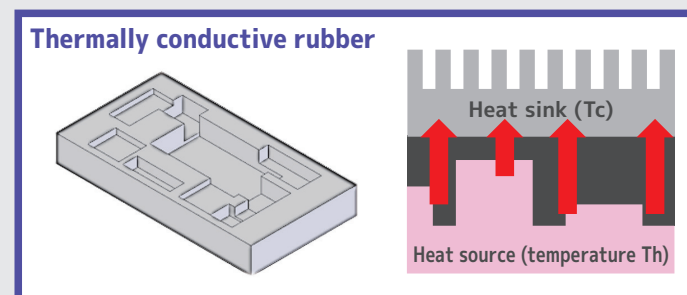
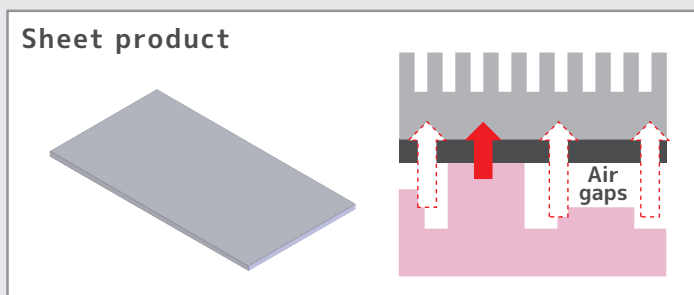


Batteries



Power Supply
Port

High heat dissipation effect achieved by eliminating air gaps with rubber shaped along the heating element

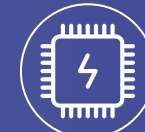


Temperature distribution 90 seconds after setting

Heat conduction

Hybrid thermal conductive material

- Handlability and heat dissipation at the same time, excellent workability and automation are possible



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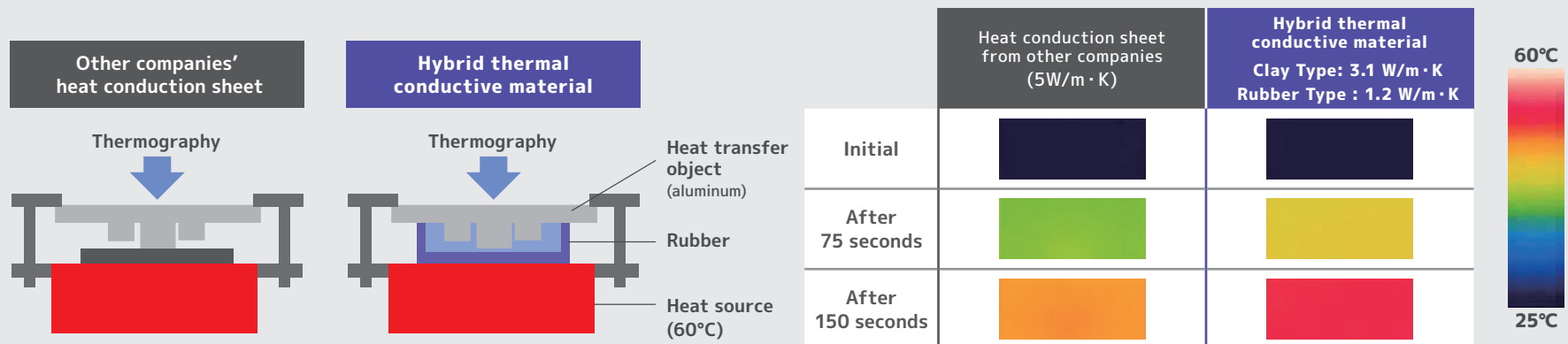
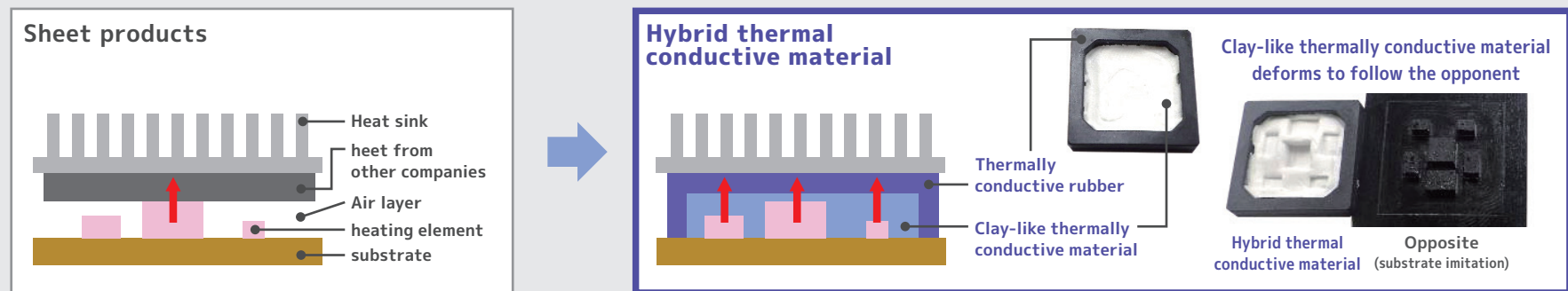


