

## Series VD Pneumatic diaphragm actuators

Metso's Neles series VD actuators are exclusively developed for linear valves. They provide safe and reliable operation and are well suited for many different kind of applications. The high performance internal coating resists wear and corrosion and the replaceable inner parts guarantee a long life cycle. The VDD/VDR series diaphragm actuator is well suited for most of the control applications.

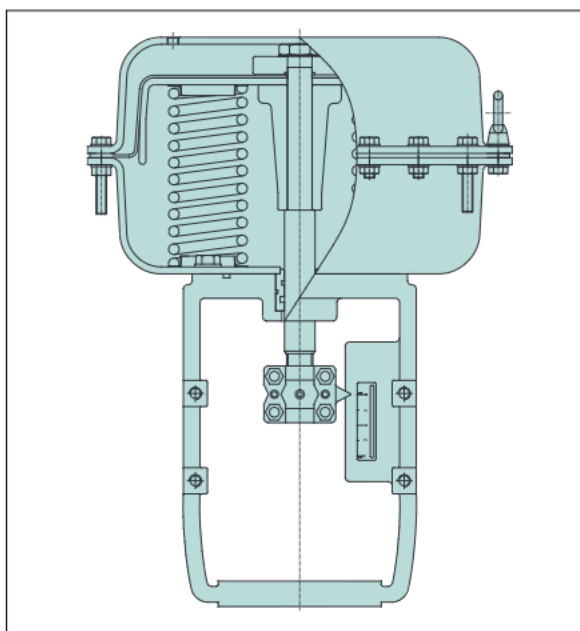
### Construction

- ❑ Excellent long lasting accuracy and reliability is achieved through the use of multiple springs and rolling diaphragm in the actuator.
- ❑ The use of involute rolling diaphragm permits long travel and excellent linearity without the need of expensive hardware normally associated with diaphragm actuators.
- ❑ A wide selection of spring ranges are available
- ❑ The actuator is field reversible between direct and reverse acting
- ❑ The rugged one piece yoke, pressed steel diaphragm case and special nylon reinforced diaphragm provide dependable, high thrust performance
- ❑ Optional handwheel for manual operation

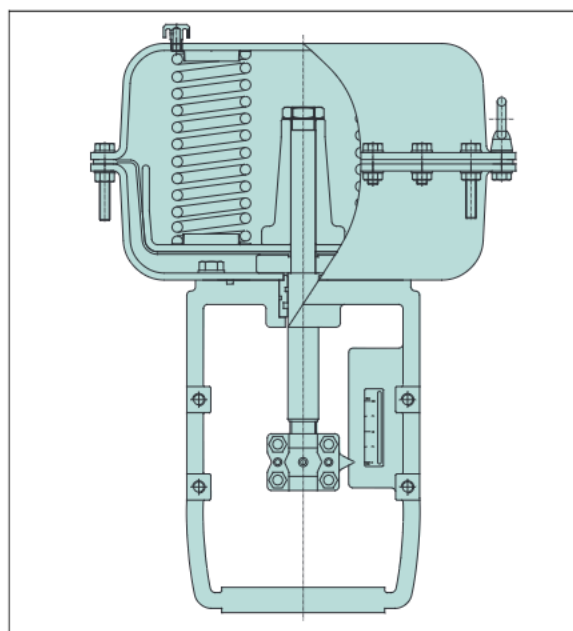


### Simple and cost effective

- ❑ Simple and cost effective design guarantee increased life time and reliability. No accurately honed bores with delicate sealing systems are required
- ❑ Low cost, simple maintenance
- ❑ High performance, low friction rolling diaphragm gives good control performance



