Electro-Hydraulic Axes

aerospace
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
sealing & shielding

Parker

ENGINEERING YOUR SUCCESS.

Note

This document and other information from Parker Hannifin GmbH, its subsidiaries, sales offices and authorized distributors provide product or system options for further investigation by users having technical expertise. Before you select or use any product or system it is important that you analyse all aspects of your application and review the information concerning the product or system in the current product catalogue. Due to the variety of operating conditions and applications for these products or systems, the user, through his own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance and safety requirements of the application are met. The products are subject to change by Parker Hannifin GmbH at any time without notice.

Contents | **Page**

Notes

Parker Hannifin GmbH
Hydraulic Controls Division
Kaarst, Germany

1. Introduction

Electro-hydraulic axes offer higher force levels than pneumatic or electromechanical cylinders and are suitable for a wide range of applications:

- Material handling and feed systems
- Wood working and plastics industries
- Machine tools (loading through vertical actuators)
- Paper industry (lifting and tensioning)
- Automotive industry (transport and feeding)

For precise motion, positioning, setting and actuating, electro-hydraulic axes have optimal characteristics:

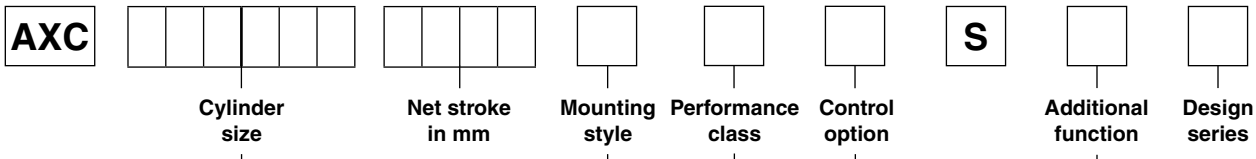
- Stroke up to 3000mm
- Push force up to 620kN
- Pull force up to 320kN
- Position and force control
- Speed up to 1m/s
- Overload protection
- Integrated position feedback
- Long life time and low maintenance
- Only P and T need connections
- 3 series in 8 sizes each
- Axis controller (option)
- Blocking valves (option)
- Pressure overload protection (option)

The electro-hydraulic axis for closed-loop control consists of proven standard components. It is mounted and tested as one unit.
Combined with control electronics, the electro-hydraulic axis is ready for use, requiring only connection lines to the system.

With the 3 Parker electro-hydraulic linear drives, position accuracy can be achieved reliably and cost-effectively in all 3 performance classes:
Performance class 1: < ±1mm*
Performance class 2: < ±0.3mm*
Performance class 3: < ±0.05mm*

*without external load and friction

2. Ordering code



Code			
		Bore [mm]	Rod [mm]
040	028	40	28
050	036	50	36
063	045	63	45
063	036	63	36
080	056	80	56
080	045	80	45
100	070	100	70
100	056	100	56
125	056	125	56
125	090	125	90
125	070	125	70
160	110	160	110
160	090	160	90
200	140	200	140

Code	Mounting style
0	C
1	DD
2	JJ
3	SBd

Code	Performance class
1	Position accuracy < ±1mm
2	Position accuracy < ±0.3mm Force accuracy < ±10% max. force
3	Position accuracy < ±0.05mm Force accuracy < ±2% max. force

Code	Additional function
0	No option
1	Blocking valves in A and B
2	Pressure overload protection of rod side
3	Pressure overload protection of piston and rod side
4	Blocking valves in A and B + Pressure overload protection of rod side
5	Blocking valves in A and B + Pressure overload protection of piston and rod side

Code	Control option
0	Without controller
1	With pressure transducers but without controller
2	Position control
3 [1)]	Position + pressure/force control
4 [1)]	Position + free programmable application program*
5 [1)]	Position + pressure/force control + free programmable application program*

[1)] up Performance class 2-3

3. Selection guide

Typ				Perfomance class	vmax extend [mm/s] p = 200 bar 1), 2), 3)	vmax retract [mm/s] p =200 bar 1), 2), 3)	Push force [kN] p = 200bar 4)	Pull force [kN] p = 200bar
AXC	040	028	xxxx	1	810	570	25	12
AXC	040	028	xxxx	2	810	570	25	12
AXC	040	028	xxxx	3	1000	710	25	12
AXC	050	036	xxxx	1	890	600	39	18
AXC	050	036	xxxx	2	890	600	39	18
AXC	050	036	xxxx	3	670	460	39	18
AXC	063	045	xxxx	1	1000	760	62	29
AXC	063	045	xxxx	2	1000	760	62	29
AXC	063	045	xxxx	3	1000	720	62	29
AXC	063	036	xxxx	1	900	730	61	40
AXC	063	036	xxxx	2	900	730	61	40
AXC	063	036	xxxx	3	850	690	61	40
AXC	080	056	xxxx	1	1000	710	100	49
AXC	080	056	xxxx	2	1000	710	100	49
AXC	080	056	xxxx	3	640	450	100	49
AXC	080	045	xxxx	1	830	680	100	66
AXC	080	045	xxxx	2	830	680	100	66
AXC	080	045	xxxx	3	520	430	100	66
AXC	100	070	xxxx	1	650	450	155	76
AXC	100	070	xxxx	2	650	450	155	76
AXC	100	070	xxxx	3	1000	910	155	76
AXC	100	056	xxxx	1	660	540	154	104
AXC	100	056	xxxx	2	660	540	154	104
AXC	100	056	xxxx	3	1000	860	154	104
AXC	125	090	xxxx	1	1000	970	242	112
AXC	125	090	xxxx	2	1000	970	242	112
AXC	125	090	xxxx	3	1000	970	242	112
AXC	125	070	xxxx	1	1000	920	241	162
AXC	125	070	xxxx	2	1000	920	241	162
AXC	125	070	xxxx	3	1000	920	241	162
AXC	125	056	xxxx	1	970	870	240	190
AXC	125	056	xxxx	2	970	870	240	190
AXC	125	056	xxxx	3	970	870	240	190
AXC	160	110	xxxx	1	830	590	397	202
AXC	160	110	xxxx	2	830	590	397	202
AXC	160	110	xxxx	3	830	590	397	202
AXC	160	090	xxxx	1	690	560	395	265
AXC	160	090	xxxx	2	690	560	395	265
AXC	160	090	xxxx	3	690	560	395	265
AXC	200	140	xxxx	1	540	380	620	305
AXC	200	140	xxxx	2	540	380	620	305
AXC	200	140	xxxx	3	540	380	620	305

1) These maximum speeds are valid for an electro-hydraulic axis without connection lines. Limits of the connection lines with respect to pressure losses, pressure ratings or allowed flow rate are not considered. See 3.1 for details.

2) The maximum speed depends on the minimum acceleration and deceleration times and the application stroke. Cylinders with short stroke cannot reach the maximum speed.

3) The maximum speed is also limited by the maximum force of acceleration and deceleration. These limits can be critical when moving large masses. Therefore check the load condition according to 3.4.

4) Beware of buckling! Check according to chapter 5.2.

3.1 Port size and speed limitations

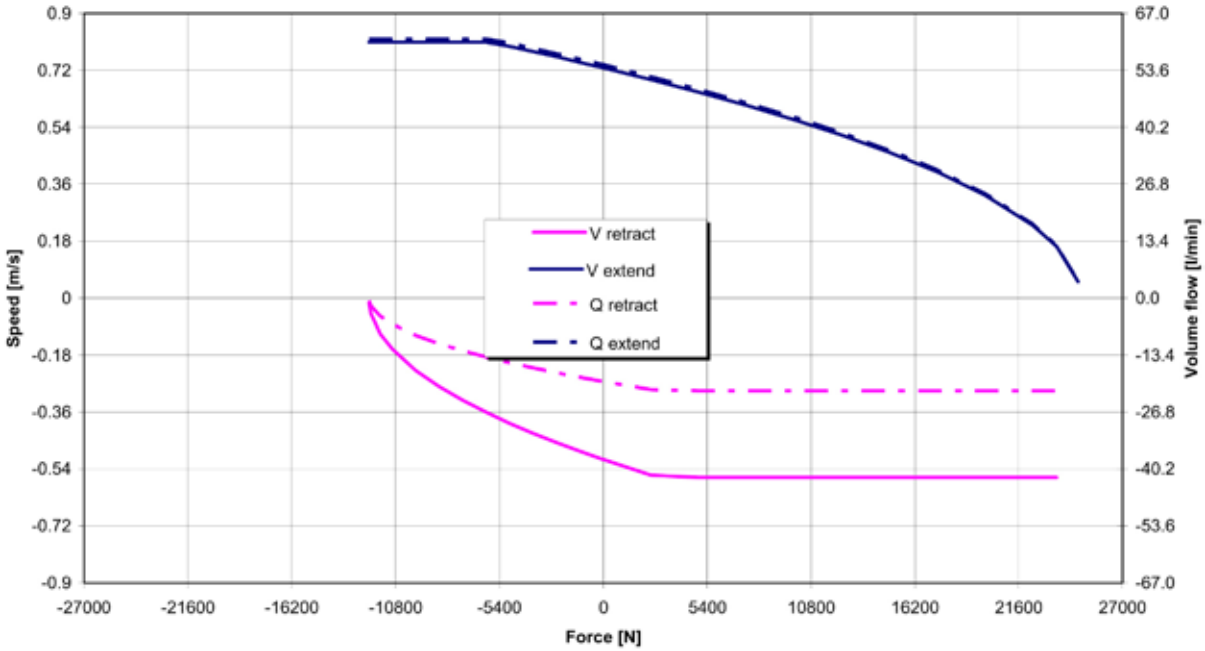
The preceding table shows only the allowed piston speeds which may be limited by the flow speed in the connecting lines.
Flow rates according to DIN 24346 recommended by Parker:
Pressure line: 3 - 5 m/s
Return line: 2 - 4 m/s
Avoid flow rates > 8 m/s! The resulting forces are high and can destroy the tube lines.
If the desired piston speed results in excess flow rates, lines with larger diameter must be used.