Batteries



Power Supply
Port

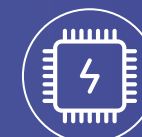
The heating element is gently wrapped in clay and surrounded by heat-conducting rubber.



Heat conduction

Thermally conductive insulating resin

- High heat dissipation and high heat resistance contribute to weight reduction by replacing metal parts



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Devices



Batteries



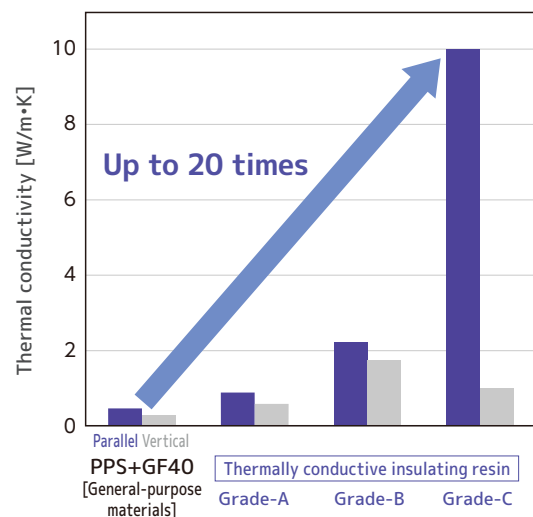
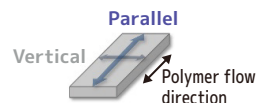
Power Supply
Port

Can be molded with high precision, has high heat resistance, and can be used continuously at up to 220°C.

Thermal conductivity

【Measurement conditions】

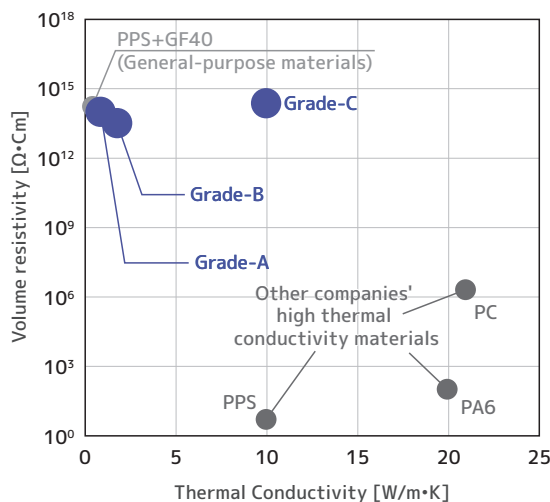
- Method : ISO 22007-02 compliant
- Temperature : 23°C



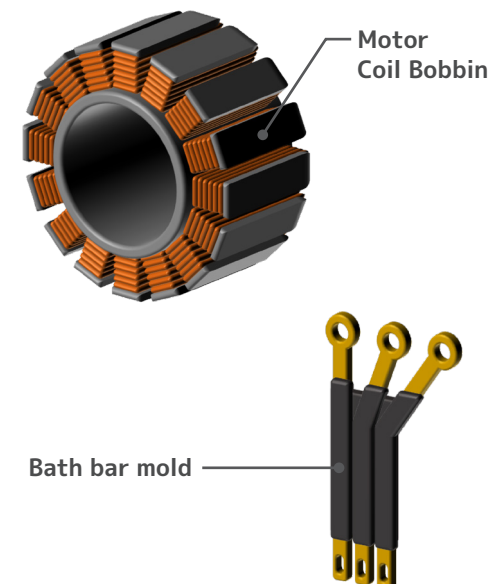
Volume low efficiency

【Measurement conditions】

- Method : ASTM D257
- Thermally conductive insulating resin Grade-A, Grade-B, Grade-C only



