

Norbro

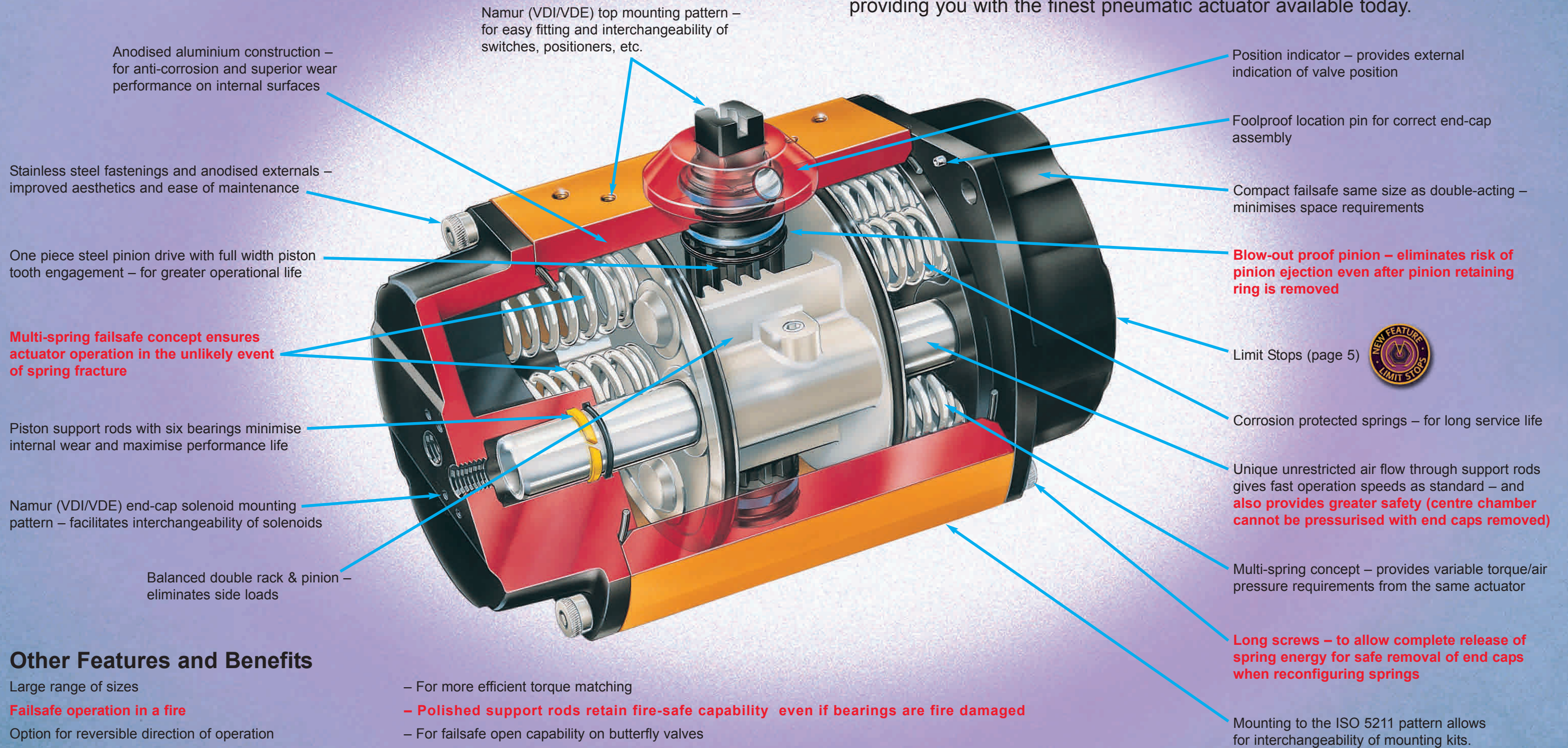
*Series 40R Pneumatic Actuator
Double Acting or Spring Return*

Since the mid-Sixties the Norbro name has been recognised as the leading quarter turn actuator for industry.