3.2 Motion profile

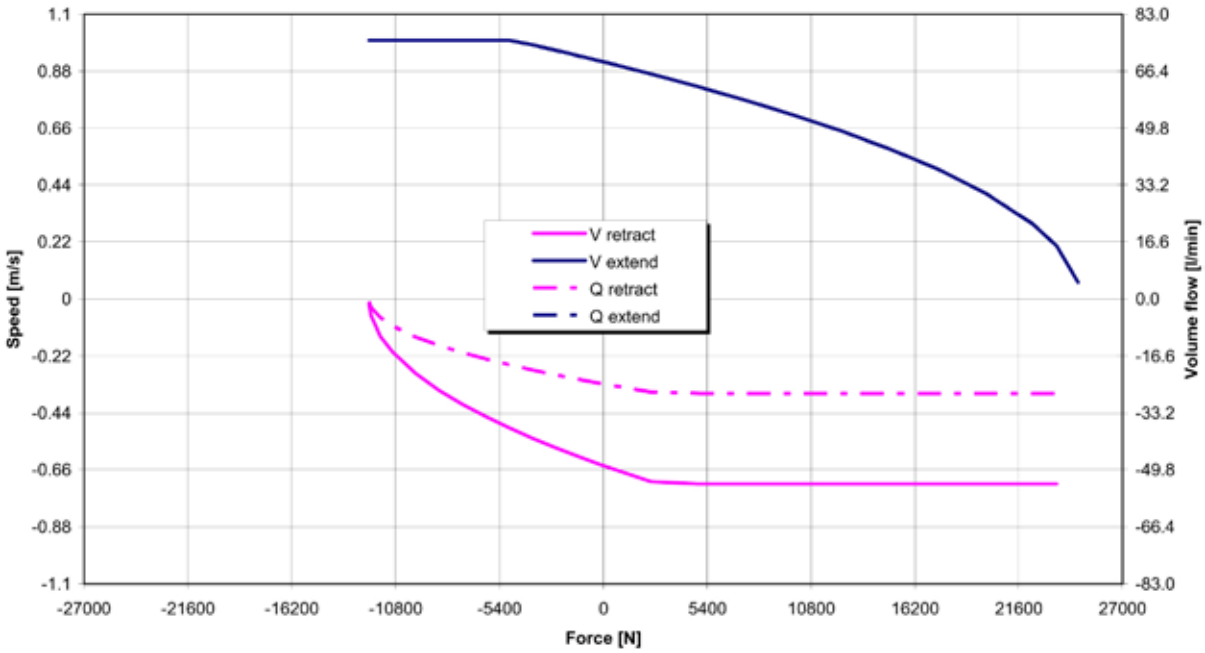
For mass deceleration control and for applications where piston speeds exceed 0.1m/s, it is recommended not to use the full stroke. In order to achieve high dynamics and good accuracy, electro-hydraulic servosystems have no hydraulic cushioning.

3.3 Performance diagrams

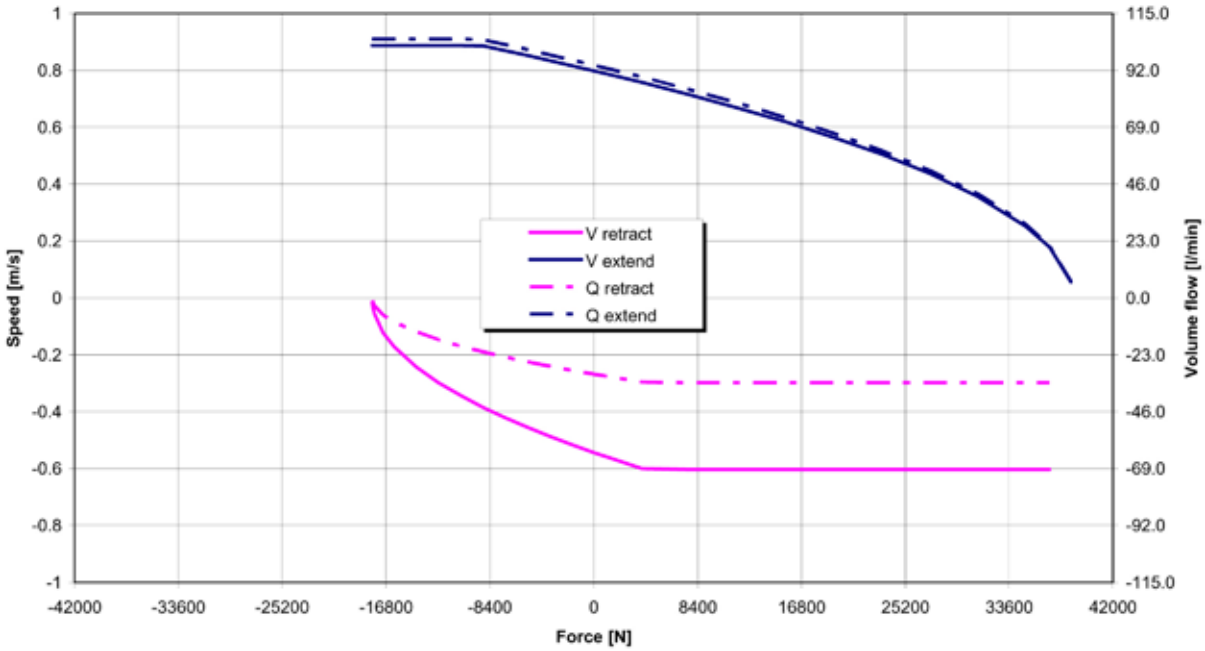
AXC040028 xxxx 1 + 2: Performance diagram cylinder d piston = 40mm, d rod = 28mm, p0 = 200bar (Allowed working points in-between the curves)



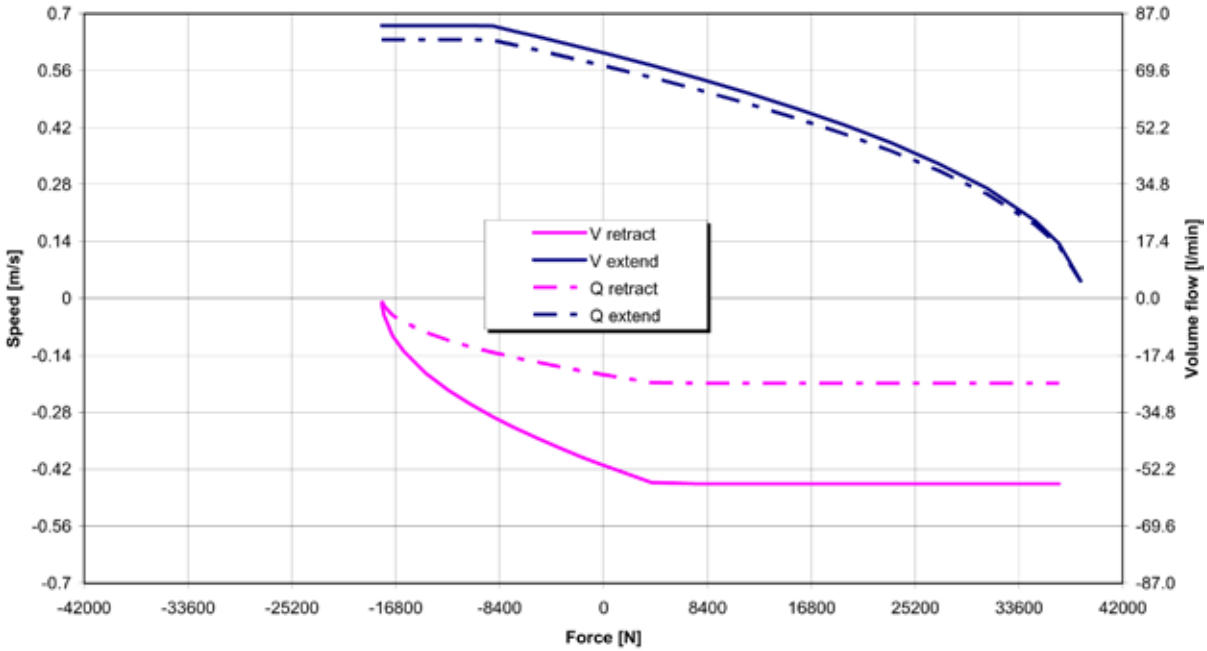
AXC040028 xxxx 3: Performance diagram cylinder d piston = 40mm, d rod = 28mm, p0 = 200bar (Allowed working points in-between the curves)



