


Double Acting (air to air) and Single Acting (spring return), 90° operation, pneumatic actuators

General Applications

For remote control of any quarter turn application, for example Ball, Butterfly or Rotary Plug Valves, Dampers etc.

Features

- Compact rack and pinion design utilising the whole piston area to develop output torque.
- Pistons with integral rack drive reducing the number of dynamic seals, minimising air leakage.
- Double pistons nullify sideloads on the pinion shaft, minimising bearing wear.
- Springs epoxy painted and colour coded for additional corrosion protection and ease of identification.
- Hard anodised aluminium body, with external ESPC finish, protects against corrosive environments including saliferous atmospheres.
- Female output drive enabling direct mounting in certain applications, thereby eliminating special connections and guaranteeing correct alignment.
- Bottom entry pinion shaft.
- Anti-friction piston pads ensuring no metal to metal contact, providing a smooth operation. Ideal for modulating or on/off control applications.
- Adjustable travel stops in both directions on certain models.
- Grease lubricated for life.
- ATEX certified  II 2 GD.



Accessories

An extensive range of standard accessories is available for direct mounting to Keystone actuators.

- Solenoid Valves - weatherproof, explosionproof or intrinsically safe.
- Limit Switchboxes - weatherproof, explosionproof or intelligent.
- Positioners - pneumatic, electro-pneumatic or intelligent.
- Declutchable manual override gearbox.
- High Visibility Indicator.
- Proximity sensing - weatherproof intrinsically safe, or intelligent.

Technical Data

Max. supply pressure : 10 barg

Rated supply pressure : 8.3 barg

Output torque at 5.5 barg

Double Acting models : up to 2054 Nm

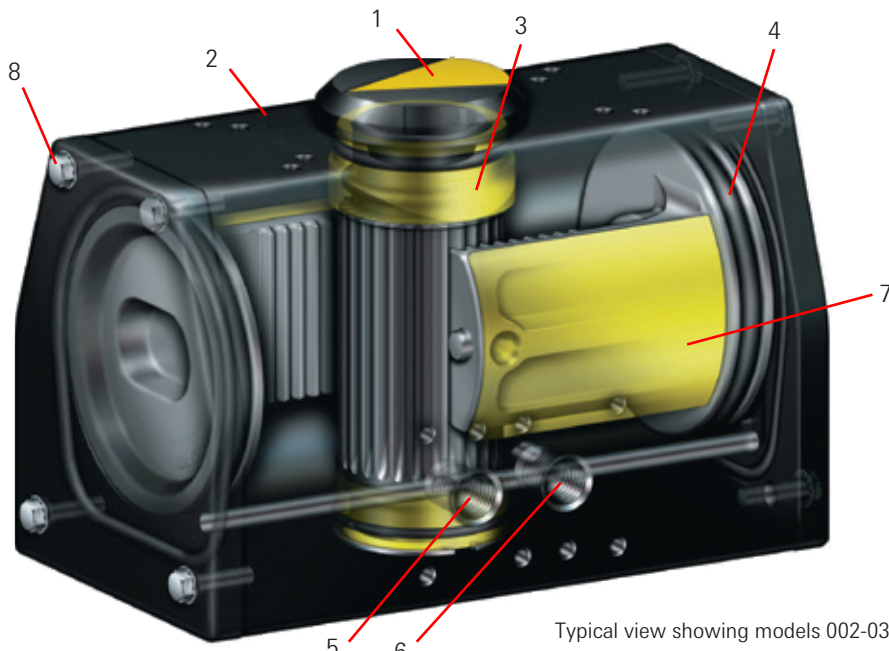
Spring Return models : up to 1414 Nm

Temperature range : -30° to +90°C*
with standard components.

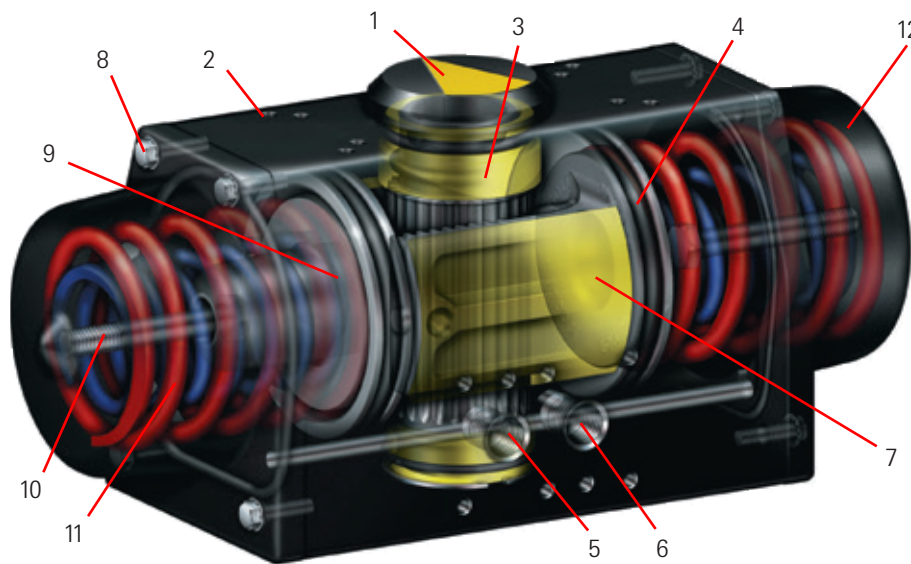
* An extended temperature range from -30°C to +150°C is available on request.

Figure 79U/E Pneumatic Actuator models 002 to 180

Model 002 to 036



Typical view showing models 002-036



Typical view showing models 002-036 (Representation only, spring colours may differ)

Double Acting and Spring Return Pneumatic Actuators incorporating mounting flange configurations to Keystone or ISO 5211 Standards.

79U - Keystone Standard
79E - ISO 5211 Standard

1. Position indicator/dust cover
2. Precision extruded body, hard anodised for maximum environmental protection
3. Engineered polymer bearings give maximum efficiency and eliminate galvanic corrosion
4. Piston seals
5. Air supply to close (port B)
6. Air supply to open (port A)
7. Anti-friction piston pads
8. Stainless steel fasteners
9. Retaining cone *
10. Retaining bolt *
11. Springs *
12. End cap