VDD, Direct  
Air to stem extend  
Field-reversible VDD



VDR, Reverse  
Air to stem retract  
Field-reversible VDR

## VD Diaphragm actuators design details

### VD specifications

| Actuator size | Effect area     |                   | Volume          |                   | Actuator stem size (Φ) |      | Maximum stroke |      | Max. allowable pressure |     |
|---------------|-----------------|-------------------|-----------------|-------------------|------------------------|------|----------------|------|-------------------------|-----|
|               | cm <sup>2</sup> | inch <sup>2</sup> | dm <sup>3</sup> | inch <sup>3</sup> | mm                     | inch | mm             | inch | bar                     | psi |
| #25           | 270             | 42                | 0.9             | 54.9              | 24.0                   | 0.95 | 20             | 0.8  | 4.2                     | 60  |
| #29           | 390             | 60                | 1.8             | 109.8             | 24.0                   | 0.95 | 40             | 1.6  |                         |     |
| #37           | 640             | 99                | 3.5             | 213.5             | 24.0                   | 0.95 | 50             | 2.0  |                         |     |
| #48           | 1130            | 175               | 10.2            | 622.4             | 35.0                   | 1.38 | 70             | 2.8  |                         |     |
| #55           | 1520            | 236               | 18.2            | 1110.0            | 35.0                   | 1.38 | 80             | 3.2  |                         |     |

### VD Spring ranges and max. travel (stroke)

| Actuator size | VDR (Signal increased to open) |       |                         |     |             |      | VDD (Signal increased to close) |       |                         |     |             |      |
|---------------|--------------------------------|-------|-------------------------|-----|-------------|------|---------------------------------|-------|-------------------------|-----|-------------|------|
|               | Spring range                   |       | Supply air set pressure |     | Max. travel |      | Spring range                    |       | Supply air set pressure |     | Max. travel |      |
|               | bar                            | psi   | bar                     | psi | mm          | inch | bar                             | psi   | bar                     | psi | mm          | inch |
| #25           | 0.2~1.0                        | 3~15  | 1.2                     | 18  | 20          | 0.8  | 0.2~1.0                         | 3~15  | 1.2                     | 18  | 20          | 0.8  |
|               | 0.8~2.6                        | 11~37 | 3.2                     | 44  |             |      | 0.8~2.6                         | 11~37 | 3.2                     | 44  |             |      |
|               | 1.5~3.4                        | 21~48 | 3.9                     | 55  |             |      | 1.5~3.4                         | 21~48 | 3.9                     | 55  |             |      |
| #29           | 0.2~1.0                        | 3~15  | 1.2                     | 18  | 40          | 1.6  | 0.2~1.0                         | 3~15  | 1.2                     | 18  | 40          | 1.6  |
|               | 0.8~2.6                        | 11~37 | 3.2                     | 44  |             |      | 0.8~2.6                         | 11~37 | 3.2                     | 44  |             |      |
|               | 1.5~3.4                        | 21~48 | 3.9                     | 55  |             |      | 1.5~3.4                         | 21~48 | 3.9                     | 55  |             |      |
| #37           | 0.2~1.0                        | 3~15  | 1.2                     | 18  | 50          | 2.0  | 0.2~1.0                         | 3~15  | 1.2                     | 18  | 50          | 2.0  |
|               | 0.8~2.6                        | 11~37 | 3.2                     | 44  |             |      | 0.8~2.6                         | 11~37 | 3.2                     | 44  |             |      |
|               | 1.5~3.4                        | 21~48 | 3.9                     | 55  |             |      | 1.5~3.4                         | 21~48 | 3.9                     | 55  |             |      |
| #48           | 0.2~1.0                        | 3~15  | 1.2                     | 18  | 70          | 2.8  | 0.2~1.0                         | 3~15  | 1.2                     | 18  | 70          | 2.8  |
|               | 0.8~2.6                        | 11~37 | 3.2                     | 44  |             |      | 0.8~2.6                         | 11~37 | 3.2                     | 44  |             |      |
|               | 1.5~3.4                        | 21~48 | 3.9                     | 55  |             |      | 1.5~3.4                         | 21~48 | 3.9                     | 55  |             |      |
| #55           | 0.2~1.0                        | 3~15  | 1.2                     | 18  | 80          | 3.2  | 0.2~1.0                         | 3~15  | 1.2                     | 18  | 80          | 3.2  |
|               | 0.8~2.6                        | 11~37 | 3.2                     | 44  |             |      | 0.8~2.6                         | 11~37 | 3.2                     | 44  |             |      |
|               | 1.5~3.4                        | 21~48 | 3.9                     | 55  |             |      | 1.5~3.4                         | 21~48 | 3.9                     | 55  |             |      |