As proof of this, Norbro pneumatic actuators can be found in a range of applications as diverse as the petrochemical industry, food and beverage, steel production, pharmaceuticals and plastics manufacturing.

From the very beginning Norbro has been dedicated to providing high performance actuators which combine reliability, long life and ease of maintenance with operational **safety** and a modular design concept which allows simple attachment of a variety of ancillaries to match customer requirements.

With the latest design of the Norbro Series 40R, all of these factors add up to providing you with the finest pneumatic actuator available today.



Anodised aluminium construction – for anti-corrosion and superior wear performance on internal surfaces

Namur (VDI/VDE) top mounting pattern – for easy fitting and interchangeability of switches, positioners, etc.

Position indicator – provides external indication of valve position

Stainless steel fastenings and anodised externals – improved aesthetics and ease of maintenance

Foolproof location pin for correct end-cap assembly

One piece steel pinion drive with full width piston tooth engagement – for greater operational life

Compact failsafe same size as double-acting – minimises space requirements

Multi-spring failsafe concept ensures actuator operation in the unlikely event of spring fracture

Blow-out proof pinion – eliminates risk of pinion ejection even after pinion retaining ring is removed

Piston support rods with six bearings minimise internal wear and maximise performance life

Limit Stops (page 5)



Namur (VDI/VDE) end-cap solenoid mounting pattern – facilitates interchangeability of solenoids

Corrosion protected springs – for long service life

Balanced double rack & pinion – eliminates side loads

Unique unrestricted air flow through support rods gives fast operation speeds as standard – and **also provides greater safety (centre chamber cannot be pressurised with end caps removed)**

Multi-spring concept – provides variable torque/air pressure requirements from the same actuator

Long screws – to allow complete release of spring energy for safe removal of end caps when reconfiguring springs

Mounting to the ISO 5211 pattern allows for interchangeability of mounting kits.

Other Features and Benefits

Large range of sizes

Failsafe operation in a fire

Option for reversible direction of operation

No special tools required for maintenance

Standard operating temperature range of -20°C to +100°C

All parts sealed and greased for life

– For more efficient torque matching

– Polished support rods retain fire-safe capability even if bearings are fire damaged

– For failsafe open capability on butterfly valves

– Simple to maintain

– Increased applications

– No lubricated air supply required

Operating Principle

The Norbro 40R pneumatic actuator is based on the opposed double rack and pinion principle utilizing piston support rods to minimise friction and wear between pistons and body bore and transfer air between the chambers of the actuator.

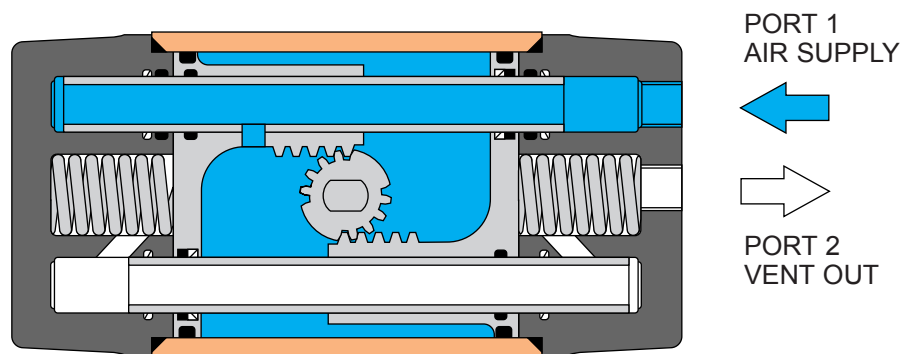
Double Acting Actuators

In the double acting model, compressed air is applied to Port 1, which is fed via the large bore support rod into the center chamber. This forces the pistons apart and turns the actuator's output drive anti-clockwise (seen from above) for valve opening, simultaneously venting the air in the end chambers via the second support rod through Port 2. This operation can be reversed by supplying air into Port 2 for clockwise rotation (valve closing).