*Spring Return models only

Materials of Construction

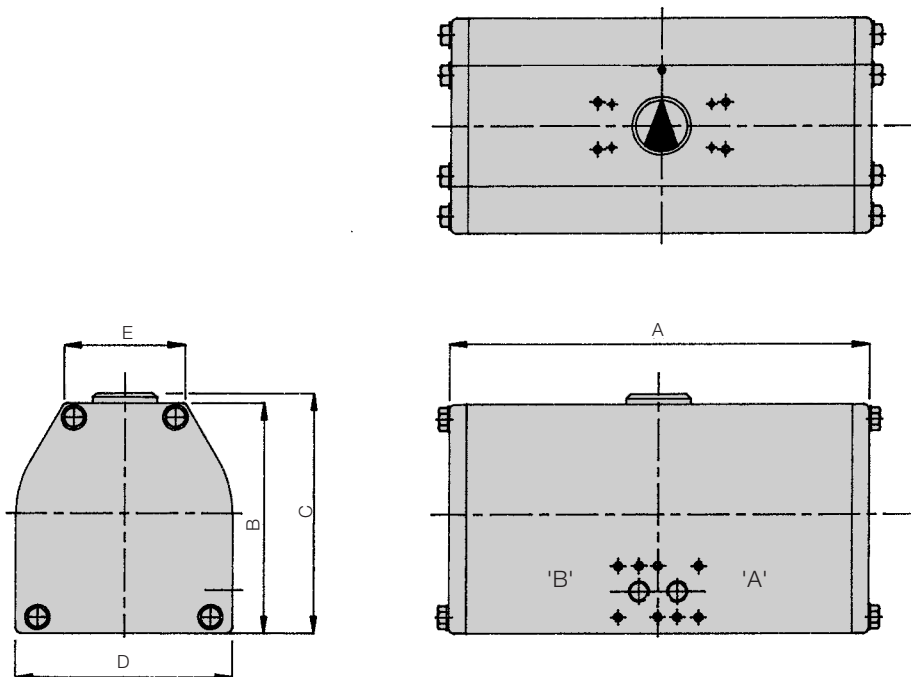
Part	Material	British Standard	Equivalent Standard
Body	Extruded aluminium hard anodised & ESPC*	BS1474 (6000 series)	DIN 3.3206.51
Endcaps	Die cast aluminium LM6 or LM24 anodised & ESPC*	BS1490	DIN 1725 - 230 or 226
Piston (002/003) (Other models)	Glass filled nylon 66 Die cast aluminium LM6 or LM24 anodised	BS1490	DIN 1725 - 230 or 226
Pinion (002 only) (Other models)	Glass filled nylon 66 Carbon steel (sealbond - N coated)	BS970 080M40	C40
Spring	Spring steel	BS5216 HS3	DIN 17223 Pti
Cone	Die cast aluminium LM6	BS1490	DIN 1725
Bearings	Engineered Polymer		
Travel Stops	Stainless steel A2/70	BS970 Part 3 - 304/305	DIN 267 Part 3
Bellhof Nut	Carbon steel (Zinc Plated)		
O-Rings	Nitrile		
Fasteners	Stainless steel A2/70	BS970 Part 3 - 304/305	DIN 267 Part 3

* Electro Static Powder Coating

Notes

1. A comprehensive range of double D and square adaptors are available.
2. Actuators can be mounted to valves in line or transversely.
3. Abbreviations - SB - small bore / LB - large bore.
4. Mounting codes CAG/CAH/XAB are only available on this model with the use of a 19 mm thick mounting plate.
5. F07 mounting is only available on this model with the use of a 12 mm thick mounting plate.
6. Mounting dimension at base of model 180 is 190 mm.
7. F12 mounting is only available on this model with the use of a 19 mm thick mounting plate.
8. Drive details obtained using appropriate adaptors.
9. Maximum distance of the travel stop should extend when setting the travel range of the actuator.

Line drawings Fig. 79U/E - models 002 to 036



Line drawings Fig. 79U/E - models 065, 090 and 180

Note: Dim 'X' for -
Models 065 to 091 = 35 mm
Model 180 = 40 mm

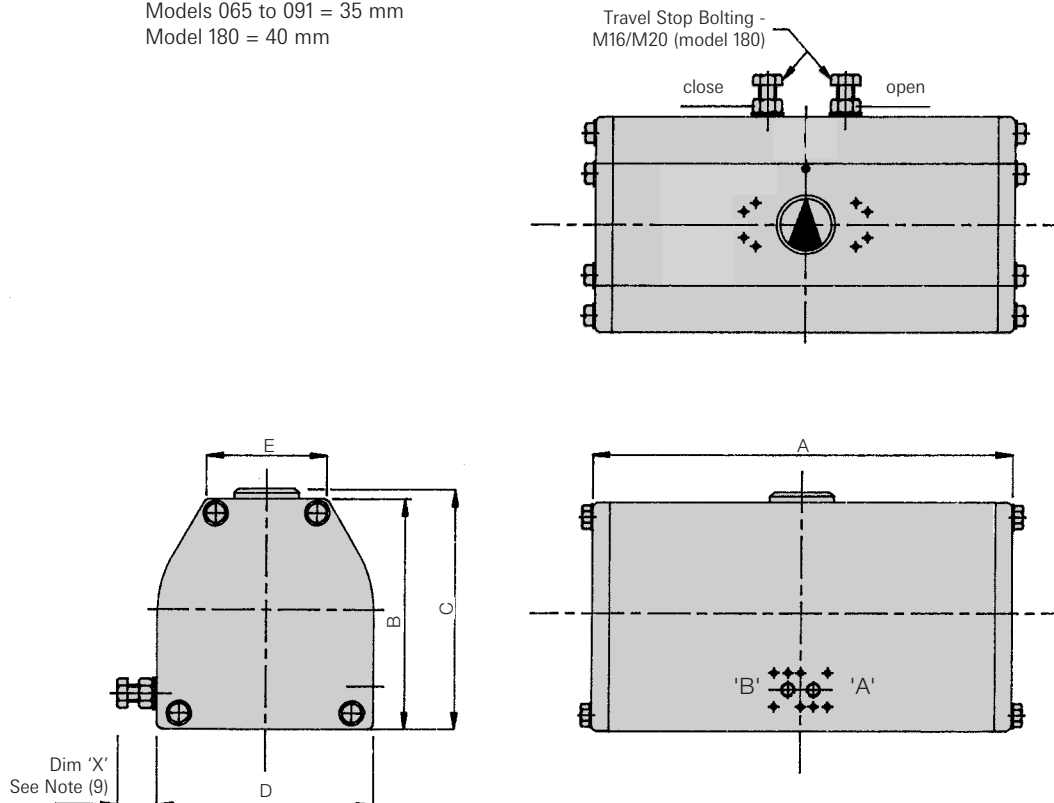


Figure 79U/E Pneumatic Actuator models 002 to 180

Actuator dimensions Fig. 79U (with Keystone standard mounting)