Example applications



Pressure control and explosion-proof

Pressure control valve series

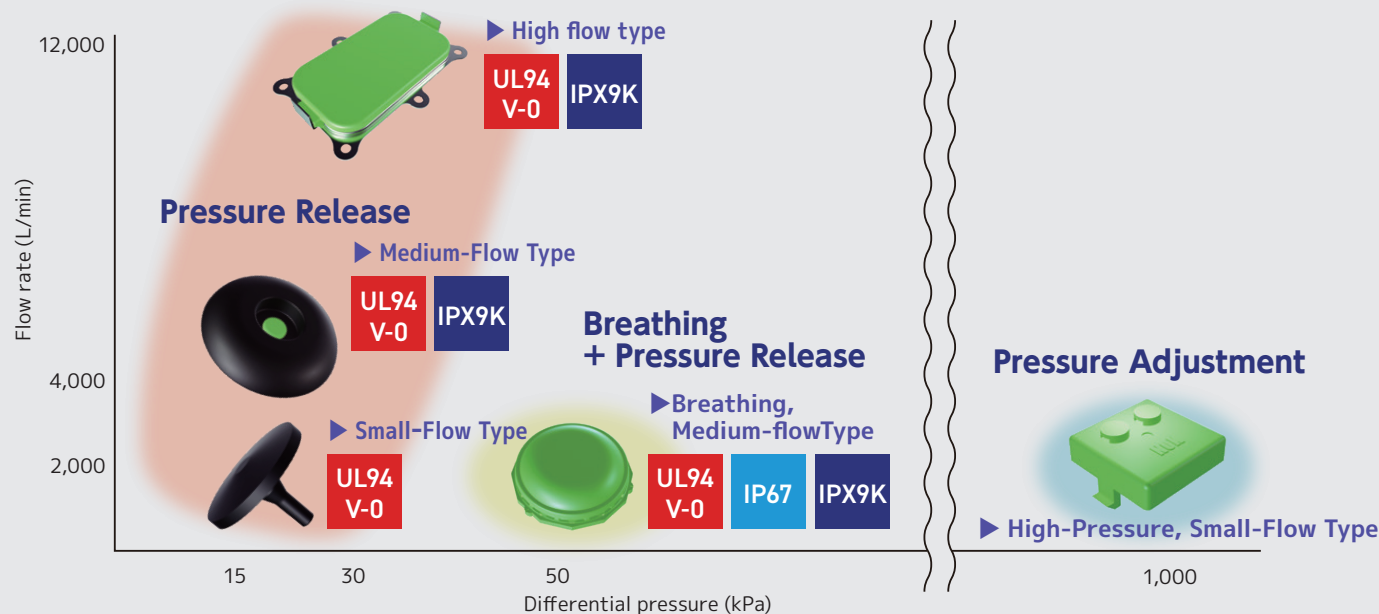
- ▶ A lineup of 5 types that can be selected according to valve opening pressure, flow rate, and application



Batteries

By attaching to the EV battery case

When a large amount of gas is generated due to thermal runaway in the battery, an appropriate amount of gas is released to the outside



Pressure control and explosion-proof

Pressure control valve **Small-flow type**

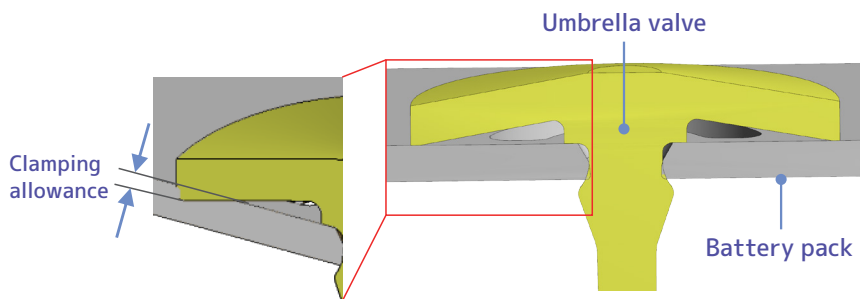
► Simple structure with only rubber valve opening