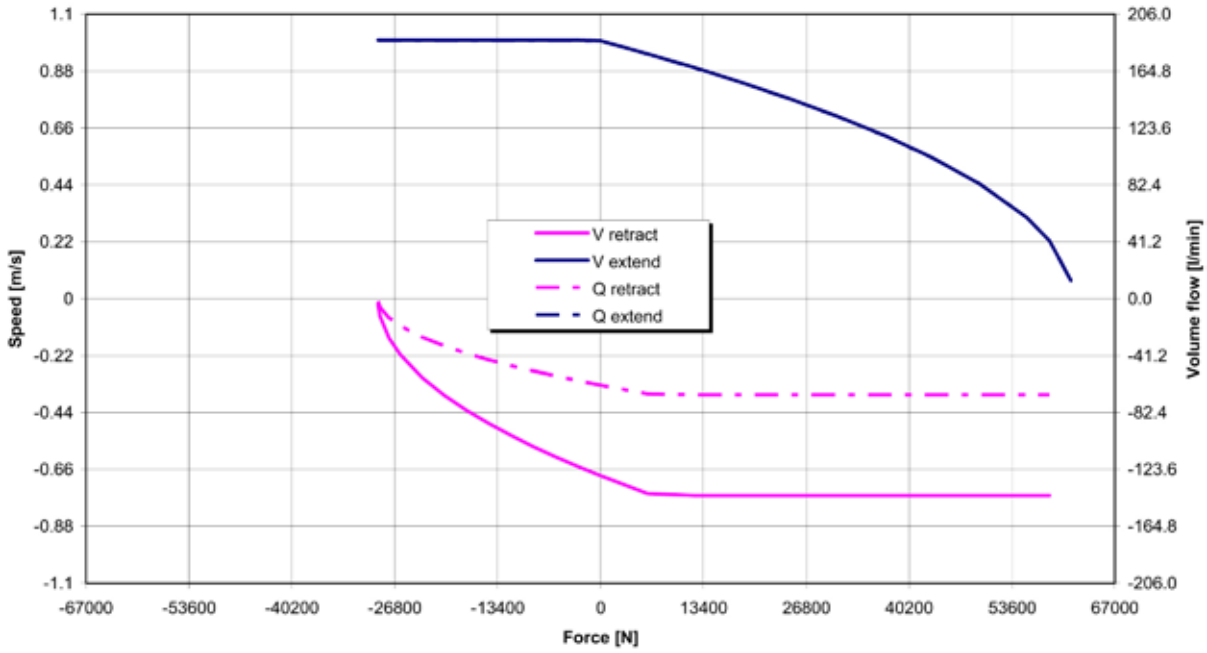
AXC050036 xxxx 1 + 2: Performance diagram cylinder d piston = 50mm, d rod = 36mm, p0 = 200bar (Allowed working points in-between the curves)



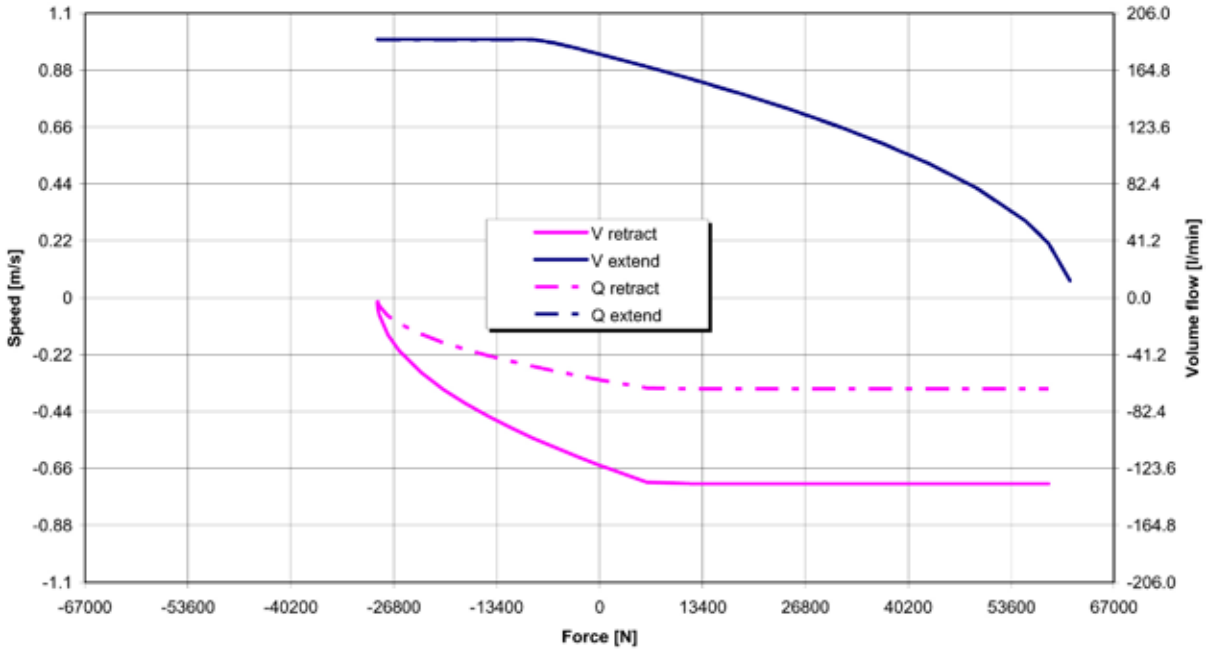
AXC050036 xxxx 3: Performance diagram cylinder d piston = 50mm, d rod = 36mm, p0 = 200bar (Allowed working points in-between the curves)



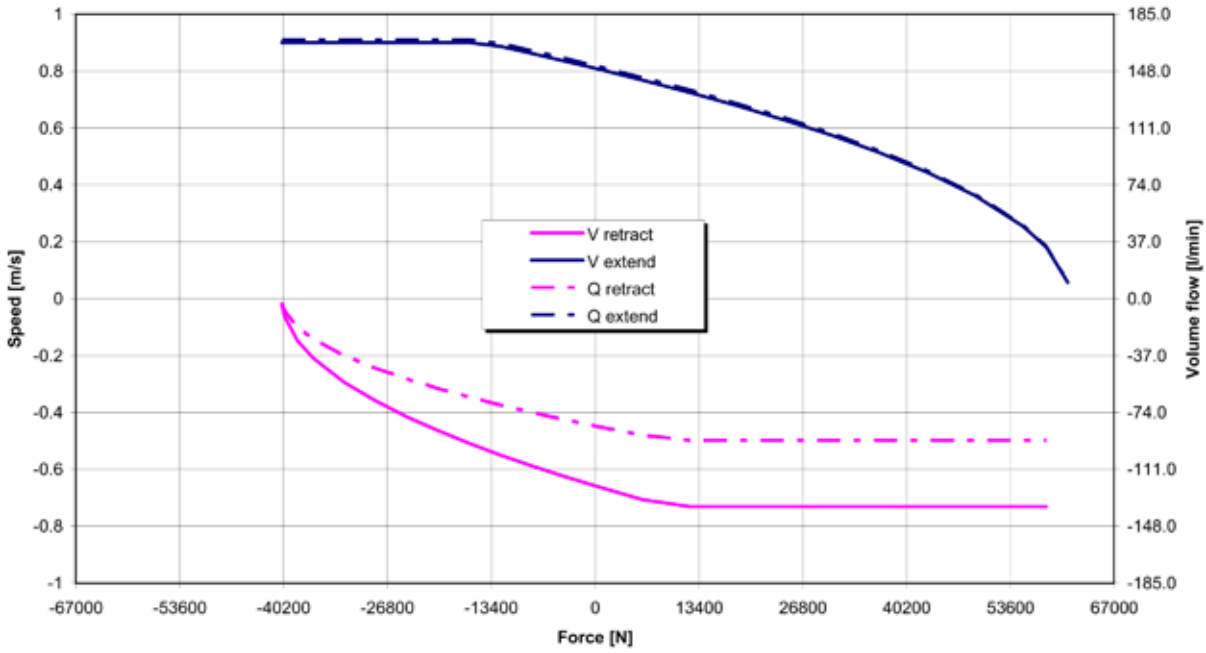
AXC063045 xxxx 1 + 2: Performance diagram cylinder d piston = 63mm, d rod = 45mm, p0 = 200bar (Allowed working points in-between the curves)