Type	A	B	C	D	E	G ⁽⁹⁾	Bottom Shaft Hole		Keyway	Keystone Mounting Compatibility Code (see table on page 6)	Mass Kg.
							J (see table on page 7)	K			
79U-002	117	81	90	80	54	-	9.5 Dia. x 6.4 A/F ⁽⁸⁾	14.3 Dia. x 9.5 A/F ⁽⁸⁾	-	XAD	1.2
79U-003	140	81	90	80	54	-	20.7 Dia. x 21.8		4.8	XAD/BAD	1.6
79U-006	167	103	112	93	57	-	25.5 Dia. x 27.0		6.4	BAD	3.2
79U-012	181	127	136	112	82	-	25.5 Dia. x 27.0		6.4	BAD	5.4
79U-024	233	150	159	136	84	-	28.6 Dia. x 31.7		6.4	BAD/CAE	10.0
79U-036	273	175	184	152	88	-	28.6 Dia. x 31.7		6.4	BAD/CAE	13.0
79U-065	325	217	226	203	114	35	28.6 Dia. x 31.7 SB		6.4	CAE/XAA/CAF	19.0
79U-066	325	217	226	203	114	35	35.0 Dia. x 38.5 LB		8.0	CAG	19.0
79U-090	409	217	226	203	114	35	41.3 Dia. x 46.0 SB		9.5	CAH	29.0
79U-091	409	217	226	203	114	35	47.6 Dia. x 52.3 LB		12.7	XAG/DAJ/CAG	29.0
79U-180	481	268	277	250	130	40	47.6 Dia. x 52.3 SB		12.7	XAG/DAJ/CAG ⁽⁴⁾	45.0
79U-181	481	268	277	250	130	40	57.2 Dia. x 61.9 LB		12.7	DAK/CAH(4)/XAB ⁽⁴⁾	45.0

See notes on previous page

Actuator dimensions Fig. 79E (with ISO 5211 mounting)

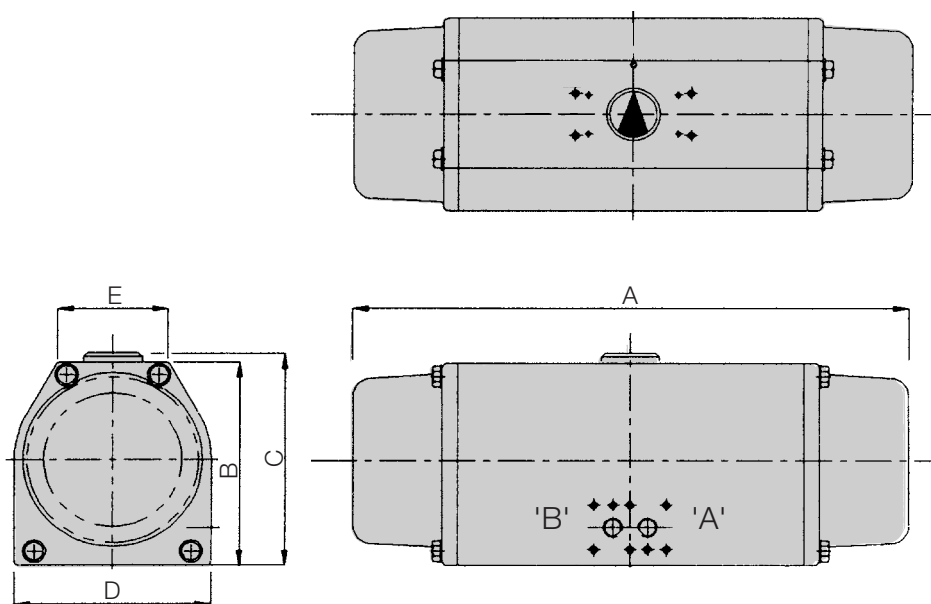
Type	A	B	C	D	E	G ⁽⁹⁾	Bottom Shaft Hole		Keyway	Mounting Flange Type	Mass Kg.
							J	K			
79E-002	117	81	90	80	54	-	16 x 11 A/F		-	F05	1.2
79E-003	140	81	90	80	54	-	20.7 Dia. x 21.8		4.8	F05/ F07	1.6
79E-006	167	103	112	93	57	-	25.5 Dia. x 27.0		6.4	F05/F07	3.2
79E-012	181	127	136	112	82	-	25.5 Dia. x 27.0		6.4	F07	5.4
79E-024	233	150	159	136	84	-	25.0 Dia. x 18 A/F		-	F07/F12	10.0
79E-036	273	175	184	152	88	-	30.0 Dia. x 22 A/F		-	F07 ⁽⁵⁾ /F12	13.0
79E-065	325	217	226	203	114	35	35.0 Dia. x 38.5		10.0	F12	19.0
79E-090	409	217	226	203	114	35	50.0 Dia. x 54.0		14.0	F12/F16	29.0
79E-180	481	268	277	250	130	40	50.0 Dia. x 54.0		14.0	F12 ⁽⁷⁾ /F16 ⁽⁶⁾	45.0

See notes on previous page

Notes

1. A comprehensive range of double D and square adaptors is available.
2. Actuators can be mounted to valves in line or transversely.
3. Abbreviations - SB - small bore / LB - large bore.
4. Mounting codes CAG/CAH/XAB are only available on this model with the use of a 19 mm thick mounting plate.
5. F07 mounting is only available on this model with the use of a 12 mm thick mounting plate.
6. Mounting dimension at base of model 180 is 190 mm.
7. F12 mounting is only available on this model with the use of a 19 mm thick mounting plate.
8. Drive details obtained using appropriate adaptors.
9. Maximum distance of the travel stop should extend when setting the travel range of the actuator.

Line drawings Fig. 79U/E - models 002S to 036S



Line drawings Fig. 79U/E - models 065S, 090S and 180S

Note: Dim 'X' for -
 Models 065 to 091 = 35 mm
 Model 180 = 40 mm

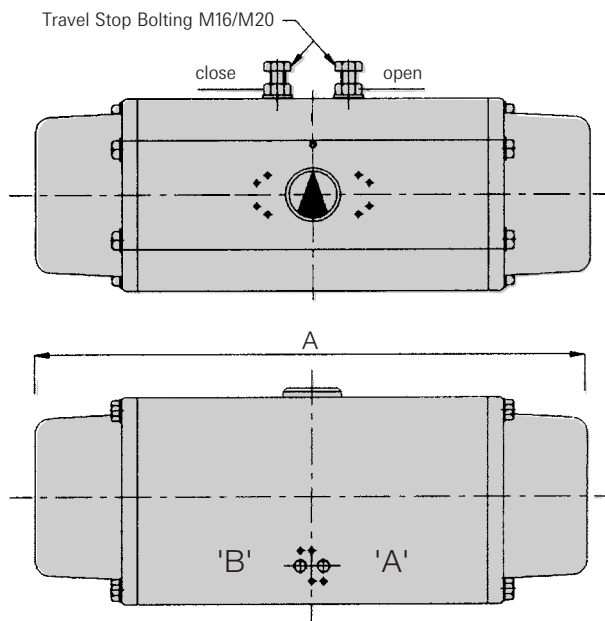
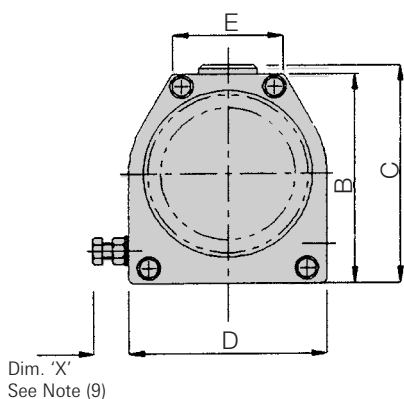