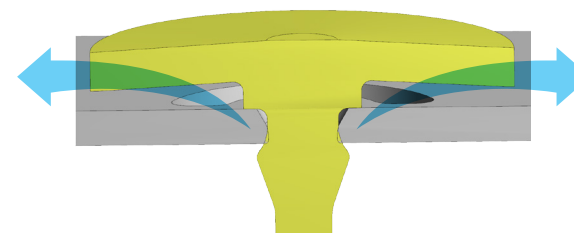
Batteries

Release increased internal pressure only by opening the umbrella valve

Structure



When the valve is open



Specifications and Main Features

- Flame Retardant Standard UL94 V-0 Equivalent (EPDM Material)
- Compatible with a flow rate of 150 L/min
- Specifications can be set according to valve opening pressure by controlling rubber hardness and tightness

Pressure control and explosion-proof

Pressure control valve **Middle-flow type**

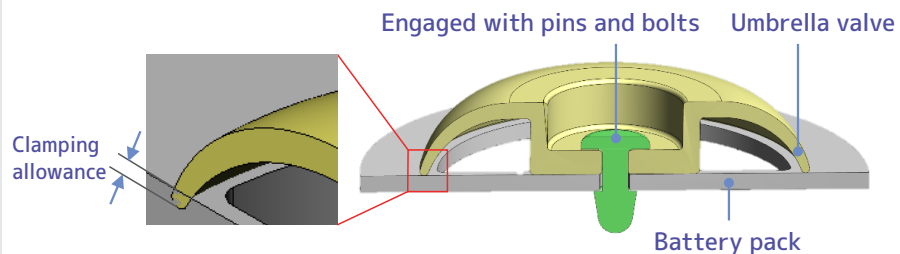
► Middle flow pressure release with simple structure



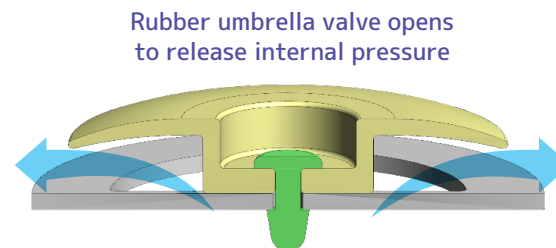
Batteries

Simple structure of umbrella valve and pin releases increased internal pressure

Structure



When the valve is open



Specifications and Main Features

- Waterproof and dustproof standard IPX9K compatible (can be set as desired)
- Flame Retardant Standard UL94 V-0 equivalent (EPDM material)
- Rubber hardness and tightness control allows specification according to valve opening pressure
- Easy installation

Pressure control and explosion-proof

Pressure control valve **High Flow Type**

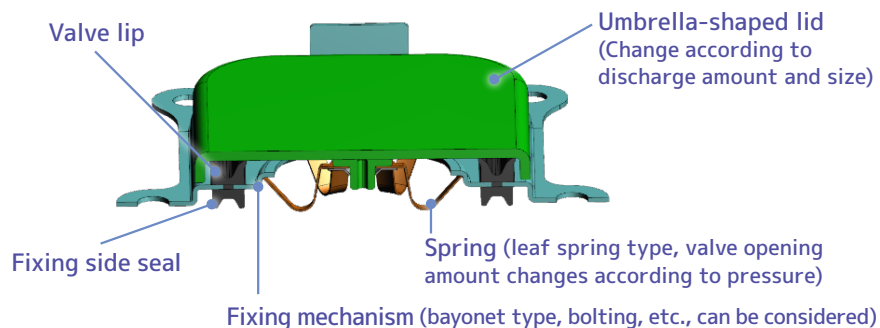
► Low Pressure Open/Large Flow



Batteries

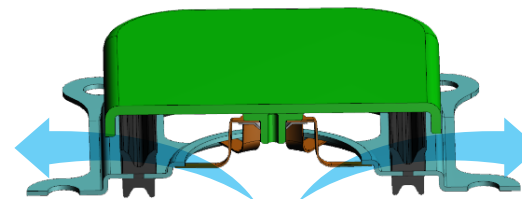
Achieves a high flow rate of 12,000 L/min at a differential pressure of 30 kPa

Structure



When the valve is open

Internal plate integrated valve
Large flow pressure release achieved by spring repulsion.