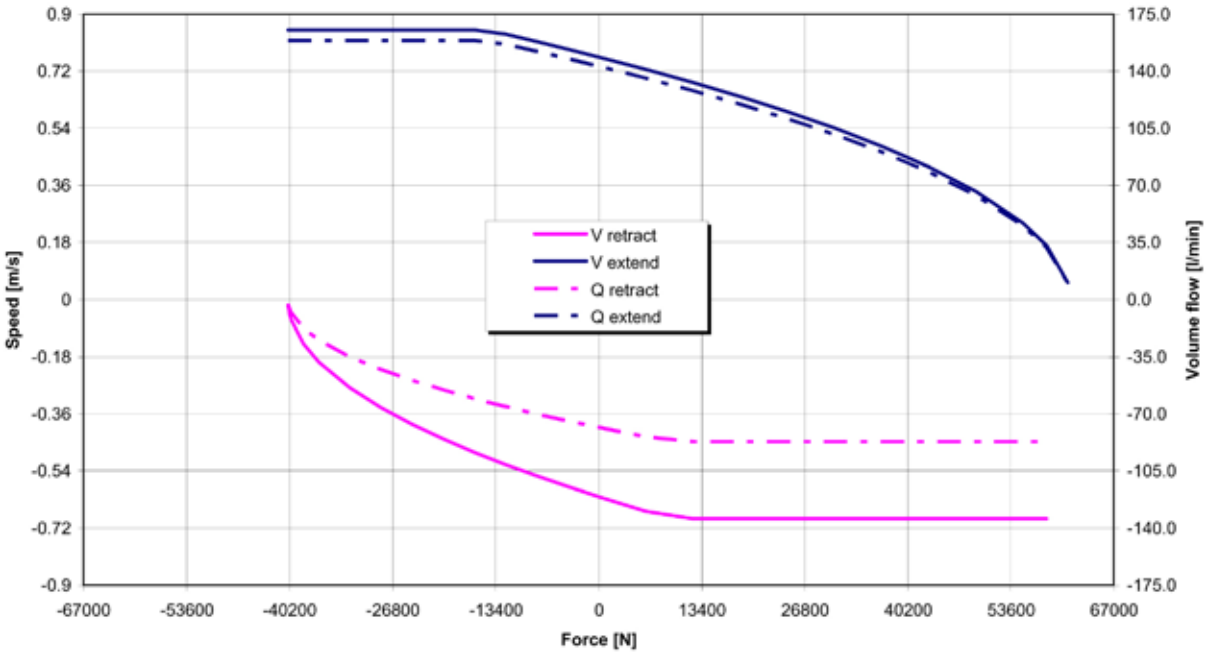
AXC063045 xxxx 3: Performance diagram cylinder d piston = 63mm, d rod = 45mm, p0 = 200bar (Allowed working points in-between the curves)



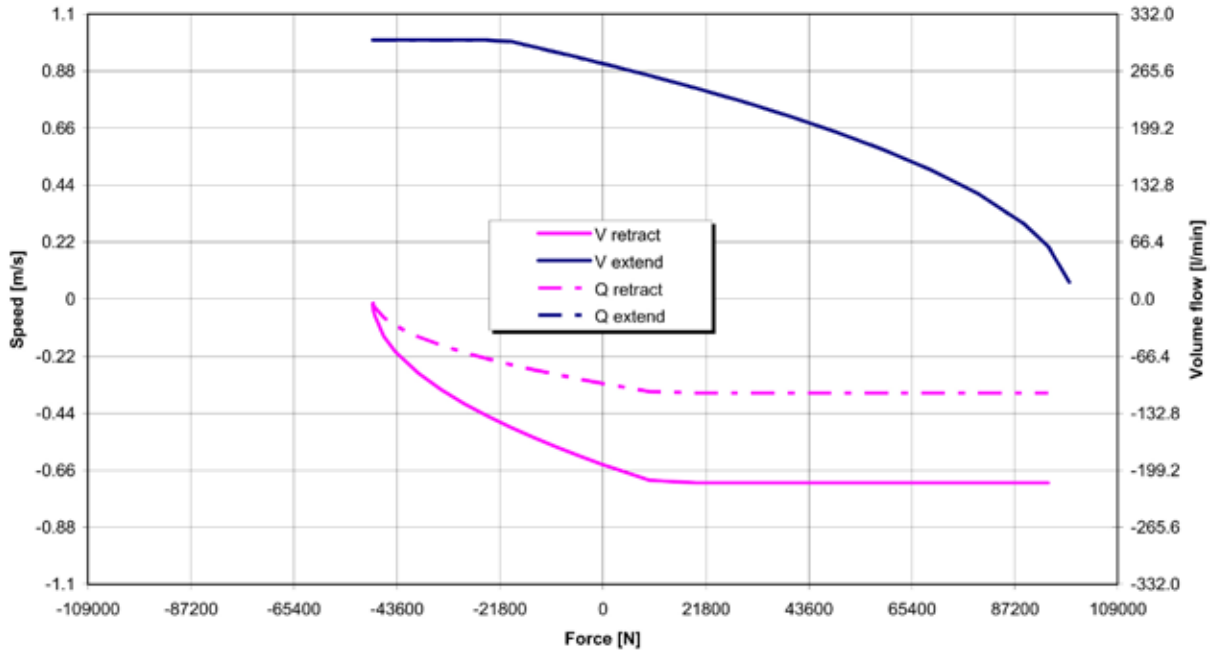
AXC063036 xxxx 1 + 2: Performance diagram cylinder d piston = 63mm, d rod = 36mm, p0 = 200bar (Allowed working points in-between the curves)



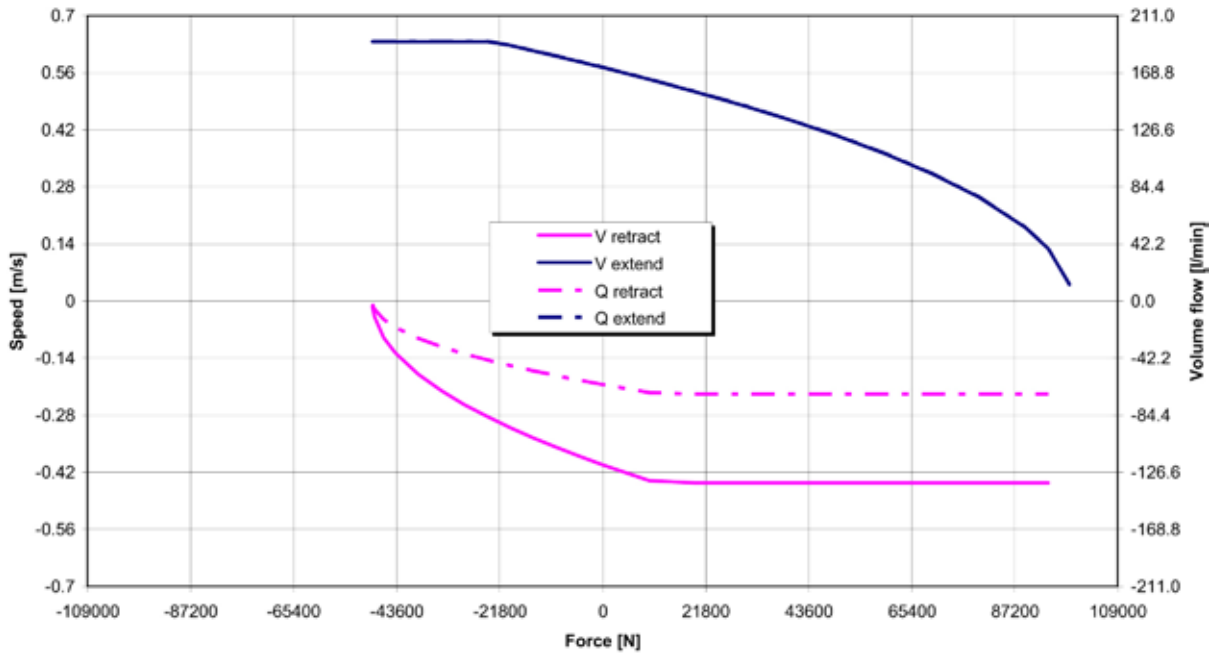
AXC063036 xxxx 3: Performance diagram cylinder d piston = 63mm, d rod = 36mm, p0 = 200bar (Allowed working points in-between the curves)