### VD Stroking times (new)

| Size | Stroke(m m) | ND Model | Stroking time(Sec.) |      |        |      |
|------|-------------|----------|---------------------|------|--------|------|
|      |             |          | Case-1              |      | Case-2 |      |
|      |             |          | Load                | Vent | Load   | Vent |
| # 25 | 20          | ND 9202  | 4                   | 5    | 4      | 5    |
|      | 20          | ND 9203  | 2                   | 3    | 2      | 3    |
| # 29 | 20          | ND 9203  | 4                   | 5    | 4      | 5    |
|      | 40          | ND 9203  | 6                   | 8    | 6      | 8    |
| # 37 | 20          | ND 9203  | 7                   | 9    | 7      | 9    |
|      | 40          | ND 9203  | 11                  | 14   | 11     | 14   |
|      | 50          | ND 9203  | 12                  | 17   | 12     | 17   |
| # 48 | 20          | ND 9206  | 4                   | 7    | 6      | 7    |
|      | 40          | ND 9206  | 5                   | 9    | 8      | 9    |
|      | 50          | ND 9206  | 6                   | 10   | 9      | 10   |
|      | 60          | ND 9206  | 7                   | 11   | 10     | 11   |
|      | 70          | ND 9206  | 8                   | 12   | 11     | 12   |
| # 55 | 20          | ND 9206  | 6                   | 9    | 8      | 9    |
|      | 40          | ND 9206  | 7                   | 11   | 10     | 11   |
|      | 50          | ND 9206  | 11                  | 13   | 12     | 13   |
|      | 60          | ND 9206  | 12                  | 15   | 14     | 15   |
|      | 70          | ND 9206  | 13                  | 17   | 16     | 17   |

- Note :
1. Mounted with ND 9200 smart positioners
  2. Case-1 : when applied B72G-1AS-980 Air set  
Case-2 : when applied YT-200BN210 Air set
  3. VD model & spring range : VDR, 0.8~2.6 bar
  4. Air supply pressure : 3.2 barg
  5. Stroking time accuracy : ± 10 %