Specifications and Main Features

- Compatible with IPX9K waterproof and dustproof standards
- Equivalent to UL94 V-0 flame retardant standards
- Shuts off oxygen inflow, prevents fire spread
- Specifications can be set according to valve opening pressure by controlling lid diameter and spring repulsion force
- Can be installed with one touch (by selecting bayonet fixing mechanism)

Pressure adjustment and explosion-proof

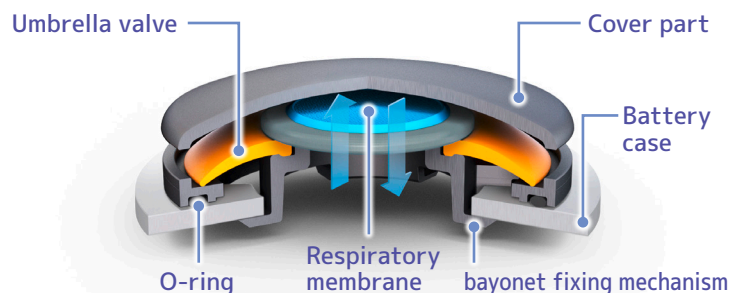
Pressure control valve **breathing, medium-flow type “Diavent”**

- ▶ The breathing membrane and waste valve are integrated, contributing to a lighter and more compact battery case

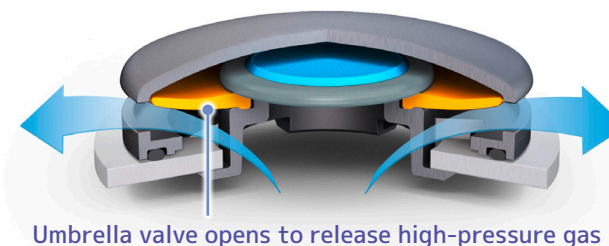


Pressure is adjusted for normal operation. High-pressure gas is released for emergency.

Structure (normal operation)



In case of emergency valve opening (cell ignition)



Specifications and Main Features

- Compatible with waterproof and dustproof standards IP67 and IPX9K
- Equivalent to flame retardant UL94 V-0
- High flow type with large gas emissions in case of emergency is also available (compatible with large battery pack)
- Can be installed with one touch

Pressure adjustment and explosion proof

Pressure control valve **High-pressure, small-flow rate type**

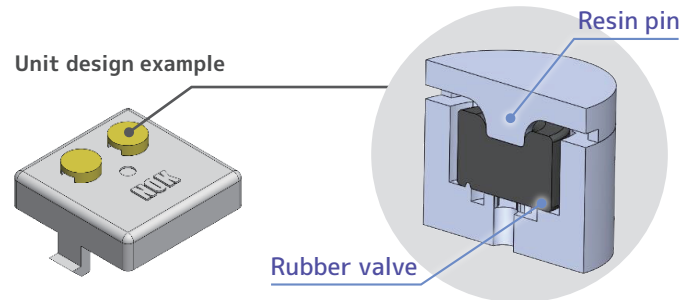
► Compact and space-saving while meeting high valve opening pressure requirements



Batteries

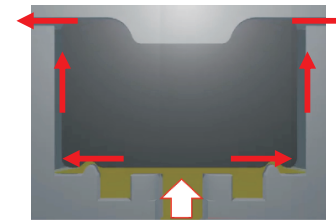
Internal plate integrated valve releases large flow pressure by spring repulsion

Structure



When valve is open

Valve opening pressure is controlled by controlling seal surface pressure with valve structure.

