



Innovative Elastomer Material Technology



## Partners



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# INEM Diaphragms





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## INEM'S Diaphragm Competence for Quality

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### From development through implementation

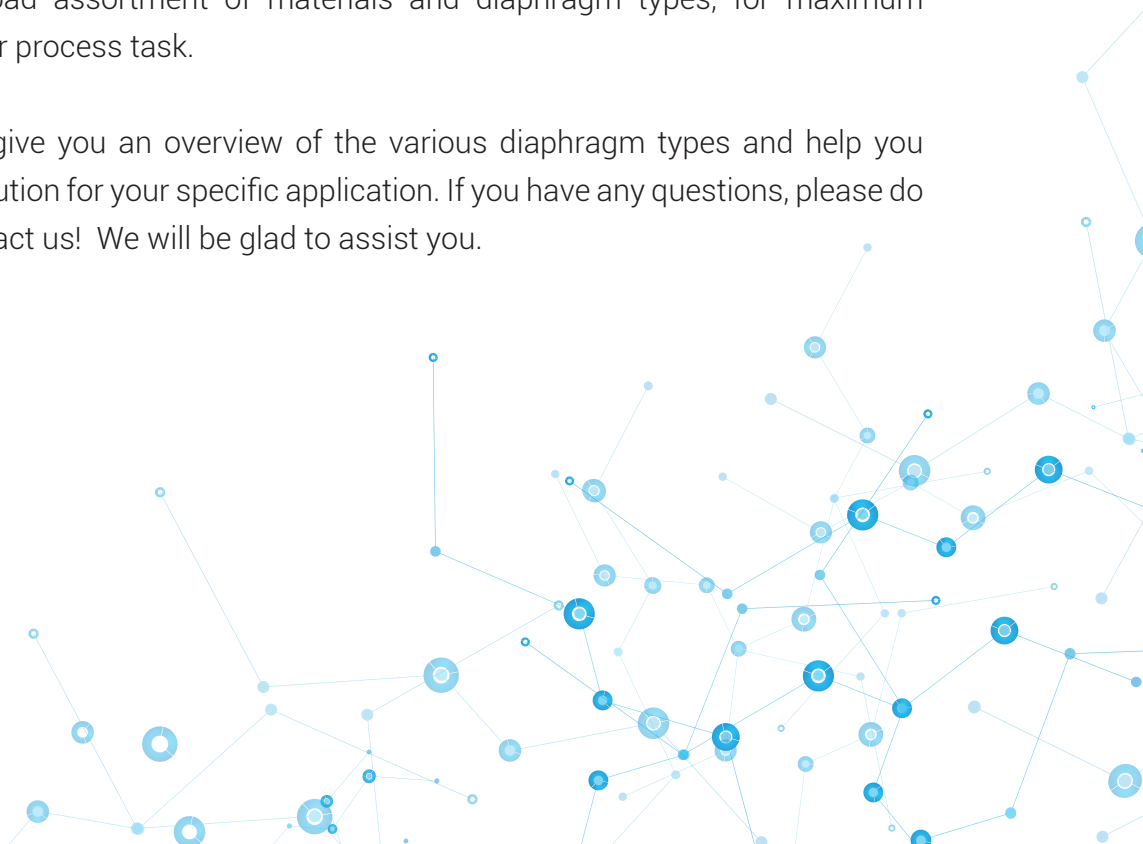
As the name implies, the diaphragm is the most important part of the valve products. It is also the sensitive point in the valves.

It ensures that different media are not mixed during the process, it protects the process from external influences and – in some cases also vice versa – it protects the environment from the influences of the process.

Any reasons can not make any compromises in quality concerning this crucial component. With INEM diaphragms, you are on the safe side in every respect.

You benefit for example from the fact that all materials used in INEM diaphragms are one-hundred percent made with own sourced materials and technology. This gives you the certainty that only the “best ingredients” are used for your diaphragm. Also, you can choose from a broad assortment of materials and diaphragm types, for maximum flexibility to suit your process task.