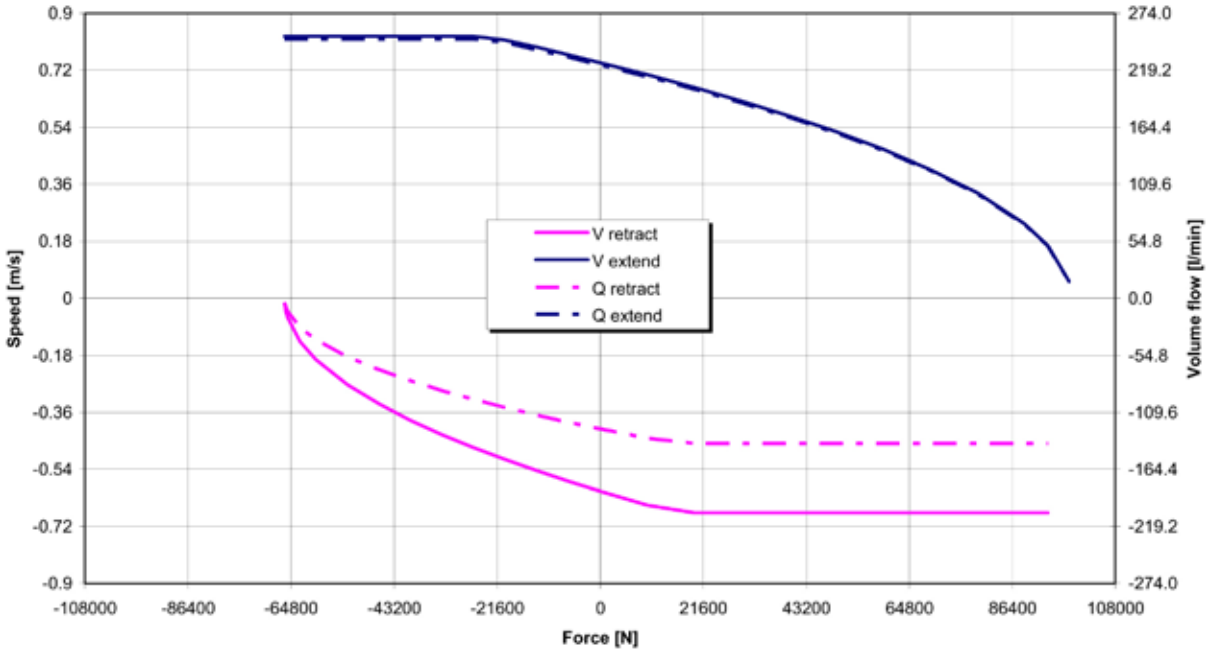
AXC080056 xxxx 1 + 2: Performance diagram cylinder d piston = 80mm, d rod = 56mm, p0 = 200bar (Allowed working points in-between the curves)



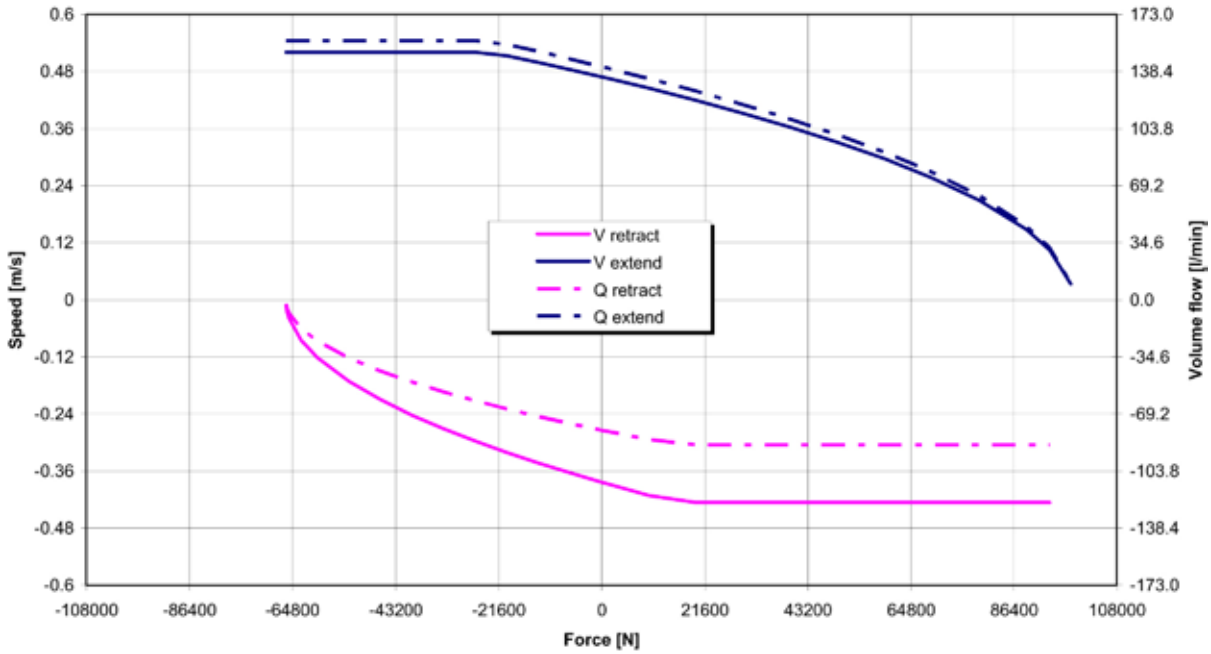
AXC080056 xxxx 3: Performance diagram cylinder d piston = 80mm, d rod = 56mm, p0 = 200bar (Allowed working points in-between the curves)



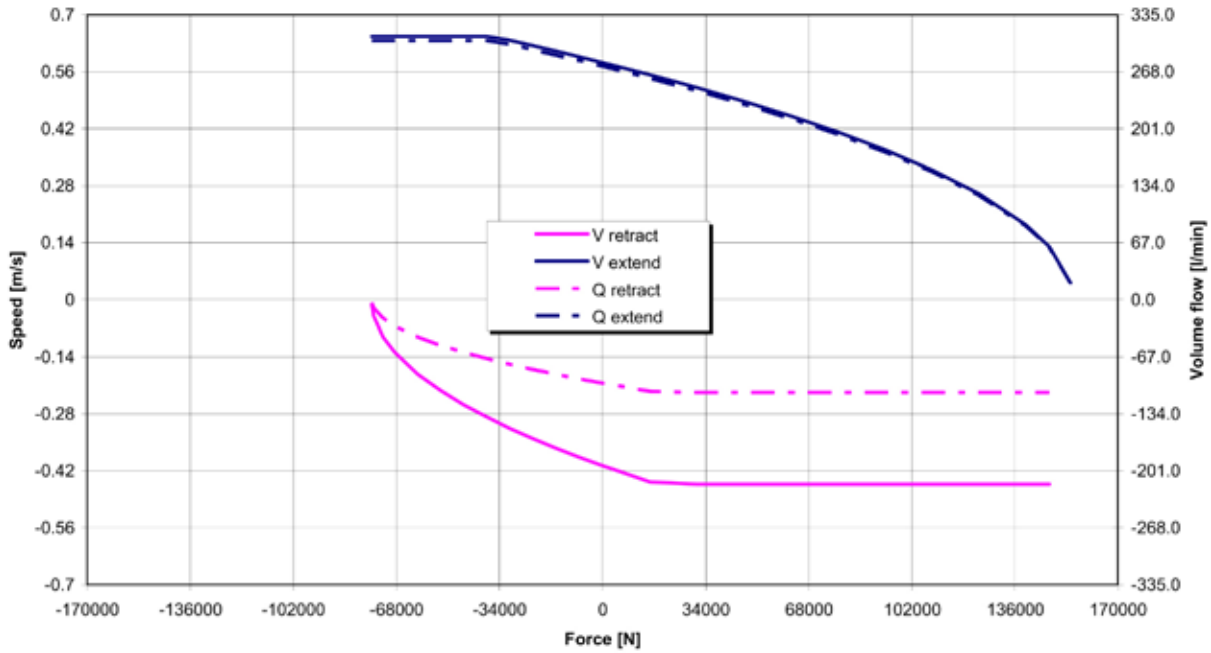
AXC080045 xxxx 1 + 2: Performance diagram cylinder d piston = 80mm, d rod = 45mm, p0 = 200bar (Allowed working points in-between the curves)