**Specifications
and
Main Features**

- Can be used repeatedly without valve replacement
- Supports high pressure
- Space saving design with $\phi 6 \sim$ valve diameter
- Can seal gas, electrolyte, etc.
- Can be used in low temperature environments (when cold resistant rubber is used for valve part)

Thermal insulation and flame retardancy

Flame retardant rubber

► Contributing to improved flame retardancy in electric vehicle units



Batteries

High flame retardancy EPDM material equivalent to UL94 V-0

Condition after
combustion



Combustion

Low-temperature properties	○
Volume Specific Resistance	○
Durability (Compressive Permanent Strain)	◎
Flame Retardant UL94	Not Supported

◎ : Excellent ○ : Good

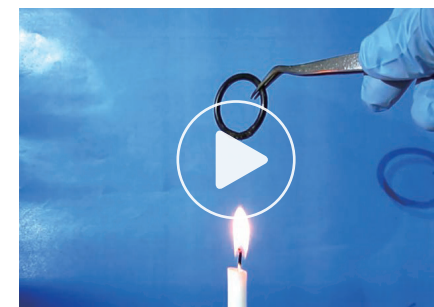
General-purpose EPDM



Fire spread

Low-temperature properties	○
Volume Specific Resistance	○
Durability (Compressive Permanent Strain)	◎
Flame Retardant UL94	Not Supported

Flame-retardant EPDM



Fire suppression

Low-temperature properties	○
Volume Specific Resistance	○
Durability (Compressive Permanent Strain)	◎
Flame Retardant UL94	V-0 Equivalent

Low | HB | V-2 | V-1 | V-0 | High

Thermal insulation and flame retardancy test

Flame Retardant Insulating Rubber

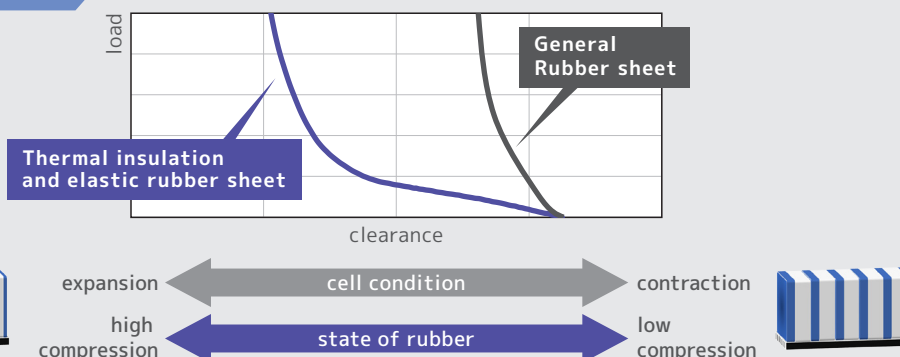
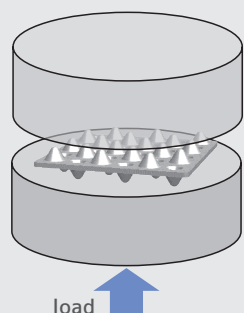
- Suppresses degradation of battery performance and improves battery safety through thermal insulation and flame retardancy



Batteries

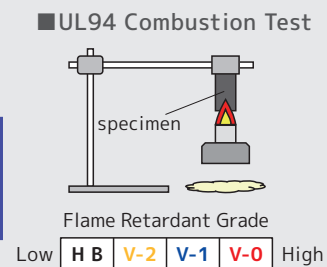
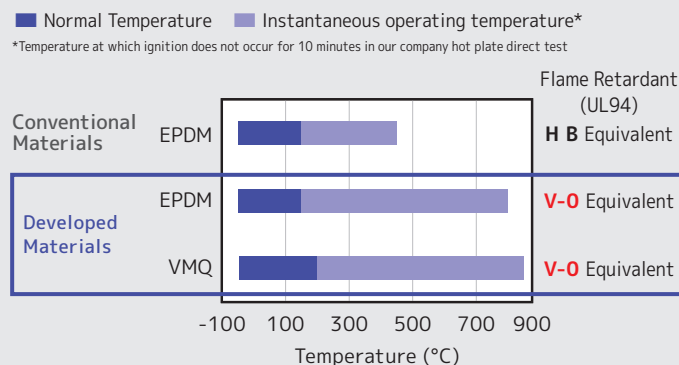
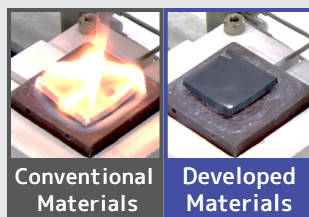
Ensure a constant reaction force and support the cell with an appropriate load.

Reaction force characteristic measurement test



Comply with UL94 V-0 flame-retardant standards.

Hot plate direct placement test



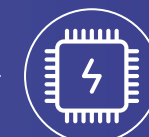
(*) The values shown in the graph are for reference only and are not guaranteed. (*) UL94 combustion test shows the results conducted in our company.