### VD Temperature ranges

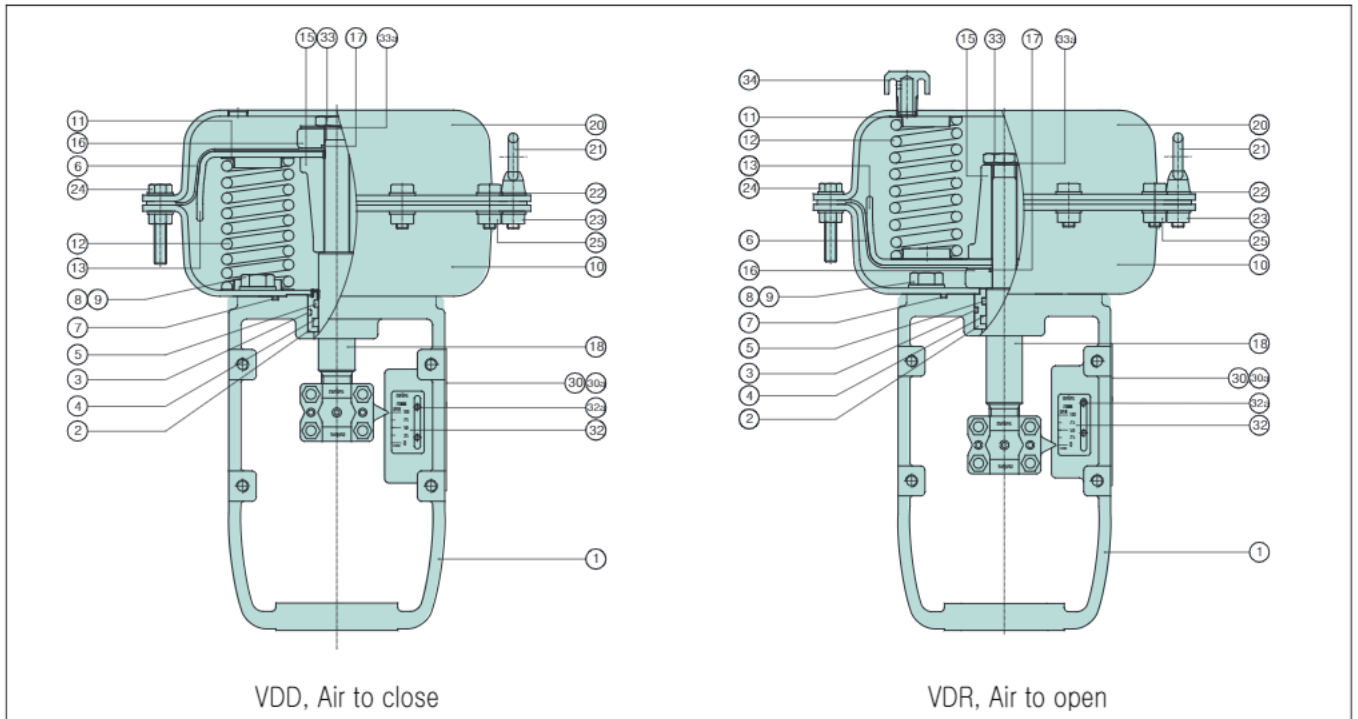
| Description    | Standard VD     | Low. Temp. VD   |
|----------------|-----------------|-----------------|
| Temp. range    | -20 °C to 70 °C | -40 °C to 70 °C |
| Type code ref. | E, A            | E, L            |

- Note :
1. Temperature : Ambient temperature
  2. Type code reference : Please see in page 6 (materials).
  3. Other low temperature ranges : Please contact Metso.

### VD Air supply connections

|          |                        |
|----------|------------------------|
| Standard | 1/4" NPT for all sizes |
| Optional | 3/8", 1/2" and others  |