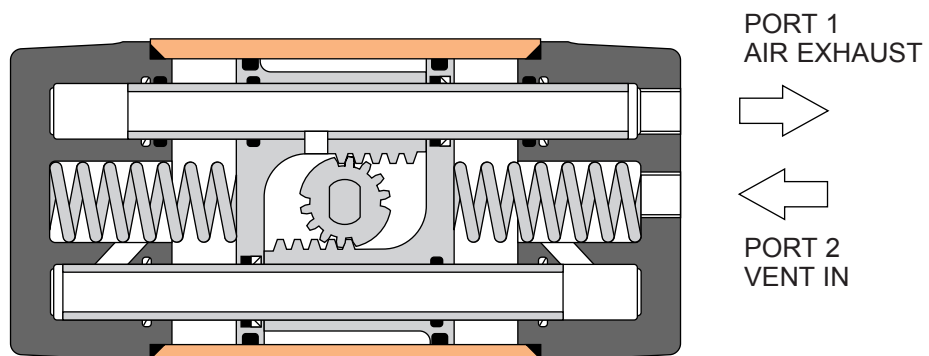
Spring Return Actuators

With the fail-safe spring return model, air is applied in a similar way to Port 1 for anti-clockwise operation (valve opening) and the movement of the pistons compresses the springs held in the end chambers of the actuator. This position will be maintained until air pressure is released when the spring force closes the pistons together for clockwise operation (valve closing).

NOTE: With the size 05 actuator, air is supplied and vented through the body of the actuator as its compact size makes the use of support rods impractical.



OPENING



CLOSING

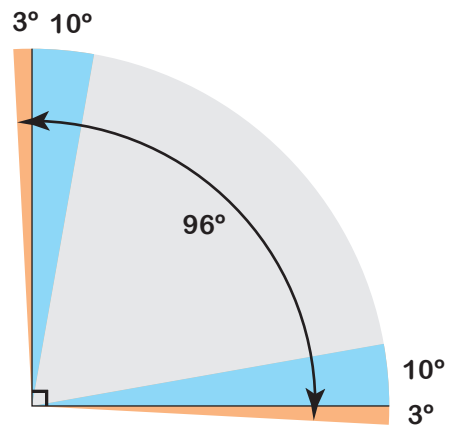
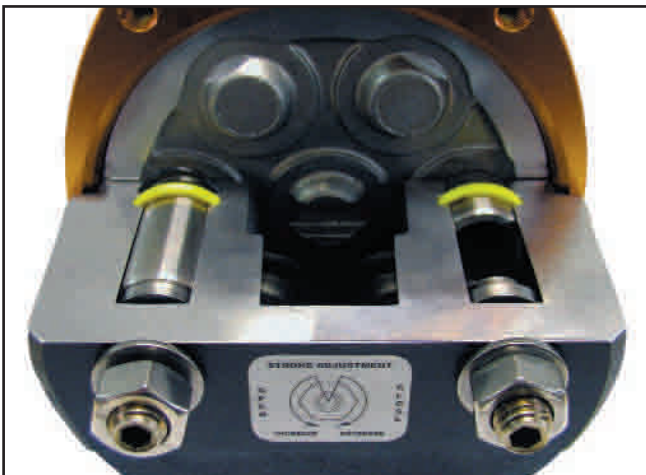
European Actuator

The inclusion of the actuator pinion output square dimensions in the new ISO 5211 standard, in addition to the VDE/VDI 3845 mounting standard, has led to a true European actuator. Norbro has adopted the 45° offset pinion drive in ISO 5211 (DIN 3337) and created the 'European Norbro' complying with all the mounting and attachment standards.

Limit Stops

Recognising the increasing need for accurate rotation adjustment on many applications within the process industry, Norbro have developed a unique method of providing this feature and it is now standard on the European version of the actuator.