High voltage support

Tracking-resistant rubber

- High voltage compliant rubber that achieves CTI* 600 and is compatible with high voltage boundaries

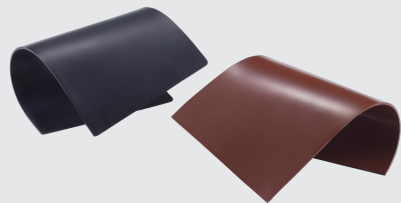
* CTI: Comparative tracking index



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All tracking-resistant rubber materials are CTI 600.

- Rubber materials suitable for use environments and application areas can be provided

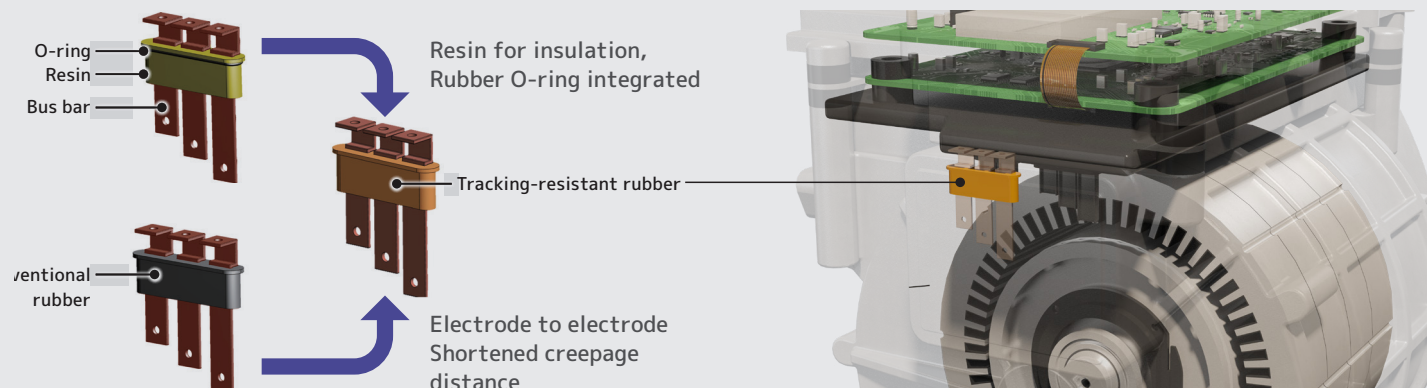


	Silicone rubber (VMQ)	Ethylene propylene rubber (EPDM)	Acrylic rubber (ACM)	Hydrogenated nitrile rubber (HNBR)
Heat resistance	◎◎	◎	◎	○
cold resistance	◎	◎	○	○
water resistance	○	◎	△	○
oil resistance	○	△	◎	◎
tracking resistance	CTI 600	CTI 600	CTI 600	CTI 600

Excellent ◎◎>◎>○>△ Poor

Unit downsizing

- Reducing the number of parts and creepage distance between electrodes contributes to unit downsizing



Support

NOK supports your development

Dependable



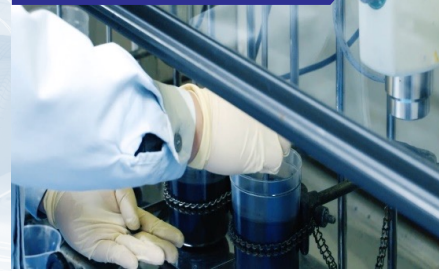
NOK's products are backed by repeated research on the materials used and mechanical designs. They are highly dependable and have been used for many years in a wide variety of machines.

Technology development



NOK's self-contained development system covers the entire process from product design to product inspection. We actively integrate R&D and production technologies to create unique, cutting-edge technologies and products.

Material technology



Material technology is one of NOK's core technologies. We have been working on the material compounding and chemical analysis technologies needed to develop rubber and adhesives used in seal products.

Global development



NOK has established production bases around the world, including Japan, China, and elsewhere in Asia, and have built a stable supply system to meet our customers' needs.

For consultations and inquiries, feel free to **contact us using [this form](#)**.



Links

Get access to NOK's latest info

NOK posts the latest information on X(formerly Twitter) and YouTube.