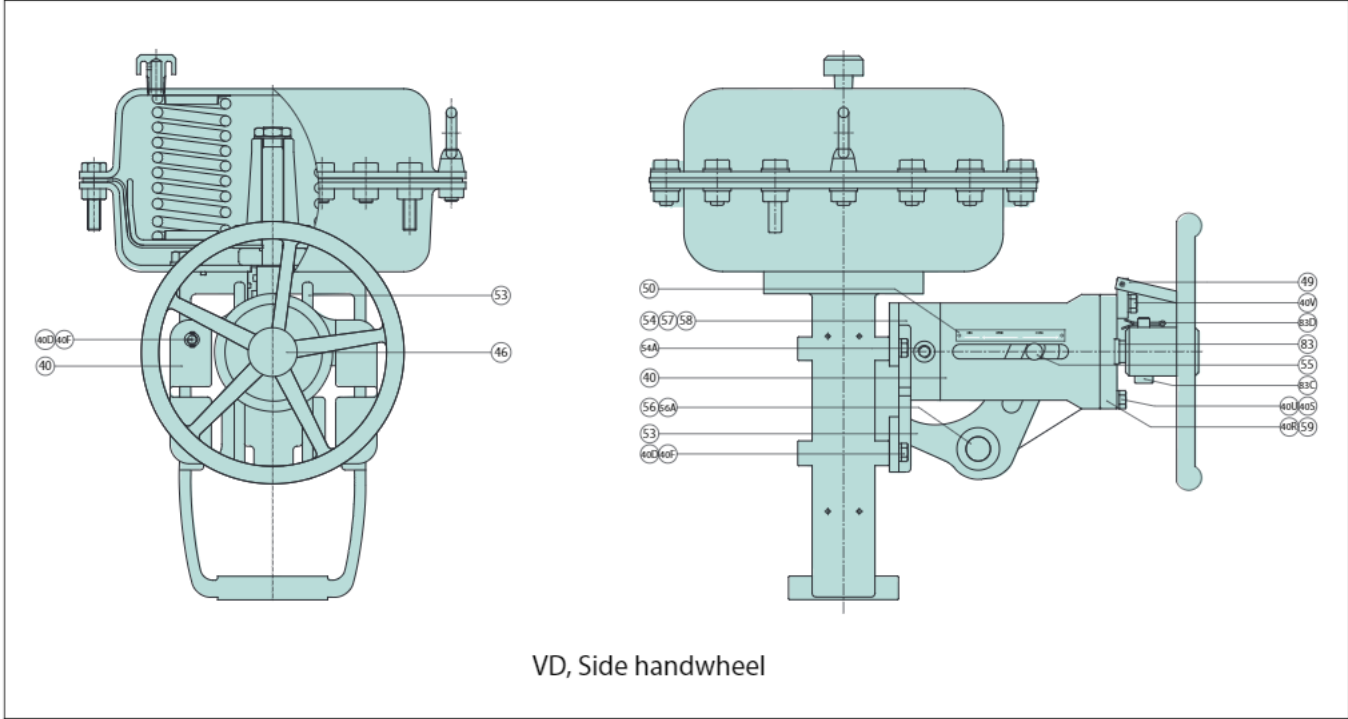
### VD, Actuator constructions without handwheel



### Standard VD, parts and materials without handwheel

| Part No. | Description          | Material                |
|----------|----------------------|-------------------------|
| 001      | YOKE                 | ASTM A216 gr. WCB       |
| 002      | STEM GUIDE           | ASTM B209 ALLOY 6061 T6 |
| 003      | O-RING               | NITRILE, NBR            |
| 004      | U-PACKING            | NITRILE, NBR            |
| 005      | O-RING               | NITRILE, NBR            |
| 006      | DIAPHRAGM            | EPDM                    |
| 007      | O-RING               | NITRILE, NBR            |
| 008      | HEXAGON SCREW        | ISO 3506 A2-70          |
| 009      | WASHER               | BRONZE                  |
| 010      | LOWER CASE           | JIS G3101_S5400         |
| 011      | SPRING SEAT          | JIS G3101_S5400+Zn      |
| 012      | SPRING               | JIS G3560_SWOSC-B       |
| 013      | DIAPHRAGM PLATE      | JIS G3101_S5400         |
| 015      | STOPPER              | ASTM A216 gr. WCB+Zn    |
| 016      | STEM ROD PLATE       | JIS G3101_S5400+Zn      |
| 017      | O-RING               | NITRILE, NBR            |
| 018      | TOP STEM             | AISI 304+HCr            |
| 020      | UPPER CASE           | JIS G3101_S5400         |
| 021      | LIFTING EYE NUT      | AISI 304                |
| 022      | WASHER               | AISI 304                |
| 023      | HEXAGON SCREW        | ISO898/1 12.9+ZINC      |
| 024      | HEXAGON SCREW        | ISO898/1 12.9+ZINC      |
| 025      | HEXAGON NUT          | ISO898/2 8+ZINC         |
| 030      | IDENTIFICATION PLATE | AISI 304                |
| 030a     | RIVET                | AISI 304                |
| 031a     | STICKER (WARNING)    | VINYL PAPER             |
| 032      | INDICATOR            | AISI 304                |
| 032a     | ROUND HEAD SCREW     | AISI 304                |
| 033      | STEM NUT             | AISI 304                |
| 033a     | LOCK WASHER          | AISI 304                |
| 034      | VENT CAP             | ASTM A351 gr. CF8       |