This brochure will give you an overview of the various diaphragm types and help you choose the right solution for your specific application. If you have any questions, please do not hesitate to contact us! We will be glad to assist you.







## Product Overview

02

- Diaphragm is a thin film type core part that has immense influence on determining the device performance and maintaining reliable operation in valves, pumps, flow meters, and other various devices.
- INEM's diaphragm is designed to be suitable for the customer's required environment and purpose, and provides reliable operation even in harsh conditions with its intensified strength using reinforced fiber. Also, the thickness of diaphragm and the position of reinforced fiber are adjusted according to the purpose of use to improve dynamic features, control and response.
- INEM manufactures and supplies various types, standard as well as non-standard diaphragm through customized design according to the customer's requirement. INEM is suggesting the most suitable diaphragms by analyzing external factors such as temperature / fluid / pressure.



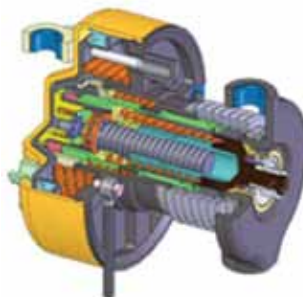
Compressor



Rolling Diaphragm



For axle disc



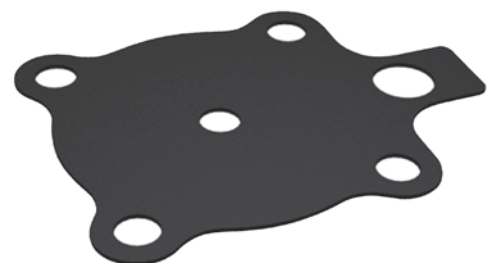
Brake Cylinder Unit



Thread pin(screw) Diaphragm



For wheel disc



Flat Diaphragm



## Production Process



1

The raw material is stored in an air conditioned warehouse that is protected against light and heat. This enables less alteration of the material.



2

One vulcanisation tool produces multiple diaphragms simultaneously.



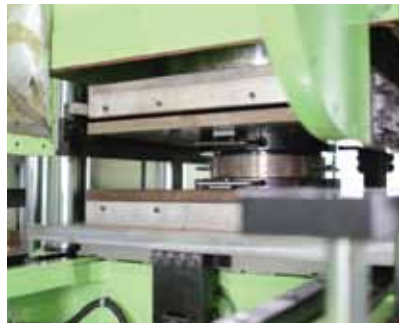
3

Rubber raw material sheet is prepared. Also re-inforced fabric is prepared.



6

After completion of the vulcanisation process, the completed diaphragms can be removed from the tool.



5

During the vulcanisation process the specific manufacturing parameters (for example: time, temperature, pressure, etc.) are monitored and recorded for future reference.



4

The vulcanisation tool on the press – the rubber blanks are placed in the moulds.



7

Completed high-tech diaphragm. The final product is a fully-compliant and traceable diaphragm made to INEM high standard specifications.



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Thorough final inspection makes sure of perfect quality.



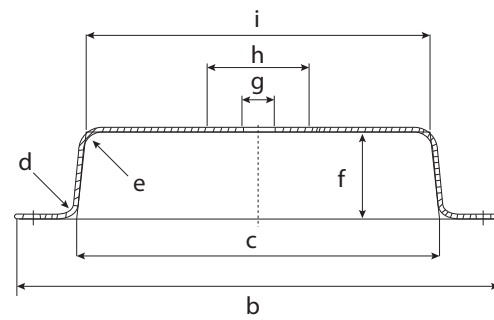
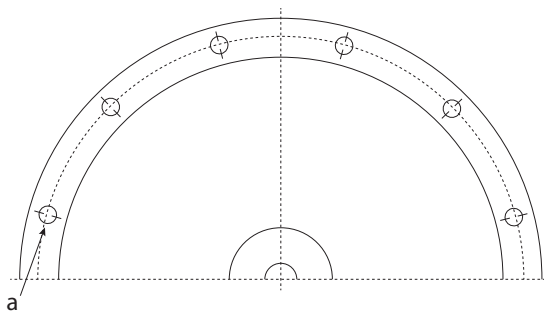
## Rolling Diaphragms