The design takes advantage of the moving guiderods within the actuator and uses two stops in the endcap to limit their travel and therefore adjust the rotation of the actuator in both directions.



The design allows for a nominal rotation of 96° providing 3° of adjustable over travel at each end of the actuator stroke. The limit stop screws can also be used to adjust the under travel of the actuator by 10° at each end of the actuator stroke.

NOTE: The limit stop will only be supplied as standard on the 40R Series, sizes 10 to 42. For 40 Series, sizes 45 and 50, please contact our Technical Sales Office.

Actuator Sizing

When sizing a valve, we recommend that a factor of safety is applied to its nominal torque.

The torque tables detailed below provide actual torque values for the range of actuators at typical pressure and spring configurations. For more comprehensive sizing calculations the Norbro sizing program should be used (available on request).

Double Acting Actuators

For a given air supply pressure the double acting actuator provides a linear (constant) torque output throughout its rotation (see chart below).

Torque Output (Nm) – Double Acting Actuator

Size-Series	Operating Pressure (Bar)										
	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	7.0	8.0
05-40R				7	8	9	10	11	12	14	
10-40R	10	13	16	19	22	25	28	31	34	40	46
15-40R	20	26	31	37	43	49	54	60	66	77	88
20-40R	37	47	57	68	78	89	99	109	120	141	162
25-40R	61	78	96	113	131	148	165	183	200	235	270
30-40R	100	129	157	186	214	243	272	300	329	386	443
33-40R	196	252	308	363	419	475	531	587	643	755	867
35-40R	240	309	377	446	515	583	652	720	789	926	1063
40-40R	383	492	602	711	821	931	1040	1149	1259	1478	1697
42-40R	665	854	1044	1234	1424	1615	1804	1993	2184	2564	2943
45-40	995	1280	1564	1847	2133	2418	2701	2984	3270	3840	4407
50-40	1539	1979	2419	2858	3299	3740	4179	4617	5058	5940	6818

Spring Return Actuators

The torque output of a spring return actuator declines throughout its rotation and therefore for both the spring and air stroke we specify a 'start' and 'end' torque. For air pressures below 5 bar the number of springs used in the actuator may need to be reduced to 'balance' the torque output of the spring stroke and air stroke.

When sizing spring return actuators it is important that the actuator has sufficient torque to open and close the valve. The table below shows the actuator torque related to the position of the valve for both fail closed (standard) and fail open operation.

Valve Position	Actuator Operation	
	Fail Closed	Fail Open
Break out from closed position	Air stroke - Start	Spring stroke - Start
Break in to open position	Air stroke - End	Spring stroke - End
Break out from open position	Spring stroke - Start	Air stroke - Start
Break in to closed position	Spring stroke - End	Air stroke - End