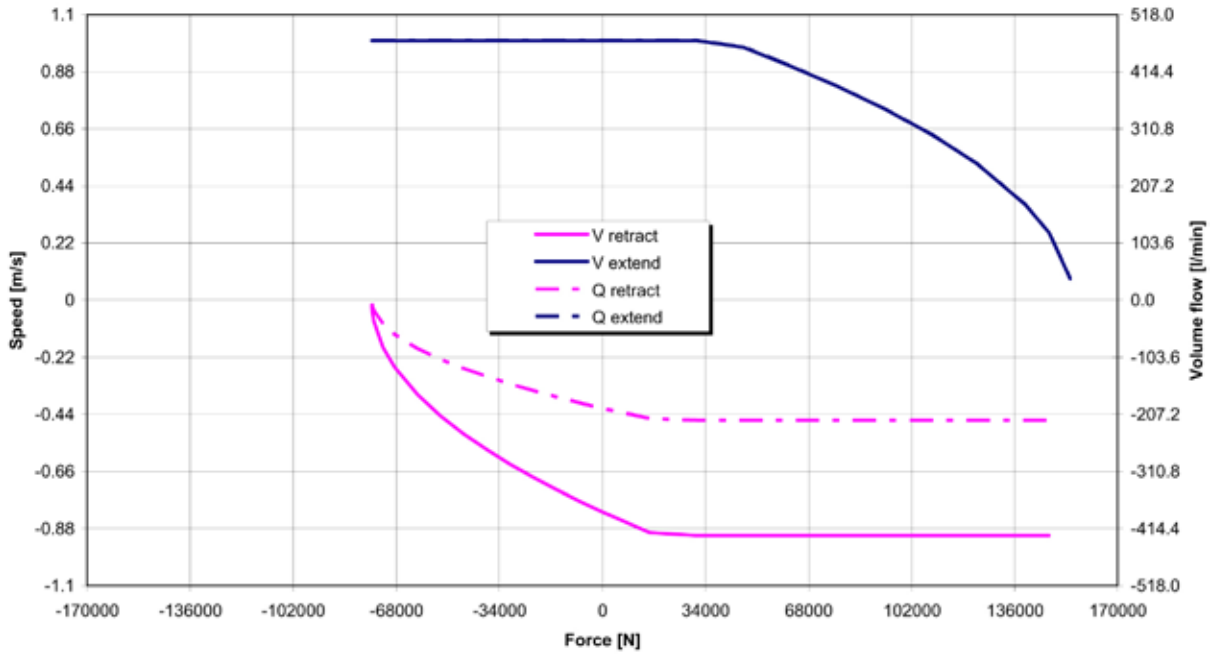
AXC080045 xxxx 3: Performance diagram cylinder d piston = 80mm, d rod = 45mm, p0 = 200bar (Allowed working points in-between the curves)



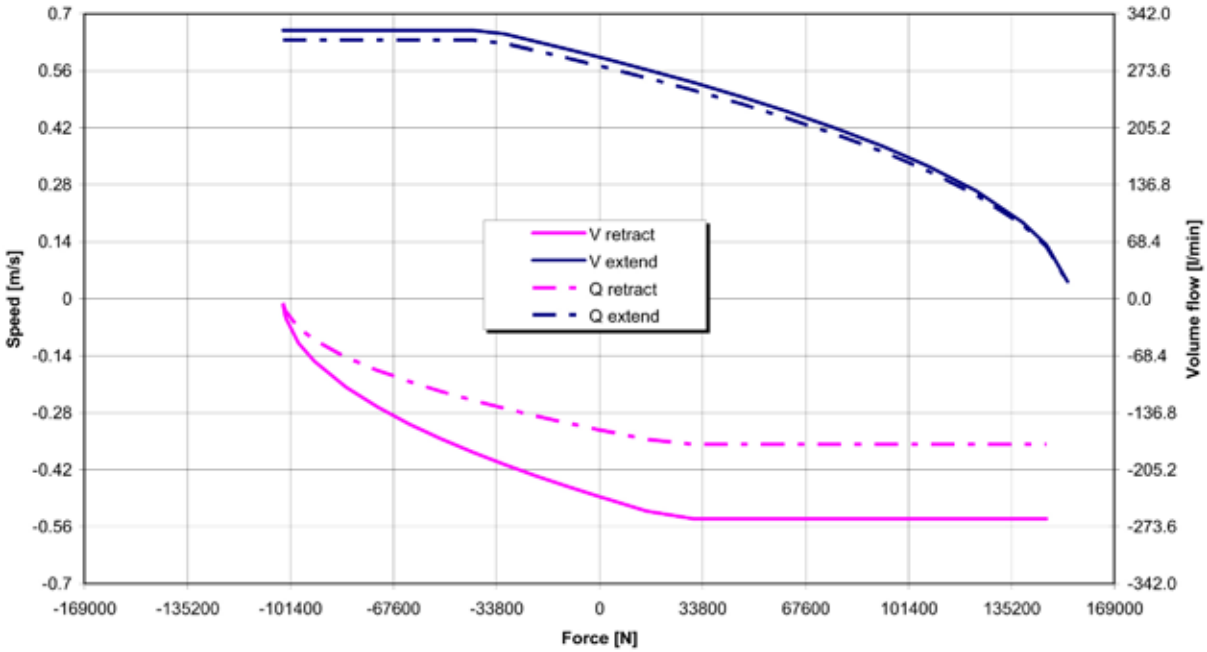
AXC100070 xxxx 1 + 2: Performance diagram cylinder d piston = 100mm, d rod = 70mm, p0 = 200bar
(Allowed working points in-between the curves)



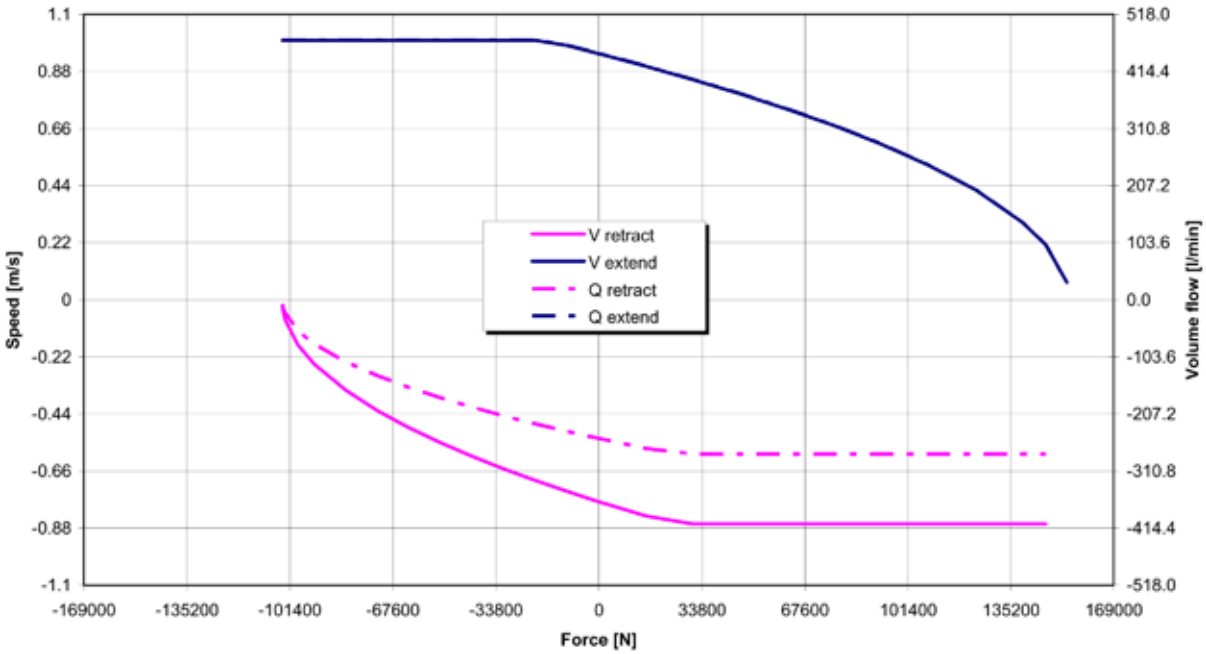
AXC100070 xxxx 3: Performance diagram cylinder d piston = 100mm, d rod = 70mm, p0 = 200bar
(Allowed working points in-between the curves)



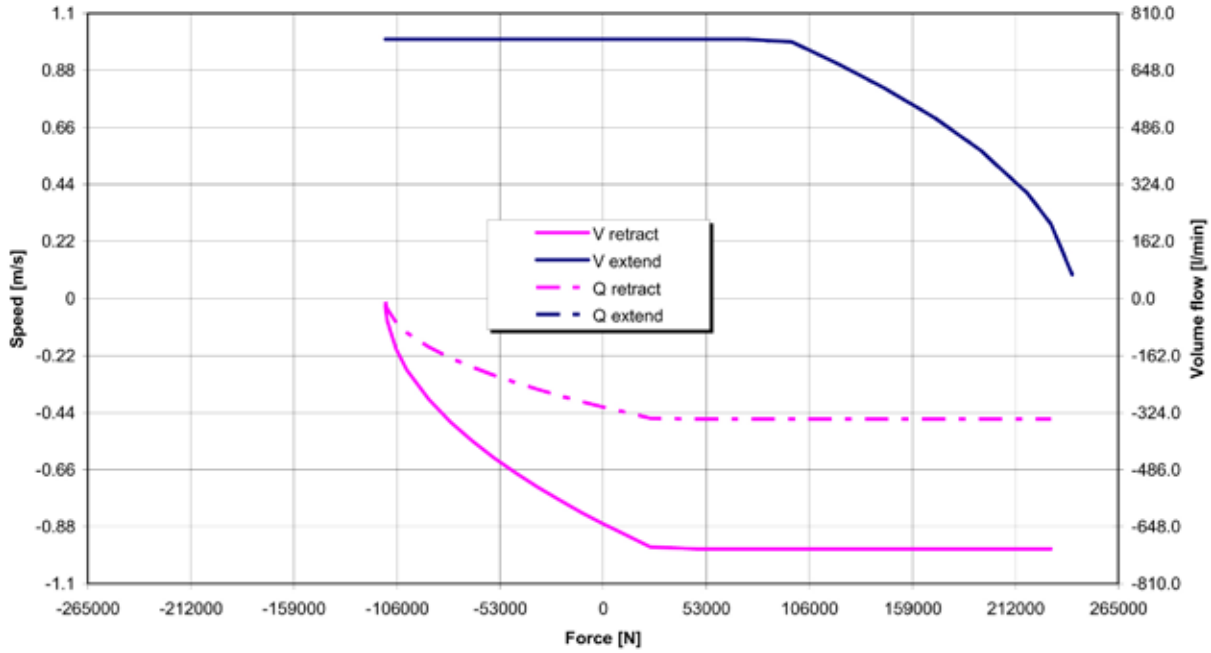
AXC100056 xxxx 1 + 2: Performance diagram cylinder d piston = 100mm, d rod = 56mm, p0 = 200bar (Allowed working points in-between the curves)