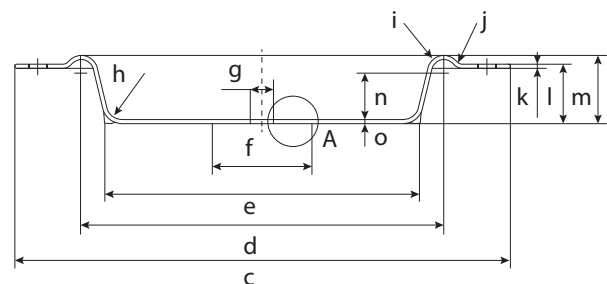
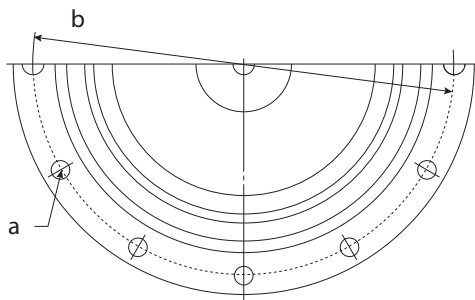
04

### Characteristics

- pressure loadable only on molding
- Few changes in effective area
- very large stroke
- possible low hysteresis
- for devices of reduced size
- design part for sealing function
- long working lifetime
- no stick-slip effect



Model	a	b	c	d	e	f	g	h	i	Thickness(mm)
250	12×Φ8	250Φ	188Φ	R7	R9	44	16Φ	50Φ	178Φ	2
290	16×Φ8	292Φ	224.5Φ	R8.5	R10	48.5	16Φ	60Φ	215Φ	2
370	20×Φ8	370Φ	290Φ	R8.3	R12	68.5	16Φ	60Φ	276Φ	3.7
480	20×Φ12	480Φ	375Φ	R10	R15	97	28Φ	100Φ	360Φ	4
550	24×Φ12	550Φ	441Φ	R10	R19	120	28Φ	100Φ	322Φ	4



Model	a	b	c	d	e	f	g	h	i	j	k	l	m	n	Thickness(mm)
1D	12×Φ9	215±0.2	235	173.4	149.7	48	10.5	R9.5	R8	R6	2±0.2	28.5	32.5	22.5	2
2D	12×Φ8.5	248±0.2	270	198.2	170	48	10.5	R12	R8	R14	2±0.2	32.5	38.5	28.5	2
3D	16×Φ8.5	305±0.3	324	251	218	86	15.2	R10	R12	R10	3±0.2	40	49	34	3.7
4D	16×Φ11	405±0.5	430	334	290	84	19	R10	R15	R11	4	52	63	44	4



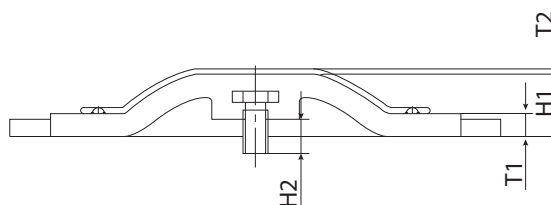
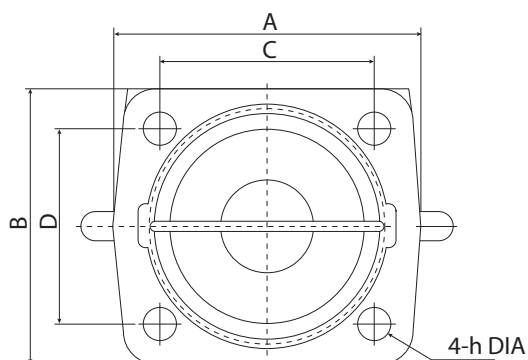
## Threaded pin(screw) Diaphragms