Torque Output (Nm) – Spring Return Actuator

Size-Series	Number of Springs	Spring Stroke		Air Stroke																	
				2.5 Bar		3.0 Bar		3.5 Bar		4.0 Bar		4.5 Bar		5.0 Bar		5.5 Bar		6.0 Bar		7.0 Bar	
		Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
05-40R	2	4.7	3.6					3.2	1.9	4.1	2.8	5.1	3.7	6.1	4.6						
	4	6	4.6											5.1	3.4	6	4.2	7	5.1		
10-40R	4	8	5	9	6	12	8														
	6	12	7			10	5	12	7	15	10										
	8	16	10							13	6	16	9	18	11						
	10	20	12											16	8	19	10	22	13	27	18
15-40R	4	13	8	18	13	24	18														
	6	20	13			20	12	25	17	30	22										
	8	26	17							26	16	31	21	37	26						
	10	33	21											33	20	38	25	43	30	54	40
20-40R	4	24	15	34	24	43	33														
	6	36	24			36	22	46	31	55	40										
	8	47	31							48	29	57	38	67	48						
	10	59	38									50	27	59	36	69	46	79	55	99	73
25-40R	4	43	26	55	37	72	52														
	6	64	39			59	32	75	47	91	63										
	8	86	53							78	43	94	58	111	73						
	10	107	66											98	53	114	69	130	84	163	115
30-40R	4	69	42	92	62	119	87														
	6	103	63			98	54	125	80	151	105										
	8	138	84							130	72	157	98	184	123						
	10	172	105											163	91	190	116	217	141	270	192
33-40R	4	142	91	171	113	224	163														
	6	213	136			178	96	231	145	283	195										
	8	284	182							238	127	290	177	343	226						
	10	356	227											297	159	350	209	402	258	510	357
35-40R	4	164	105	217	149	281	210														
	6	246	158			228	132	293	193	357	254										
	8	328	210							304	176	369	237	433	298						
	10	410	263											381	220	445	281	509	342	638	463
40-40R	4	281	169	345	219	447	316														
	6	421	253			363	184	465	281	568	377										
	8	562	337							483	245	586	342	689	439						
	10	702	422											604	306	707	403	810	500	1015	694
42-40R	4	496	293	598	372	776	540														
	6	744	439			629	306	807	474	985	642										
	8	992	585							839	408	1017	576	1195	744						
	10	1240	731											1049	510	1227	678	1404	846	1761	1182
45-40	8	690	357	976	607	1242	859														
	12	1035	535			1064	532	1330	785												
	16	1380	714					1152	459	1419	711	1685	962								
	20	1725	892									1507	636	1773	888	2040	1140				
	24	2070	1071											1595	562	1861	814	2128	1066	2661	1569
50-40	8	1090	552	1510	918	1923	1307														
	12	1635	827	1235	403	1647	793	2059	1182												
	16	2180	1103					1783	667	2196	1057	2608	1446								
	20	2725	1379									2332	931	2745	1321	3157	1710				
	24	3270	1654											2469	806	2881	1196	3294	1585	4119	2364

Double Acting Actuators

Pressure Limitation	8.3 bar Maximum. For higher pressures contact our sales office.
Media	Air or non-corrosive fluid
Temperature range	Standard -20°C to +100°C Low temperature variant -40°C to +85°C High temperature variant -20°C to +150°C
Operation	Pinion rotates anti-clockwise when the (viewed from) the top) centre chamber supply port (RHS) is pressurised (see Page 4)

Rotation Options

UK Norbro	Nominal 92° total travel including nominal 1° overtravel both clockwise and anti-clockwise.
European Norbro	Nominal 96° total travel including nominal 3° adjustable overtravel and adjustable 10° undertravel both clockwise and anti-clockwise.
Special	180°, 120° - Series 33. For further options consult the Sales Office.

Operating Speeds (Seconds) – Actuator with no load – using Solenoid Control Valve – 5.5 bar

Size-Series	05-40R	10-40R	15-40R	20-40R	25-40R	30-40R	33-40R	35-40R	40-40R	42-40R	45-40	50-40
Double Acting Open and Close	0.1	0.2	0.3	0.5	0.6	1.1	2.1	2.9	4.4	7	11	19
Spring Return Spring Stroke (Closed)	0.1	0.2	0.3	0.5	0.6	1	1.7	2.2	3.4	4.6	6.8	10
Spring Return Air Stroke (Open)	0.1	0.2	0.3	0.5	0.9	1.4	2.7	3.5	5.7	9.9	15	24

Speeds other than those given above are obtainable if required by using additional control equipment.

NOTE: These times for the actuator are typical and can vary under actual operating conditions.

They are given as a guide only.

Air Consumption per Stroke – Actual Volume – Litres

Size-Series	05-40R	10-40R	15-40R	20-40R	25-40R	30-40R	33-40R	35-40R	40-40R	42-40R	45-40	50-40
Anti-Clockwise	0.05	0.17	0.35	0.69	1.22	1.86	3.39	3.93	6.73	12.0	13.51	23.87
Clockwise (D.A.only)	0.05	0.22	0.39	0.74	1.31	2.05	4.79	5.54	8.19	13.89	20.0	30.5

To obtain Free Air Displacement (FAD) Volume, multiply actual volumes by absolute working pressure (bar A).