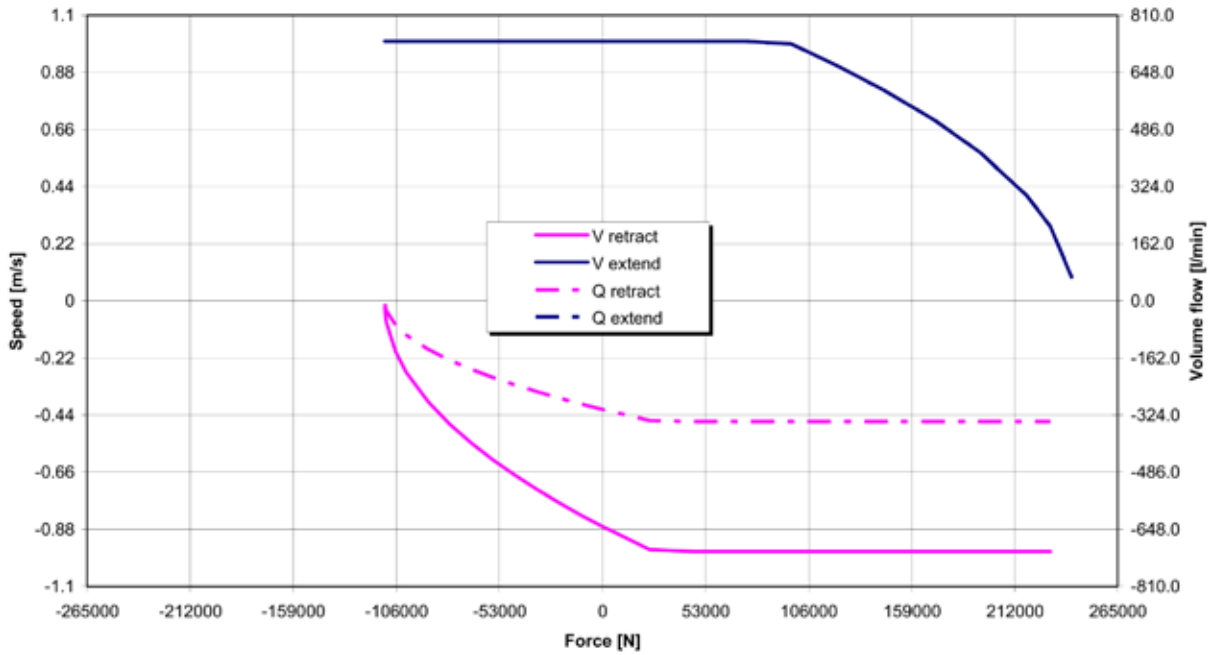
AXC100056 xxxx 3: Performance diagram cylinder d piston = 100mm, d rod = 56mm, p0 = 200bar (Allowed working points in-between the curves)



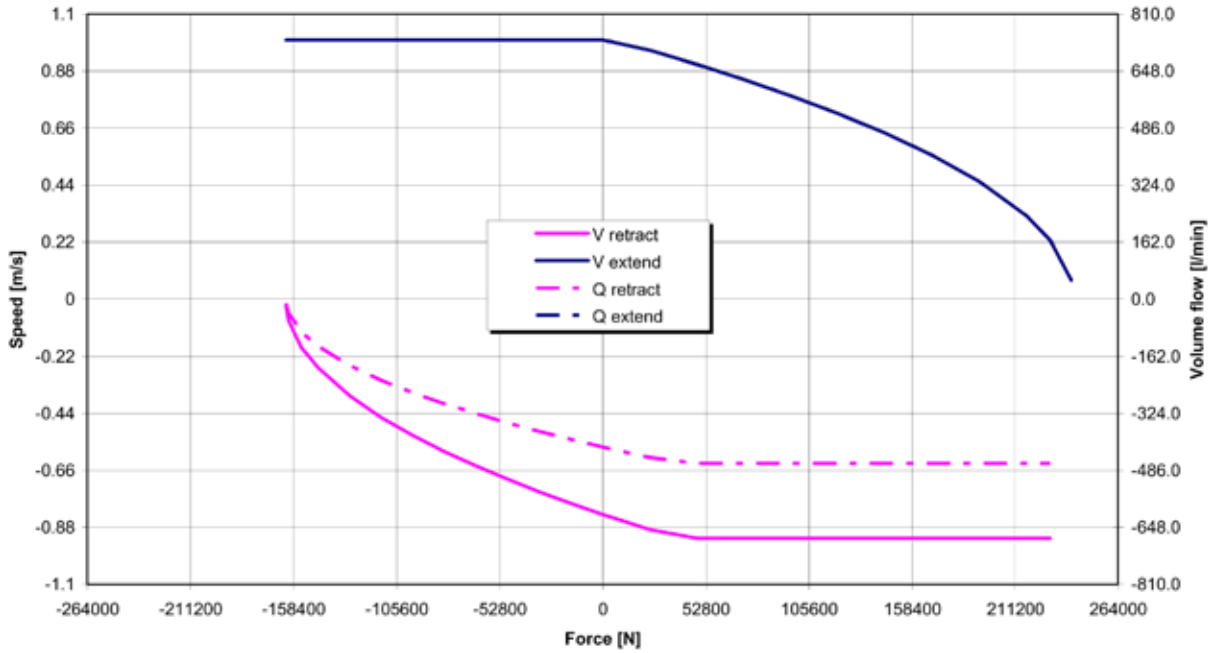
AXC125090 xxxx 1 + 2: Performance diagram cylinder d piston = 125mm, d rod = 90mm, p0 = 200bar
(Allowed working points in-between the curves)



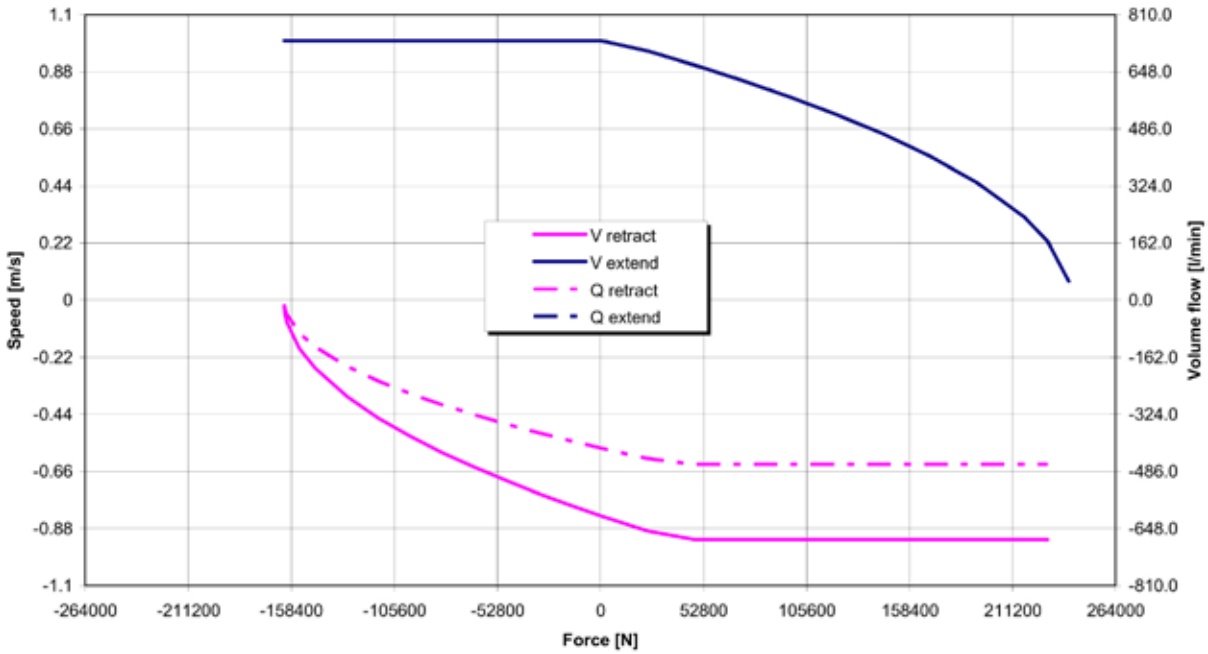
AXC125090 xxxx 3: Performance diagram cylinder d piston = 125mm, d rod = 90mm, p0 = 200bar
(Allowed working points in-between the curves)