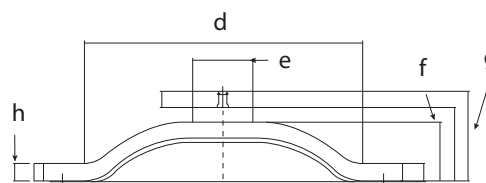
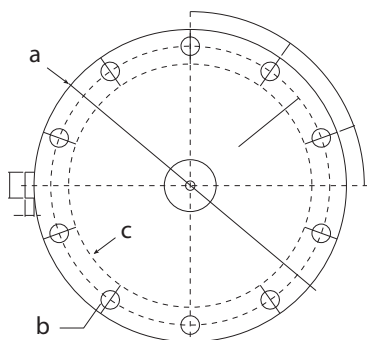
05

### Characteristics

- Uniformly fixed in the compressor by means of a threaded pin.
- The largest advantage of fixing by means of threaded pin, e.g. in comparison to a bayonet fitting, is that the force transfer is distributed onto the large area of the flanks of the screw thread.



Valve Size(mm)	A	B	C	D	T1	T2	H1	H2	h
DN 20(3/4")	62	58	45	40	4.6	0.9	10.6	3.3	9
DN 25(1")	70	67	54	46	4.8	1	11.3	5.4	9.5
DN 40(1.5")	102	91	71	65	6	1.2	15.7	7.9	11
DN 50(2")	125	105	86	78	6.4	1.2	19.6	7.5	12.5
DN 65(2.5")	164	131	102	95	7.5	1.2	21.2	9	14.3
DN 80(3")	187	155	127	115	7.4	1.2	27.1	9.4	20



Valve Size(mm)	a	b	c	d	e	f	g	h
DN 20(3/4")	62	58	45	40	4.6	0.9	10.6	3.3
DN 25(1")	70	67	54	46	4.8	1	11.3	5.4





## Dished Diaphragms



### Characteristics

- pressure loadable on both sides
- same effective area on both sides
- average stroke
- low hysteresis
- no stick-slip effect
- design part for sealing function
- long working lifetime



## Flat Diaphragms



### Characteristics

- pressure loadable on both sides
- same effective area on both sides
- limited stroke as defined
- no stick-slip effect
- low hysteresis



## Convolute Diaphragms



### Characteristics

- pressure loadable in loop direction
- small effective surface change
- average stroke
- low hysteresis
- no stick-slip effect
- design part for sealing function
- very long working lifetime



## Characteristics of the Elastomers

All synthetic rubbers are made,

- with own recipe development and mixture manufacture
- for use in temperatures ranging from -60°C to + 280°C
- resistant to nearly all liquids and gases in use
- in accordance with DVGW, KTW/WRC, BGA/FDA requirements.

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	Material	Code	Compression Set Resistance	Hardness (Shore A)	Tensile strength(psi)	Elongation	Max Temperature	Resilience
●	Butyl	IIR	GOOD	30-100	2000+	300-800	120°C	EXCELLENT
●	Chloropene	CR	FAIR-GOOD	40-95	2000-3000	650-850	121°C	EXCELLENT
●	Styrene butadyene	SBR	GOOD	40-100	2000+	400-500	100°C	GOOD
●	Ethylene propylene	EPDM	FAIR	30-90	1500-3000	200-800	200°C	GOOD
●	Fluoro Carbon	FKM	GOOD-EXCEL.	50-95	1500-3000	100-450	280°C	FAIR
●	Fluoro Silicone	FVMQ	FAIR-GOOD	35-80	350-850	100-500	235°C	GOOD
●	Nitrile	NBR	GOOD	20-90	1000-3500	400-600	160°C	GOOD
●	Hydrogenated Nitrile	HNBR	EXCELLENT	30-95	1500-3500	90-550	180°C	GOOD
●	Epichlorohydrine ethylene oxide	ECO	FAIR-GOOD	30-95	1500-2000	300-400	140°C	GOOD
●	Silicone	VMQ	GOOD-EXCEL.	25-90	600-1500	90-900	240°C	POOR-EXCEL.
●	Natural rubber	NR	GOOD	30-100	4000+	300-500	110°C	EXCELLENT
●	Urethane	AU/EU	FAIR	60-100 45-75 (Durometer D)	3000-9000	270-800	82°C	GOOD
●	Acrylate rubber	ACM	POOR	40-90	500-2500	100-450	177°C	FAIR
●	Ethylene acrylate	AEM	GOOD	35-95	500-3000	200-850	150°C	GOOD