Weight – Kgs

Size-Series	05-40R	10-40R	15-40R	20-40R	25-40R	30-40R	33-40R	35-40R	40-40R	42-40R	45-40	50-40
Double Acting	0.7	1.3	2.7	4.5	7.4	11.0	22.5	26.0	43.6	71.8	97.0	138.0
Spring Return	0.8	1.6	3.1	5.5	8.4	12.0	26.0	30.0	48.6	80.6	115.0	161.0

Accessories and Options



Norbro's unique end-mounted J-switch enclosure is suitable for any standard 40R actuator (except size 05). Not available with limit stop version.



A wide range of ancillary equipment can be fitted to meet the most exacting customer requirements. This is an area where Flowserve has considerable experience and we would be pleased to discuss any process problems.



- **Geared Override**

A retro fittable gearbox is available for manual operation of the valve when power is lost.

- **Fast Acting**

Modifications for quicker opening/closing speeds.

- **Protective Coatings**

Various coatings (eg Epoxy, PVC, etc.) are available for marine, hygienic and spark inhibition applications.

- **Hydraulic Operation**

Complete range available for operation with hydraulic fluids at pressure, temperature and torque conditions corresponding to normal air supply.

Mounting Configurations (all dimensions in mm)

Actuator / Valve Interface



EUROPEAN
NORBRO



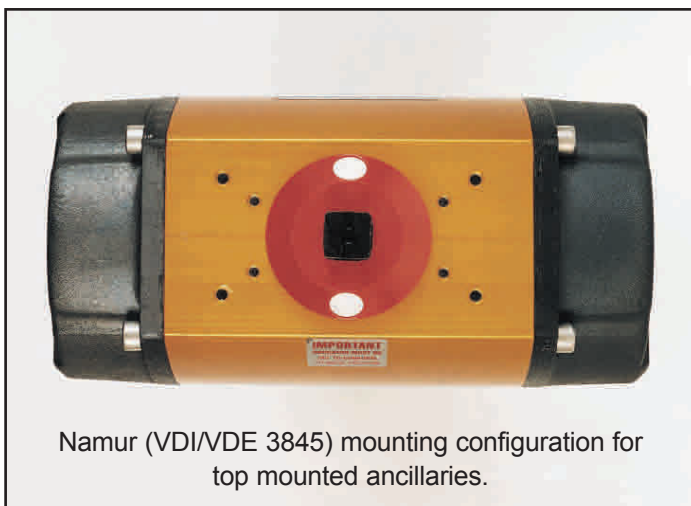
Size-Series	Mounting/Output
05-40R	F03 x 9.00 sq
10-40R	F04 x 11.00 sq
15-40R	F05 x 14.00 sq
20-40R	F07 x 17.00 sq
25-40R	F07 x 17.00 sq
30-40R	F10 x 22.00 sq
33-40R	F12 x 27.00 sq
35-40R	F12 x 27.00 sq
40-40R	F14 x 36.00 sq
42-40R	F16 x 46.00 sq
45-40	F16 x 46.00 sq
50-40	F25 x 55.00 sq



UK
NORBRO

Size-Series	Mounting/Output
05-40R	F03 x 9.00 sq
10-40R	F04 x 11.10 sq
15-40R	F05 x 14.27 sq
20-40R	F07 x 14.27 sq
25-40R	F07 x 19.05 sq
30-40R	F10 x 19.05 sq
33-40R	F12 x 25.40 sq
35-40R	F12 x 25.40 sq
40-40R	F14 x 28.57 sq
42-40R	F16 x 46.00 sq
45-40	Norbro x 44.45 sq
50-40	Norbro x 44.45 sq