Figure 79U/E Pneumatic Actuator models 002 to 180

Actuator dimensions Fig. 79U (with Keystone standard mounting)

Type	A	B	C	D	E	G ⁽⁹⁾	Bottom Shaft Hole		Keyway	Keystone Mounting Compatibility Code (see table below)	Mass Kg.
							J	K			
							(see table on page 7)				
79U-002S	186	81	90	80	54	-	9.5 Dia. x 6.4 A/F ⁽⁸⁾		-	XAD	1.6
							14.3 Dia. x 9.5 A/F ⁽⁸⁾				
79U-003S	216	81	90	80	54	--	20.7 Dia. x 21.8		4.8	XAD/BAD	2.0
79U-006S	257	103	112	93	57	-	25.5 Dia. x 27.0		6.4	BAD	4.0
79U-012S	282	127	136	112	82	-	25.5 Dia. x 27.0		6.4	BAD	7.5
79U-024S	351	150	159	136	84	-	28.6 Dia. x 31.7		6.4	BAD/CAE	14.7
79U-036S	422	175	184	152	88	-	28.6 Dia. x 31.7		6.4	BAD/CAE	19.5
79U-065S	500	217	226	203	114	35	28.6 Dia. x 31.7 SB		6.4	CAE/XAA/CAF	34.0
79U-066S	500	217	226	203	114	35	35.0 Dia. x 38.5 LB		8.0	CAG	34.0
79U-090S	584	217	226	203	114	35	41.3 Dia. x 46.0 SB		9.5	CAH	45.0
79U-091S	584	217	226	203	114	35	47.6 Dia. x 52.3 LB		12.7	XAG/DAJ/CAG	45.0
79U-180S	694	268	277	250	130	40	47.6 Dia. x 52.3 SB		12.7	XAG/DAJ/CAG ⁽⁴⁾	72.0
79U-181S	694	268	277	250	130	40	57.2 Dia. x 61.9 LB		12.7	DAK/CAH ⁽⁴⁾ /XAB ⁽⁴⁾	72.0

See notes on previous page

Actuator dimensions Fig. 79E (with ISO 5211 mounting)

Type	A	B	C	D	E	G ⁽⁹⁾	Bottom Shaft Hole		Keyway	Mounting Flange Type	Mass Kg.
							J	K			
79E-002S	186	81	90	80	54	-	16 x 11 A/F		-	F05	1.6
79E-003S	216	81	90	80	54	-	20.7 Dia. x 21.8		4.8	F05/F07	2.0
79E-006S	257	103	112	93	57	-	25.5 Dia. x 27.0		6.4	F05/F07	4.0
79E-012S	282	127	136	112	82	-	25.5 Dia. x 27.0		6.4	F07	7.5
79E-024S	351	150	159	136	84	-	25.0 Dia. x 18 A/F		-	F07/F12	14.7
79E-036S	422	175	184	152	88	-	30.0 Dia. x 22 A/F		-	F07 ⁽⁵⁾ /F12	19.5
79E-065S	500	217	226	203	114	35	35.0 Dia. x 38.5		10.0	F12	34.0
79E-090S	584	217	226	203	114	35	50.0 Dia. x 54.0		14.0	F12/F16	45.0
79E-180S	694	268	277	250	130	40	50.0 Dia. x 54.0		14.0	F12 ⁽⁷⁾ /F16 ⁽⁶⁾	72.0

See notes on previous page

Mounting flange dimension details

Keystone Mounting Compatibility Codes	PCD	Bolt Holes
XAD	44.45	4 x M6 x 10 Dp.
BAD	82.6	4 x M10 x 13 Dp.
CAE	127.0	4 x M12 x 16 Dp.
CAF	127.0	4 x M12 x 16 Dp.
CAG	127.0	4 x M12 x 19 Dp.
CAH	127.0	4 x M12 x 19 Dp.
XAA	127.0	4 x M12 x 16 Dp.
XAB	127.0	4 x M12 x 19 Dp.
DAJ	165.0	4 x M20 x 25 Dp.
DAK	165.0	4 x M20 x 25 Dp.
XAG	165.0	4 x M20 x 25 Dp.

ISO Mounting Types	PCD	Bolt Holes
F05	50.0	4 x M6 x 10 Dp.
F07	70.0	4 x M8 x 13 Dp.
F10	102.0	4 x M10 x 15 Dp.
F12	125.0	4 x M12 x 19 Dp.
F14	140.0	4 x M16 x 25 Dp.
F16	165.0	4 x M20 x 25 Dp.

Notes

1. Refer to dimension tables on page 4 and this page to identify the relevant mounting flange configuration.
2. The compatibility codes also refer to the bore and key of the pinion drive in order to accommodate Keystone valve shaft and topworks details.

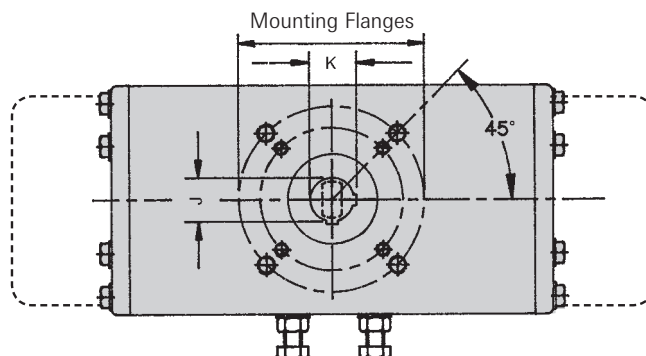
Actuator pinion top drive details

Fig. 79U/E - all models - Double Acting or Spring Return

Model	Figure 79U (Keystone)			Figure 79E (ISO 5211)		
	J	K	Keyway	J	K	Keyway
002	16 Dia. x 11 A/F	-	-	16 Dia. x 11 A/F	-	-
003	20.7 Dia. x 21.8	4.8	4.8	20.7 Dia. x 21.8	4.8	4.8
006	25.5 Dia. x 27.0	6.4	6.4	25.5 Dia. x 27.0	6.4	6.4
012	25.5 Dia. x 27.0	6.4	6.4	25.5 Dia. x 27.0	6.4	6.4
024	28.6 Dia. x 31.7	6.4	6.4	28.6 Dia. x 31.7	6.4	6.4
036	28.6 Dia. x 31.7	6.4	6.4	28.6 Dia. x 31.7	6.4	6.4
065/066	28.6 Dia. x 31.7	6.4	6.4	28.6 Dia. x 31.7	6.4	6.4
090/091	28.6 Dia. x 31.7	6.4	6.4	28.6 Dia. x 31.7	6.4	6.4
180/181	28.6 Dia. x 31.7	6.4	6.4	28.6 Dia. x 31.7	6.4	6.4