- Generally used materials
- Specially used materials



## Fabric Material

A key component of diaphragms is the fabric to ensure the diaphragm which can withstand the pressure, stroke and environment. INEM offers a comprehensive selection of standard fabric styles, each with specific physical characteristics, based on weave patterns, tensile strength, formability and chemical and heat resistance capabilities, as well as other variables. INEM engineers are available to assist for selecting the proper fabric for a specific application.

### Fabric Characteristics

Fabric	Tensile Strength	Maximum Temperature	Fabric Gauge (mm)	General Physical Properties
Cotton	Fair	170°C	0.3~1.1	Weak acids resistance, excellent organic solvents resistance
Polyester	Fair	170°C	0.3~1.0	Light weight, general purpose, high stability
Polyamide(Nylon)	Excellent	200°C	0.2~0.7	High strength, high temperature, good abrasion resistance
Polyaramid(NOMEX)	Excellent	260°C	0.3~0.8	High temperature, mildew resistance
Polyaramid(KEVLAR)	Excellent	400°C	0.3~1.1	Extreme temperature, extreme strength
Nitrile coated polyester	Fair	120°C	0.3~1.0	Good formability
Nitrile coated Nylon	Good	120°C	0.2~0.7	High strength, good formability
FKM coated polyester	Fair	150°C	0.3~1.0	Good chemical resistance
EPDM coated Polyester	Fair	150°C	0.3~1.0	General purpose, high stability
EPDM coated Nylon	Good	120°C	0.2~0.7	Special purpose, high strength, high stability

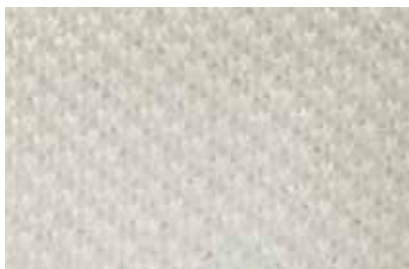
### Criteria of Fabric Selection

- Check point : Operating Pressure, Frequency(Hz), Temperature
- Right Fabric selection is the most important.

### Various Fabric Sample



- **Material** Polyester
- **Weaving type** Plain



- **Material** Polyester
- **Weaving type** Knit(Double layer)



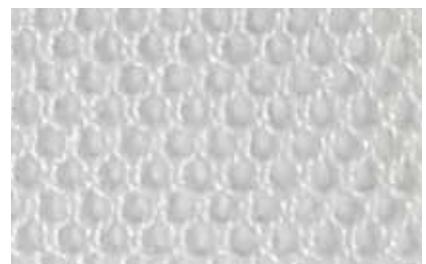
- **Material** Polyamide(Nylon)
- **Weaving type** Woven(Single layer)



- **Material** Polyamide(Nylon)
- **Weaving type** Knit(Single layer)



- **Material** m-Aramid(NomexTM)
- **Weaving type** Knit(Single layer)



- **Material** m-Aramid(NomexTM)
- **Weaving type** Knit(Honey comb)



# Production Facilities

## Production equipment



Production equipment



Mixing apparatus



Cutting machine



Mold management

## Experimental apparatus of R&D center



Various experimental apparatus



Rheometer



Mooney Viscometer



UTM



Specimen Cutter



Aging Tester



Mixing tester



Thermal aging furnace



Sealing tester



Abrasion resistance tester



Fire resistance tester



Oil resistance tester



Precision scale