**VD, Actuator construction with handwheel**

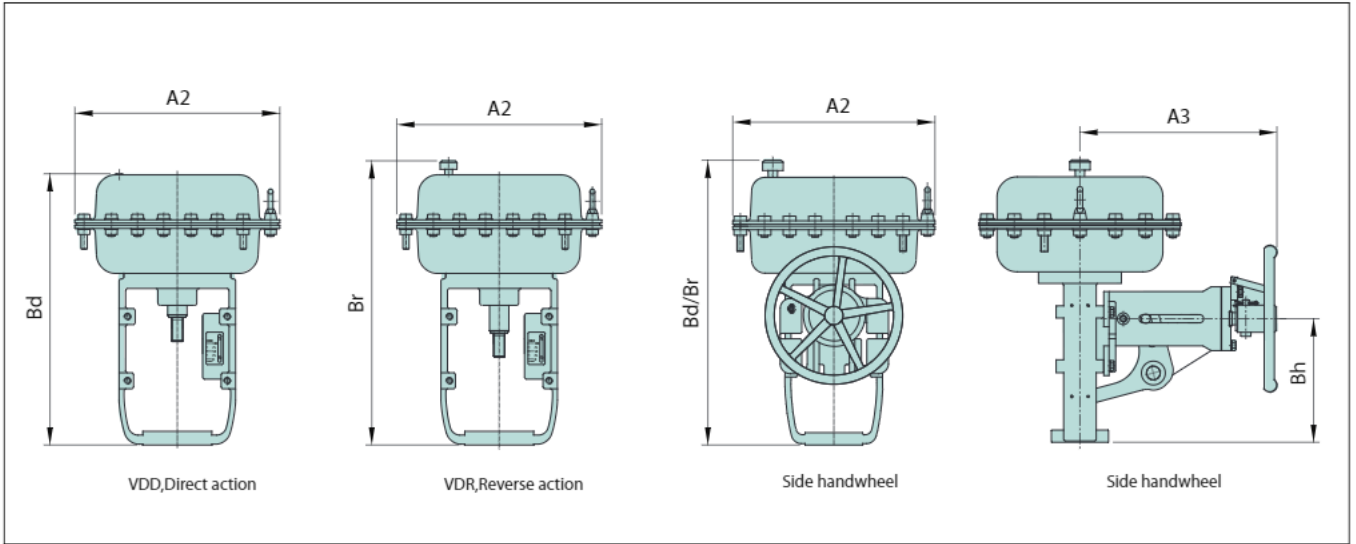


**Standard VD, parts and materials with handwheel**

| Part No. | Description                  | Material                |
|----------|------------------------------|-------------------------|
| 040      | HANDLE BASE                  | ASTM A216 gr. WCB       |
| 040d     | HEXAGON SCREW                | ISO 3506 A2-70          |
| 040f     | SPRING WASHER                | AISI 304                |
| 040r     | HANDLE BASE COVER            | ASTM A216 gr. WCB       |
| 040s     | HEXAGON SCREW                | ISO 3506 A2-70          |
| 040u     | SPRING WASHER                | AISI 304                |
| 040v     | HEXAGON SCREW                | ISO 3506 A2-70          |
| 046      | HANDLE                       | ASTM B209 ALLOY 6061 T6 |
| 049      | LOCKING HANDLE               | AISI 304                |
| 050      | HANDLE INDICATOR             | ALUMINIUM               |
| 053      | LEVER ARM                    | ASTM A216 gr. WCB       |
| 054      | BEARING FLANGE               | ASTM A216 gr. WCB       |
| 054a     | BEARING FLANGE SCREW         | JIS G4051-S45C          |
| 055      | SHAFT FLANGE                 | JIS G4051-S45C          |
| 056      | LEVER ARM PIN                | AISI 304                |
| 056a     | SNAP RING (UNSHOWN)          | AISI 304                |
| 057      | THRUST BALL BEARING(UNSHOWN) | JIS G3101-SS400         |
| 058      | SNAP RING(UNSHOWN)           | AISI 304                |
| 059      | DU DRY BEARING(UNSHOWN)      | AISI304+PTFE+Pb         |
| 083      | HANDLE SHAFT                 | JIS G4051-S45C          |
| 083c     | SHAFT PIN                    | AISI 304                |
| 083d     | SPLIT PIN                    | AISI 304                |