Note: A comprehensive range of adaptors is available, where required, to convert all pinion top drive details to the standard Keystone top mounted accessory drive of 16 x 11 A/F

Actuator pinion bottom drive details



Model	Figure 79U (Keystone)			Figure 79E (ISO 5211)		
	Bottom Shaft Hole		Keyway	Bottom Shaft Hole		Keyway
	J	K		J	K	
002	9.5 Dia. A/F x 6.4 A/F ⁽⁸⁾	-	-	16 Dia. x 11 A/F	-	-
	14.3 Dia. A/F x 9.5 A/F ⁽⁸⁾					
003	20.7 Dia. x 21.8	4.8	4.8	20.7 Dia. x 21.8	4.8	4.8
006	25.5 Dia. x 27.0	6.4	6.4	25.5 Dia. x 27.0	6.4	6.4
012	25.5 Dia. x 27.0	6.4	6.4	25.5 Dia. x 27.0	6.4	6.4
024	28.6 Dia. x 31.7	6.4	6.4	25.0 Dia. x 18 A/F	-	-
036	28.6 Dia. x 31.7	6.4	6.4	30.0 Dia. x 22 A/F	-	-
065	28.6 Dia. x 31.7 SB	6.4	6.4	35.0 Dia. x 38.5	10.0	10.0
066	35.0 Dia. x 38.5 LB	8.0	8.0			
090	41.3 Dia. x 46.0 SB	9.5	9.5	50.0 Dia. x 54.0	14.0	14.0
091	47.6 Dia. x 52.3 LB	12.7	12.7			
180	47.6 Dia. x 52.3 SB	12.7	12.7	50.0 Dia. x 54.0	14.0	14.0
181	57.2 Dia. x 61.9 LB	12.7	12.7			

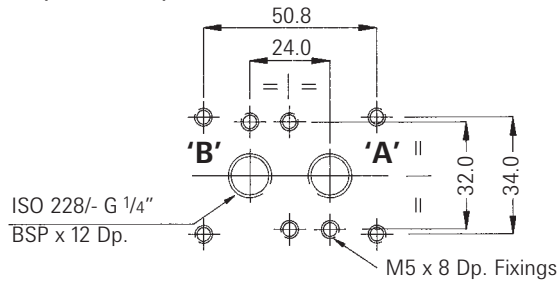
Note: A comprehensive range of adaptors for 79U/E is available to convert all pinion bottom drive details to suit all Keystone valve stems.

Figure 79U/E Pneumatic Actuator models 002 to 180

Actuator body drilling for solenoid mounting

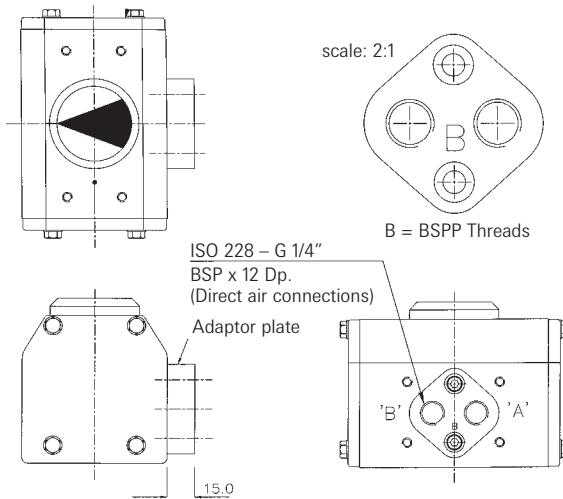
Port Hole Drillings - Fig. 79U/E (all models)

(See note 1 + 2)



Adaptor Plate

(see note 3)



Notes

1. Solenoid mounting dual drilled to suit Keystone standard and Namur standard. Diagram note:
air port hole 'B' - CLOSED
air port hole 'A' - OPEN
2. On Model 180 Drillings are aligned vertically (not horizontally, as shown) with Port A at top.
3. On sizes 002 and 003 an adaptor plate is supplied fitted as shown. This allows direct piping connections. Removal of this plate allows direct mounting of solenoid valve.

Actuator body top drillings for accessory mounting

Fig. 79U/E (models 065, 090, 180)

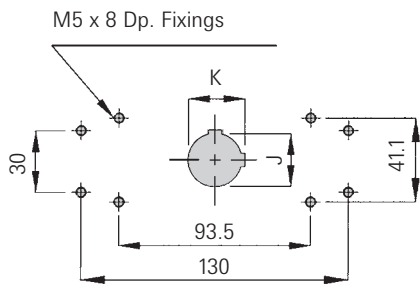
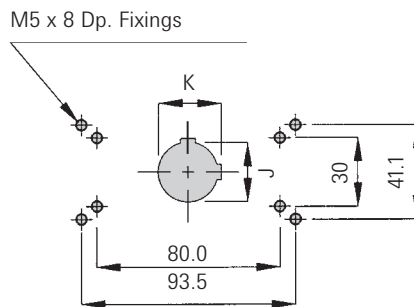
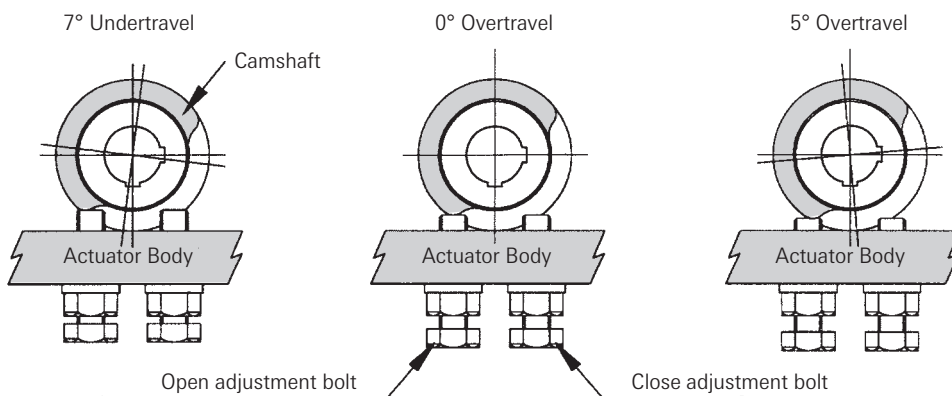


Fig. 79U/E (models 003 to 036) (for model 002 see note 5)



4. Top face dual drilled to suit Keystone and Namur (VDI/VDE 3845) Standard accessory mountings.
5. 79U/E Model 002 has Namur (VDI/VDE 3845) fixings only (80 x 30). An adaptor plate is available for conversion to Keystone Standard mounting details.
6. Dimensions K and J refer to Top Drive. Details shown in table on previous page.