Top Mount Interface

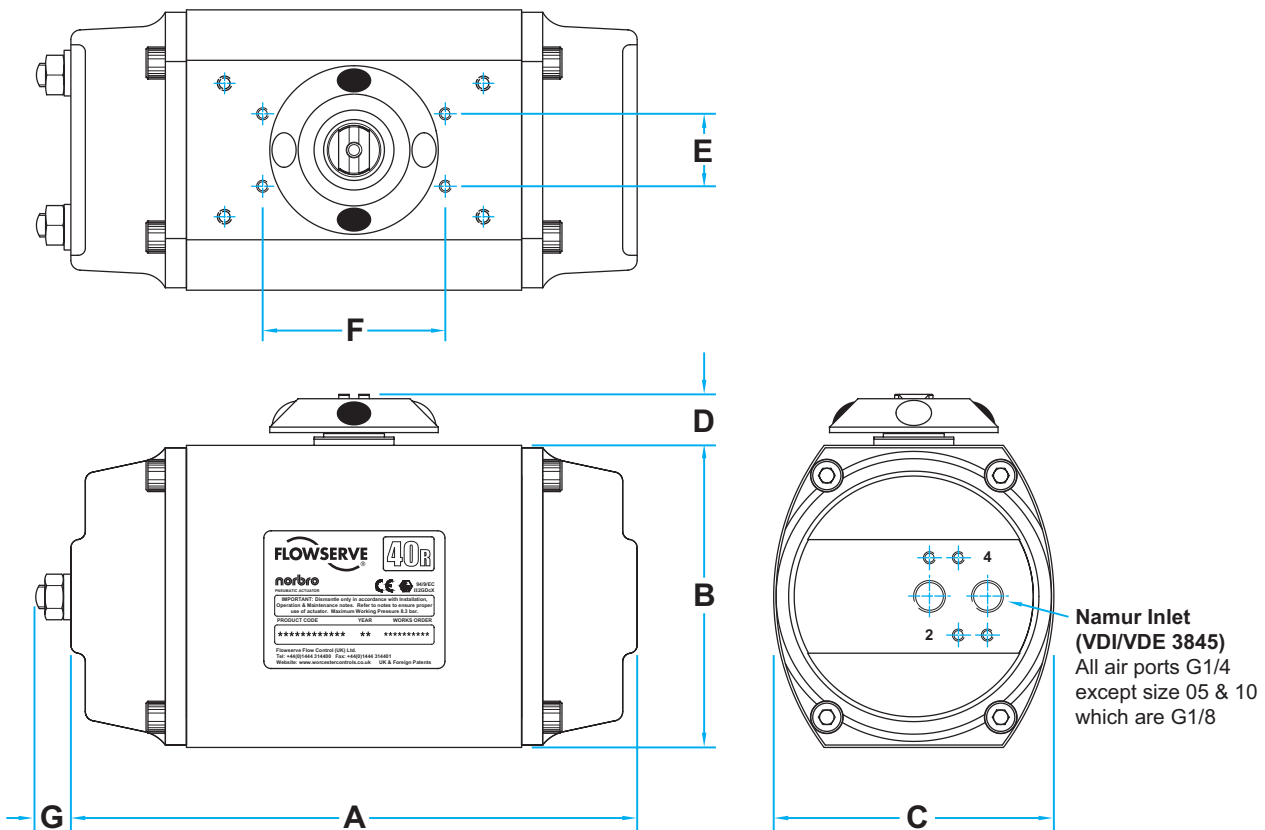


UK &
EUROPEAN
NORBRO



Parts List / Materials Specification

Description	Material/Finish	Description	Material/Finish
Body	Aluminium (Extrusion) Anodised	'O' Rings	Nitrile Rubber
Pinion	Carbon Steel (Corrosion Resistant Coated)	End Cap Screws	Stainless Steel
Pistons	Aluminium	Springs	Chrome Silicon Steel (Corrosion Resistant Coated)
End Caps	Aluminium Anodised	Position Indicator	Polyethylene
Support Rods	Stainless Steel	Limit Stops	Stainless Steel
Bearings	Acetal	Thread Seal	Bonded Nitrile + Corrosion Resistant Steel