## VD Diaphragm actuators

### Actuators dimensions



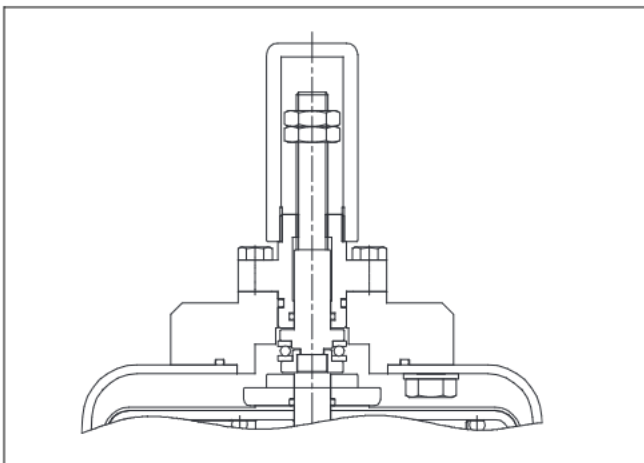
(UNIT : mm)

| Size | Without handwheel |     |     |             | With handwheel |     |     |     |     |             |
|------|-------------------|-----|-----|-------------|----------------|-----|-----|-----|-----|-------------|
|      | A2                | Bd  | Br  | Weight (kg) | A2             | Bd  | Br  | A3  | Bh  | Weight (kg) |
| #25  | 255               | 348 | 373 | 12          | 255            | 348 | 373 | 312 | 170 | 22          |
| #29  | 295               | 391 | 416 | 18          | 295            | 391 | 416 | 312 | 182 | 28          |
| #37  | 375               | 464 | 489 | 28          | 464            | 464 | 489 | 342 | 201 | 43          |
| #48  | 486               | 652 | 677 | 86          | 486            | 652 | 677 | 464 | 244 | 119         |
| #55  | 566               | 695 | 720 | 112         | 566            | 695 | 720 | 464 | 244 | 145         |

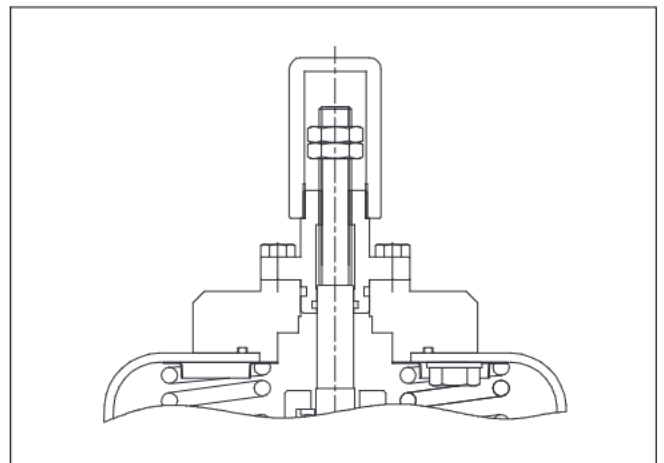
**NOTE**

1. 'Br' refers to reverse acting actuator, VDR
2. 'Bd' refers to direct acting actuator, VDD

### VD Actuator, max/min stop



Model VDD  
Maximum stop  
Optional adjustable limit stop



Model VDR  
Minimum stop  
Optional adjustable limit stop

## HOW TO ORDER

Pneumatic diaphragm actuator, linear type, series VD

| 1. | 2. | 3. | 4. | 5.  | 6. | 7. | 8. | 9. | 10. | 11. | 12. | 13. | 14. |
|----|----|----|----|-----|----|----|----|----|-----|-----|-----|-----|-----|
| VD | D  | 25 | C  | 020 | A  | E  | A  | K  | X   | X   | A   | X   | R   |