Bi-directional travel stops of models 065 to 181



All views illustrated in the open position

Notes

1. Adjustable travel stops are fitted as standard to the following models:
79U/E - models 065 to 181
2. Adjustable stops on the centre of the body provide the flexibility of accurate valve rotational positioning at the end of the 'open' and 'close' stroke.
3. The total travel of 100 degrees allows for end of travel adjustment of 5 degrees over / 7 degrees under at both open and close positions.
4. Travel stops must not be used for manual override purposes.
5. Travel stops on actuators with reverse action require special build and must be specified at time of ordering.

Notes

- Operating times under no load, for air pressures of 5.5 barg (80 psi).
(Times based on actual measurements)
- All times obtained using a direct mounted NAMUR solenoid valve, 5/2 (DA) and 3/2 (SA), with a Cv of 0.97 and no exhaust restrictors, with 8.0 mm diameter air connections and piping.
- Total time is defined as time required from energising/de-energising Solenoid Valve to completion of 90° stroke.
- Times for Single Acting Actuators are for Fail Close.

Actuator operating times (seconds)

Double Acting models

Actuator	Moving Time		Total Time	
	Opening	Closing	Opening	Closing
002	0.050	0.050	0.060	0.060
003	0.050	0.050	0.060	0.060
006	0.075	0.080	0.080	0.090
012	0.120	0.130	0.160	0.200
024	0.220	0.250	0.420	0.450
036	0.300	0.350	0.550	0.600
065/066	0.550	0.600	1.100	1.200
090/091	0.700	0.900	1.500	1.700
180/181	1.600	1.700	2.800	2.850

Spring Return models

Actuator	Moving Time		Total Time	
	Opening	Closing	Opening	Closing
002S	0.070	0.070	0.080	0.080
003S	0.070	0.070	0.080	0.080
006S	0.070	0.070	0.130	0.080
012S	0.140	0.120	0.220	0.200
024S	0.750	0.250	1.000	0.350
036S	0.750	0.300	1.050	0.500
065S/066S	1.600	0.600	2.300	0.800
090S/091S	1.900	0.700	2.600	1.200
180S/181S	1.500	1.400	3.600	2.300

- Piston displacement is the total volume of pressurised air after the actuator has completed its stroke.

Actuator piston displacement (in litres)

Actuator	Open	Close
	(Double Acting and Spring Return)	(Double Acting only)
002	0.137	0.097
003	0.187	0.123
006	0.346	0.234
012	0.629	0.455
024	1.290	0.912
036	1.945	1.363
065/066	3.523	2.635
090/091	4.779	3.347
180/181	9.690	6.700

Standard spring colour codes

Spring Rating	Models 002S to 180S
40 psi - 2.8 bar	Light Blue (both ends)
50 psi - 3.5 bar	Light Blue (one end) White (other end)
60 psi - 4.2 bar	White (both ends)
70 psi - 4.8 bar	Light Blue/Dark Blue* White (other end)
80 psi - 5.5 bar	Light Blue/Dark Blue* (both ends)
90 psi - 6.2 bar	Light Blue/White* Light Blue/Dark Blue* (other end)
100 psi - 6.9 bar	Light Blue/White* (both ends)

* Nested (double) springs

Figure 79U/E Pneumatic Actuator
models 002 to 180

Output torques for double acting actuators in lb. in., air supply in psi						
Type	40	50	60	80	100	120
002	122	155	188	254	320	386
003	156	198	240	325	409	493
006	298	379	459	621	782	943
012	580	737	893	1207	1520	1834
024	1159	1472	1785	2411	3038	3664
036	1732	2200	2668	3604	4540	5476
065/066	3347	4252	5157	6966	8775	10585
090/091	4252	5401	6550	8848	11146	13444
180/181	8736	11097	13458	18180	22902	27624

Output torques for double acting actuators in Nm., air supply in psi (bar)						
Type	40 (2.7)	50 (3.4)	60 (4.1)	80 (5.5)	100 (6.9)	120 (8.3)
002	14	18	21	29	36	44
003	18	22	27	37	46	56
006	34	43	52	70	88	107
012	66	83	101	136	172	207
024	131	166	202	272	343	414
036	196	249	301	407	513	619
065/066	378	480	583	787	992	1196
090/091	480	610	740	1000	1259	1519
180/181	987	1254	1521	2054	2588	3121

Output torques for double acting actuators in Nm., air supply in bar						
Type	3	4	5	6	7	8
002	15	20	26	31	37	42
003	19	26	33	40	47	54
006	37	51	63	76	89	103
012	72	99	123	149	175	200
024	143	197	246	297	348	400
036	214	294	368	444	520	598
065/066	414	569	710	859	1006	1155
090/091	526	722	902	1091	1277	1467
180/181	1080	1484	1854	2241	2626	3015