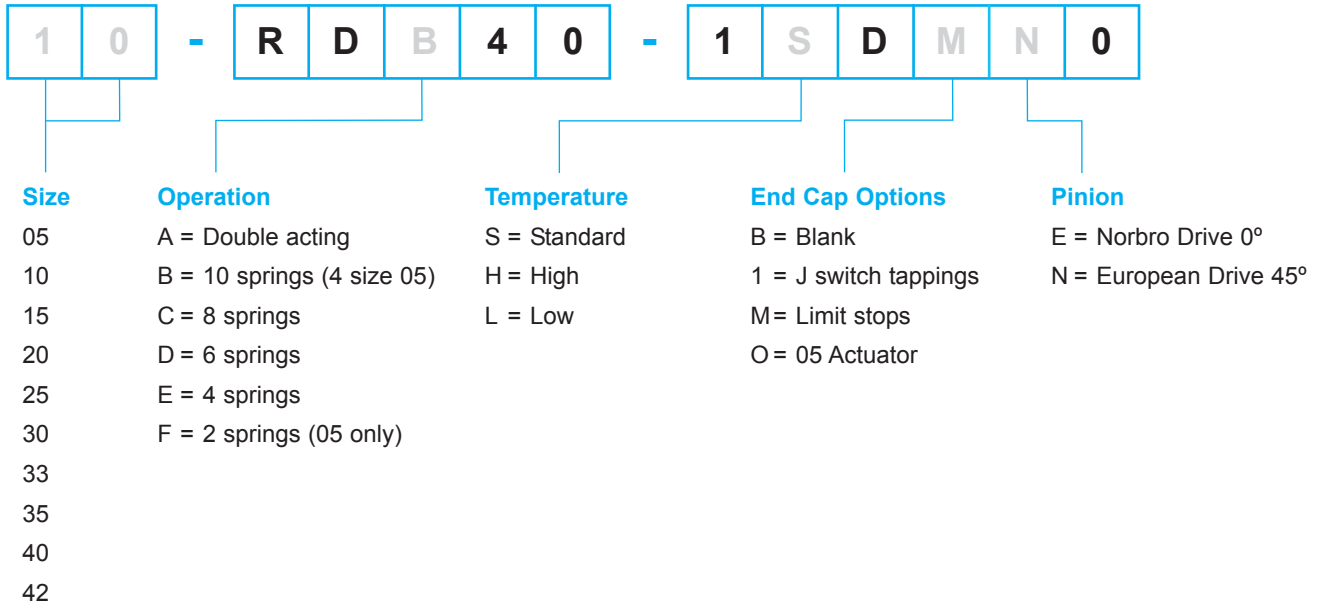
Dimensions (mm)

Series-Size	Length A	Height B	Width C	D	VDI/VDE 3845		Limit Stop (Max) G
					E	F	
05-40R	138*	70	67	-	-	-	-
10-40R	155	86	77	20	30	80	13
15-40R	194	104	94	20	30	80	13
20-40R	235	125	116	20	30	80	15
25-40R	270	147	136	30	30	80	15
30-40R	325	168	155	30	30	80	20
33-40R	397	214	206	30	30	80	20
35-40R	422	217	213	30	30	80	35
40-40R	508	276	245	50	30	130	25
42-40R	616	316	283	50	30	130	35
45-40	576	374	335	50	30	130	30
50-40	626	424	388	50	30	130	30

* Spring Return Version - Double Acting Length is 106mm

Basic Coding on Norbro 40R Pneumatic Actuators

(For full details of 40R coding and 40 Series coding please contact Norbro technical sales)



Variants



Norbro's Series 61 two-stage actuator is designed for drum filling applications.



The Series 33 180° actuator provides the perfect solution for Worcester's range of multi-ported valves.