### ACTUATOR CONSTRUCTIONS

| 1. | ACTUATOR SERIES                           |
|----|---|
| VD | Pneumatic diaphragm actuator, linear type |

| 2. | FUNCTION CODE  |           |             |
|----|----------------|-----------|-------------|
|    | Direction      | Spring to | Air to stem |
| D  | Direct acting  | Open      | Extended    |
| R  | Reverse acting | Close     | Retracted   |

| 3. | ACTUATOR SIZE     |  |
|----|-------------------|--|
|    | Outline dimension |  |
| 25 | Ø255 mm           |  |
| 29 | Ø295 mm           |  |
| 37 | Ø375 mm           |  |
| 48 | Ø486 mm           |  |
| 55 | Ø566 mm           |  |

| 4.                    | SPRING RANGE |         |                     |
|-----------------------|--------------|---------|---------------------|
|                       | bar          | psi     | Supply air pressure |
| C                     | 0.8 - 2.6    | 11 - 37 | 3.2 bar / 44 psi    |
| Optional spring range |              |         |                     |
| A                     | 0.2 - 1.0    | 3 - 15  | 1.2 bar / 18 psi    |
| D                     | 1.5 - 3.4    | 21 - 48 | 3.9 bar / 55 psi    |
| Y                     | Special      | Special | Special             |

| 5.  | STROKE  |                                  |       |       |       |       |
|-----|---------|----------------------------------|-------|-------|-------|-------|
|     | Desc.   | VD_25                            | VD_29 | VD_37 | VD_48 | VD_55 |
| 020 | 20 mm   | O                                | O     | O     | -     | -     |
| 030 | 30 mm   | -                                | O     | O     | -     | -     |
| 040 | 40 mm   | -                                | O     | O     | O     | O     |
| 050 | 50 mm   | -                                | -     | O     | O     | O     |
| 060 | 60 mm   | -                                | -     | -     | O     | O     |
| 070 | 70 mm   | -                                | -     | -     | O     | O     |
| 080 | 80 mm   | -                                | -     | -     | -     | O     |
| YYY | Special | Contact Metso for special stroke |       |       |       |       |

### MATERIALS

| 6. | ACTUATOR CASE MATERIAL      |
|----|-----------------------------|
| A  | JIS G3101-SS400 (ASTM A-36) |
| Y  | Special                     |

| 7. | DIAPHRAGM MATERIAL |
|----|--------------------|
| E  | EPDM               |
| Y  | Special            |

| 8.                        | SEAL MATERIAL  |
|---------------------------|----------------|
| A                         | Nitrile rubber |
| Optional seal application |                |
| L                         | Low temp. NBR  |
| Y                         | Special        |

| 9.                        | BOLTING MATERIAL         |
|---------------------------|--------------------------|
| K                         | Stainless steel          |
| Optional bolting material |                          |
| A                         | Zinc coated carbon steel |
| Y                         | Special                  |

### OTHERS

| 10.                  | POSITION LIMITATION |
|----------------------|---------------------|
| X                    | Not applicable      |
| Optional application |                     |
| M                    | Mechanical stopper  |
| Y                    | Special             |

| 11. | EXTERNAL OVERRIDE OPTION |
|-----|--------------------------|
| X   | Not applicable           |
| A   | Handwheel                |

| 12. | AIR SUPPLY CONNECTION |                   |
|-----|-----------------------|-------------------|
|     | Connection size       | Actuator size     |
| A   | 1/4" NPT              | VD_25/29/37/48/55 |
| Y   | Special               |                   |

| 13. | OPTIONS        |
|-----|----------------|
| X   | Not applicable |
| Y   | Special        |

| 14. | ACTUATOR DESIGN APPLICATION |
|-----|-----------------------------|
| -   | Original type               |
| R   | Field reversible type       |

Subject to change without prior notice.

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