Figure 79U/E Pneumatic Actuator models 002 to 180

Output torques for single acting actuators in Nm., air supply in bar

Actuator Mode	Spring Type(bar)	2.7		3.4		4.1		4.8		5.5		6.2		6.9		8.3		Spring only	
		start	end	start	end	start	end	start	end	start	end	start	end	start	end	start	end	start	end
002S	2.7	7	3	11	7	15	11	18	15	22	18	26	22	30	26	37	33	9	5
	3.4			9	5	13	8	17	12	20	16	24	20	28	23	35	31	12	7
	4.1					11	6	15	10	19	13	23	17	26	21	34	28	14	9
	4.8							13	7	17	11	21	14	25	18	32	26	17	10
	5.5									16	8	19	12	23	16	30	23	20	12
	6.2											18	9	21	13	29	20	22	14
	6.9													20	10	27	18	25	15
003S	2.7	9	4	14	9	19	14	23	19	28	23	33	28	38	33	47	43	12	7
	3.4			12	6	17	11	21	15	26	20	31	25	36	30	45	39	15	9
	4.1					14	7	19	12	24	17	29	22	34	26	43	36	18	11
	4.8							17	9	22	14	27	18	31	23	41	33	22	13
	5.5									20	10	25	15	29	20	39	29	25	15
	6.2											22	12	27	17	37	26	28	18
	6.9													25	13	35	23	32	20
006S	2.7	17	8	26	17	35	27	44	36	53	45	62	54	72	63	90	81	23	14
	3.4			22	11	31	20	40	29	49	38	58	47	67	57	86	75	29	18
	4.1					27	14	36	23	45	32	54	41	63	50	81	68	35	22
	4.8							32	17	41	26	50	35	59	44	77	62	42	27
	5.5									37	19	46	28	55	38	73	56	48	31
	6.2											42	22	51	31	69	49	54	35
	6.9													47	25	65	43	61	39
012S	2.7	31	16	49	33	67	51	84	69	102	86	120	104	138	122	173	157	45	29
	3.4			41	21	58	39	76	56	94	74	111	92	129	109	164	145	57	37
	4.1					50	26	67	44	85	61	103	79	121	97	156	132	70	46
	4.8							59	31	77	49	94	67	112	84	147	120	82	54
	5.5									68	36	86	54	103	72	139	107	95	63
	6.2											77	42	95	59	130	95	107	72
	6.9													86	47	122	82	119	80
024S	2.7	66	32	101	67	137	103	172	138	207	173	243	209	278	244	349	315	88	55
	3.4			85	42	120	78	156	113	191	149	226	184	262	219	333	290	113	71
	4.1					104	53	139	88	175	124	210	159	246	195	316	265	138	87
	4.8							123	64	158	99	194	134	229	170	300	241	163	103
	5.5									142	74	178	110	213	145	284	216	188	120
	6.2											161	85	197	120	267	191	212	136
	6.9													180	95	251	166	237	152
036S	2.7	99	50	151	103	204	156	257	209	310	261	363	314	416	367	522	473	130	81
	3.4			127	66	180	119	233	172	286	225	339	278	392	331	497	437	166	106
	4.1					156	83	209	136	262	189	314	242	367	294	473	400	203	130
	4.8							184	99	237	152	290	205	343	258	449	364	239	154
	5.5									213	116	266	169	319	222	425	327	276	178
	6.2											242	132	294	185	400	291	312	203
	6.9													270	149	376	254	348	227
065S/066S	2.7	190	92	292	194	394	296	497	398	599	501	701	603	803	705	1008	910	256	158
	3.4			245	122	347	225	450	327	552	429	654	531	756	634	961	838	327	205
	4.1					300	153	403	255	505	357	607	460	709	562	914	766	399	252
	4.8							356	184	458	286	560	388	662	490	867	695	470	299
	5.5									411	214	513	317	615	419	820	623	542	346
	6.2											466	245	568	347	773	552	614	393
	6.9													521	276	725	480	685	440
090S/091S	2.7	241	117	371	246	501	376	631	506	761	636	890	766	1020	896	1280	1155	325	200
	3.4			311	156	441	285	571	415	701	545	831	675	961	805	1220	1064	416	260
	4.1					382	194	511	324	641	454	771	584	901	714	1160	973	507	320
	4.8							452	233	581	363	711	493	841	623	1101	882	598	379
	5.5									522	272	651	402	781	532	1041	792	689	439
	6.2											592	311	722	441	981	701	779	499
	6.9													662	350	921	610	870	559
180S/181S	2.7	496	240	763	506	1029	773	1296	1040	1563	1307	1830	1574	2097	1840	2630	2374	667	411
	3.4			640	320	907	586	1173	853	1440	1120	1707	1387	1974	1653	2507	2187	854	534
	4.1					784	400	1051	666	1317	933	1584	1200	1851	1467	2385	2000	1041	656
	4.8							928	480	1195	746	1461	1013	1728	1280	2262	1813	1228	779
	5.5									1072	559	1339	826	1606	1093	2139	1627	1414	902
	6.2											1216	639	1483	906	2016	1440	1601	1025
	6.9													1360	719	1894	1253	1788	1147

Figure 79U/E Pneumatic Actuator models 002 to 180

Output torques for single acting actuators in lb. in., air supply in psi

Actuator Mode	Spring Type(psi)	40		50		60		70		80		90		100		120		Spring only	
		start	end	start	end	start	end	start	end	start	end	start	end	start	end	start	end	start	end
002S	40	64	31	97	64	130	97	163	130	196	163	229	196	262	229	328	295	81	49
	50			82	41	115	74	148	107	181	140	214	173	247	206	313	272	104	63
	60					100	51	134	84	167	117	200	150	233	183	299	249	127	78
	70							119	61	152	94	185	127	218	160	284	226	150	92
	80									137	71	170	104	203	138	269	204	173	107
	90											156	82	189	115	255	181	196	122
	100													174	92	240	158	219	136
003S	40	81	39	123	81	166	124	208	166	250	208	292	250	334	292	419	377	104	62
	50			105	52	147	94	189	137	231	179	273	221	316	263	400	347	133	81
	60					128	65	170	107	213	150	255	192	297	234	381	318	162	99
	70							152	78	194	120	236	163	278	205	363	289	192	118
	80									175	91	217	133	260	176	344	260	221	137
	90											199	104	241	146	325	231	250	155
	100													222	117	307	202	279	174
006S	40	150	73	231	154	311	235	392	315	472	396	553	476	634	557	795	718	201	124
	50			194	98	274	178	355	259	435	340	516	420	597	501	758	662	257	161
	60					237	122	318	203	398	283	479	364	560	445	721	606	313	198
	70							281	147	361	227	442	308	523	388	684	549	369	235
	80									324	171	405	252	486	332	647	493	425	272
	90											368	195	449	276	610	437	482	309
	100													412	220	573	381	538	346
012S	40	277	138	434	295	591	451	748	608	904	765	1061	921	1218	1078	1531	1392	395	255
	50			359	184	515	341	672	498	829	654	985	811	1142	968	1456	1281	505	331
	60					440	230	596	387	753	544	910	701	1067	857	1380	1171	616	406
	70							521	277	678	433	834	590	991	747	1304	1060	726	482
	80									602	323	759	480	915	636	1229	950	837	558
	90											683	369	840	526	1153	839	947	633
	100													764	415	1078	729	1058	709
024S	40	582	282	895	595	1209	908	1522	1221	1835	1534	2148	1847	2461	2161	3087	2787	783	462
	50			751	376	1064	689	1378	1002	1691	1315	2004	1628	2317	1941	2943	2568	1002	627
	60					920	470	1233	783	1547	1096	1860	1409	2173	1722	2799	2348	1221	771
	70							1089	563	1403	877	1716	1190	2029	1503	2655	2129	1441	915
	80									1258	657	1572	970	1885	1284	2511	1910	1660	1059
	90											2138	1170	2606	1638	3542	2574	2761	1793
	100													2391	1316	3327	2252	3083	2008
036S	40	872	442	1340	910	1808	1378	2276	1846	2744	2314	3212	2782	3680	3250	4616	4186	1149	719
	50			1125	588	1593	1056	2061	1524	2529	1992	2997	2460	3465	2928	4401	3864	1471	934
	60					1379	734	1847	1201	2315	1669	2783	2137	3251	2605	4187	3541	1794	1149
	70							1632	879	2100	1347	2568	1815	3036	2283	3972	3219	2116	1363
	80									1885	1025	2353	1493	2821	1961	3757	2897	2438	1578
	90											2138	1170	2606	1638	3542	2574	2761	1793
	100													2391	1316	3327	2252	3083	2008
065S/066S	40	1682	813	2586	1717	3491	2622	4395	3526	5300	4431	6205	5336	7109	6240	8918	8049	2263	1394
	50			2170	1084	3075	1988	3979	2893	4884	3797	5788	4702	6693	5607	8502	7416	2897	1810
	60					2658	1355	3563	2259	4467	3164	5372	4068	6277	4973	8086	6782	3530	2227
	70							3146	1626	4051	2530	4956	3435	5860	4339	7669	6149	4164	2643
	80									4617	2409	5766	3558	6915	4707	9213	7005	4797	3059
	90											5237	2753	6386	3902	8664	6200	5431	3475
	100													5857	3098	8155	5395	6064	3892
090S/091S	40	2136	1032	3285	2181	4434	3330	5583	4479	6732	5628	7881	6777	9030	7926	11328	10224	2874	1770
	50			2756	1376	3905	2525	5054	3674	6203	4823	7352	5972	8501	7121	10799	9419	3679	2299
	60					3376	1721	4525	2870	5674	4019	6823	5168	7972	6317	10270	8614	4484	2828
	70							3997	2065	5145	3214	6294	4363	7443	5512	9741	7810	5289	3357
	80									4617	2409	5766	3558	6915	4707	9213	7005	6093	3886
	90											5237	2753	6386	3902	8664	6200	6898	4414
	100													5857	3098	8155	5395	7703	4943
180S/181S	40	4389	2122	6750	4482	9111	6843	11472	9204	13833	11565	16193	13926	18554	16286	23276	21008	5905	3637
	50			5664	2829	8025	5190	10385	7551	12746	9911	15107	12272	17468	14633	22189	19355	7558	4724
	60					6938	3537	9299	5897	11660	8258	14021	10619	16381	12980	21103	17701	9212	5810
	70							8213	4244	10573	6605	12934	8966	15295	11326	20017	16048	10865	6896
	80									9487	4952	11848	7312	14209	9673	18930	14395	12518	7983
	90											10762	5659	13122	8020	17844	12741	14171	9069
	100													12036	6367	16758	11008	15825	10155

Figure 79U/E Pneumatic Actuator models 002 to 180

Output torques for single acting actuators in Nm., air supply in bar

Actuator Mode	Spring Type(b ar)	3		4		5		6		7		8		Spring only		
		start	end	start	end	start	end	start	end	start	end	start	end	start	end	
002S	2.7	9	5	15	11	19	16	25	21	30	26	36	32	9	5	
	3.4			13	8	18	13	23	18	28	23	34	29	12	7	
	4.1			11	6	16	10	21	16	26	21	32	27	14	9	
	4.8					14	8	20	13	25	18	31	24	17	10	
	5.5					13	5	18	11	23	16	29	22	20	12	
	6.2								16	8	21	13	27	19	22	14
	6.9										20	10	26	16	25	15
003S	2.7	11	6	19	14	25	20	32	27	38	33	45	41	12	7	
	3.4	9	3	17	11	23	17	29	24	36	30	43	37	15	9	
	4.1			14	7	20	13	27	20	34	26	41	34	18	11	
	4.8					18	10	25	17	31	23	39	31	22	13	
	5.5					16	7	23	14	29	20	37	27	25	15	
	6.2								21	10	27	17	35	24	28	18
	6.9								19	7	25	13	33	21	32	20
006S	2.7	20	11	35	27	47	38	60	51	72	63	86	77	23	14	
	3.4	16	5	31	20	42	32	56	45	67	57	82	71	29	18	
	4.1			27	14	38	25	51	38	63	50	78	65	35	22	
	4.8					34	19	47	32	59	44	74	58	42	27	
	5.5					30	12	43	26	55	38	69	52	48	31	
	6.2								39	19	51	31	65	46	54	35
	6.9								35	13	47	25	61	39	61	39
012S	2.7	38	22	67	51	89	73	115	99	138	122	166	150	45	29	
	3.4	29	9	58	39	80	61	106	86	129	109	157	138	57	37	
	4.1			50	26	72	48	97	74	121	97	149	125	70	46	
	4.8					63	36	89	61	112	84	140	113	82	54	
	5.5					55	23	80	49	103	72	132	100	95	63	
	6.2								72	36	95	59	123	88	107	72
	6.9								63	24	86	47	115	75	119	80
024S	2.7	78	44	137	103	181	147	232	198	278	244	335	301	88	55	
	3.4	62	19	120	78	165	122	216	173	262	219	318	276	113	71	
	4.1			104	53	148	97	200	149	246	195	302	251	138	87	
	4.8					132	73	183	124	229	170	286	226	163	103	
	5.5					116	48	167	99	213	145	270	202	188	120	
	6.2								151	74	197	120	253	177	212	136
	6.9								134	49	180	95	237	152	237	152
036S	2.7	117	68	204	156	270	222	347	299	416	367	500	452	130	81	
	3.4	93	32	180	119	246	185	323	262	392	331	476	415	166	106	
	4.1			156	83	222	149	299	226	367	294	452	379	203	130	
	4.8					198	113	274	189	343	258	428	343	239	154	
	5.5					173	76	250	153	319	222	403	306	276	178	
	6.2								226	116	294	185	379	270	312	203
	6.9								201	80	270	149	355	233	348	227
065S/066S	2.7	226	128	394	296	522	424	670	572	803	705	967	869	256	158	
	3.4	179	56	347	225	475	352	623	501	756	634	920	797	327	205	
	4.1			300	153	428	281	576	429	709	562	873	725	399	252	
	4.8					381	209	529	357	662	490	826	654	470	299	
	5.5					334	138	482	286	615	419	779	582	542	346	
	6.2								435	214	568	347	732	511	614	393
	6.9								388	143	521	276	685	439	685	440
090S/091S	2.7	287	162	501	376	663	539	852	727	1020	896	1228	1103	325	200	
	3.4	227	71	441	285	604	448	792	636	961	805	1168	1012	416	260	
	4.1			382	194	544	357	732	545	901	714	1109	921	507	320	
	4.8					484	266	672	454	841	623	1049	831	598	379	
	5.5					424	175	613	363	781	532	989	740	689	439	
	6.2								553	272	722	441	929	649	779	499
	6.9								493	181	662	350	870	558	870	559
180S/181S	2.7	589	333	1029	773	1363	1107	1750	1493	2097	1840	2523	2267	667	411	
	3.4	467	146	567	586	1240	920	1627	1307	1974	1653	2401	2080	854	534	
	4.1			784	400	1117	733	1504	1120	1851	1467	2278	1893	1041	656	
	4.8					995	546	1381	933	1728	1280	2155	1707	1228	779	
	5.5					872	359	1259	746	1606	1093	2032	1520	1414	902	
	6.2								1136	559	1483	906	1910	1333	1601	1025
	6.9								1073	373	1360	719	1787	1146	1788	1147