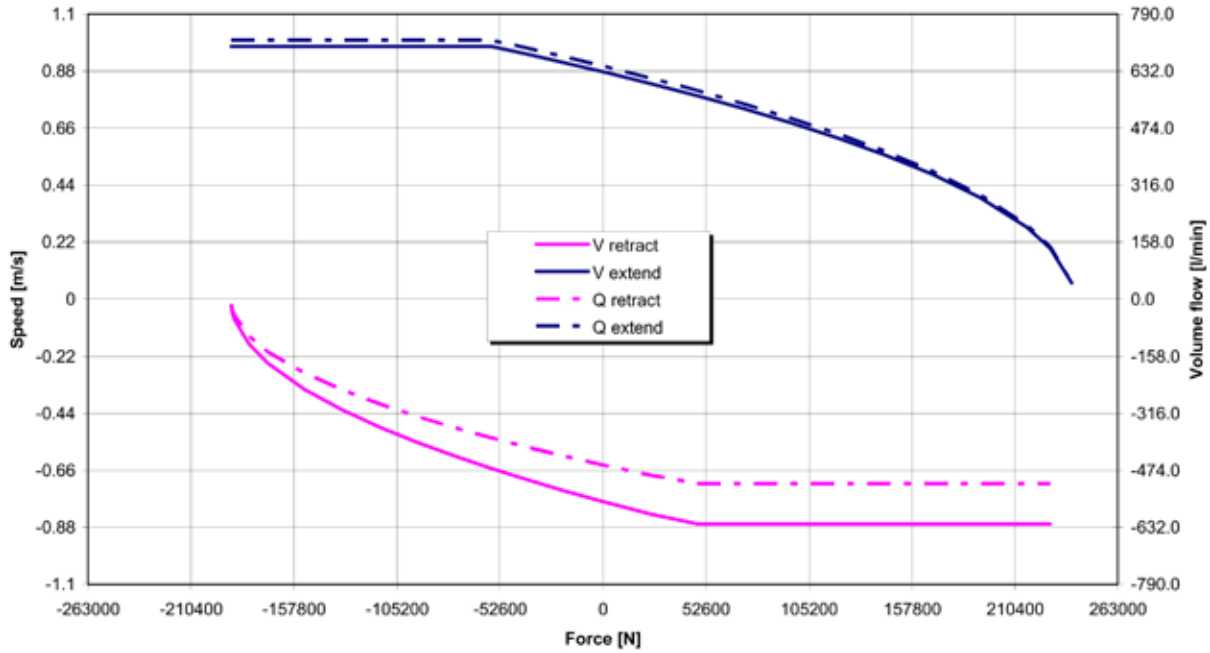
AXC125070 xxxx 1 + 2: Performance diagram cylinder d piston = 125mm, d rod = 70mm, p0 = 200bar
(Allowed working points in-between the curves)



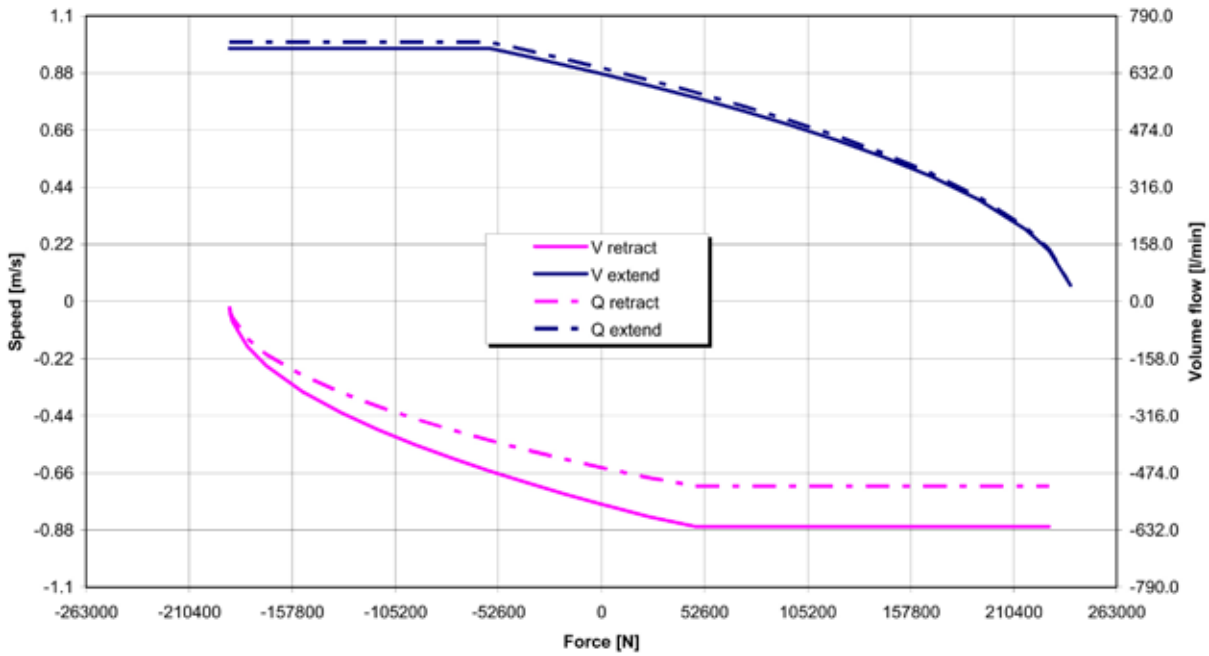
AXC125070 xxxx 3: Performance diagram cylinder d piston = 125mm, d rod = 70mm, p0 = 200bar
(Allowed working points in-between the curves)



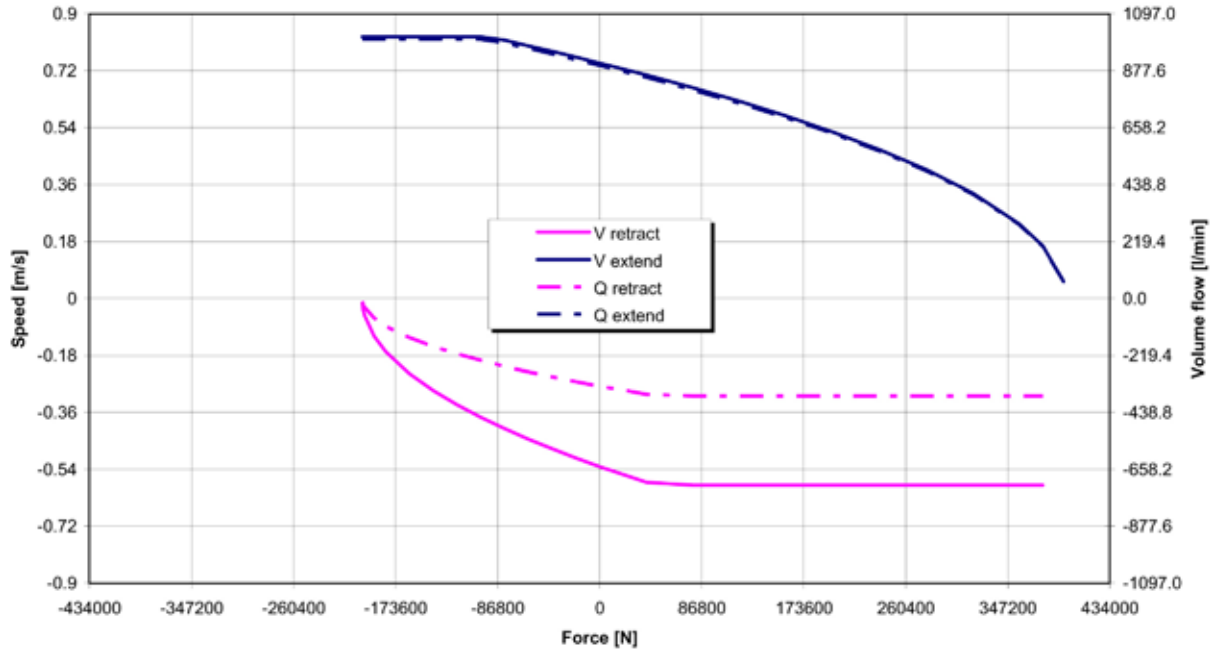
AXC125056 xxxx 1 + 2: Performance diagram cylinder d piston = 125mm, d rod = 56mm, p0 = 200bar (Allowed working points in-between the curves)



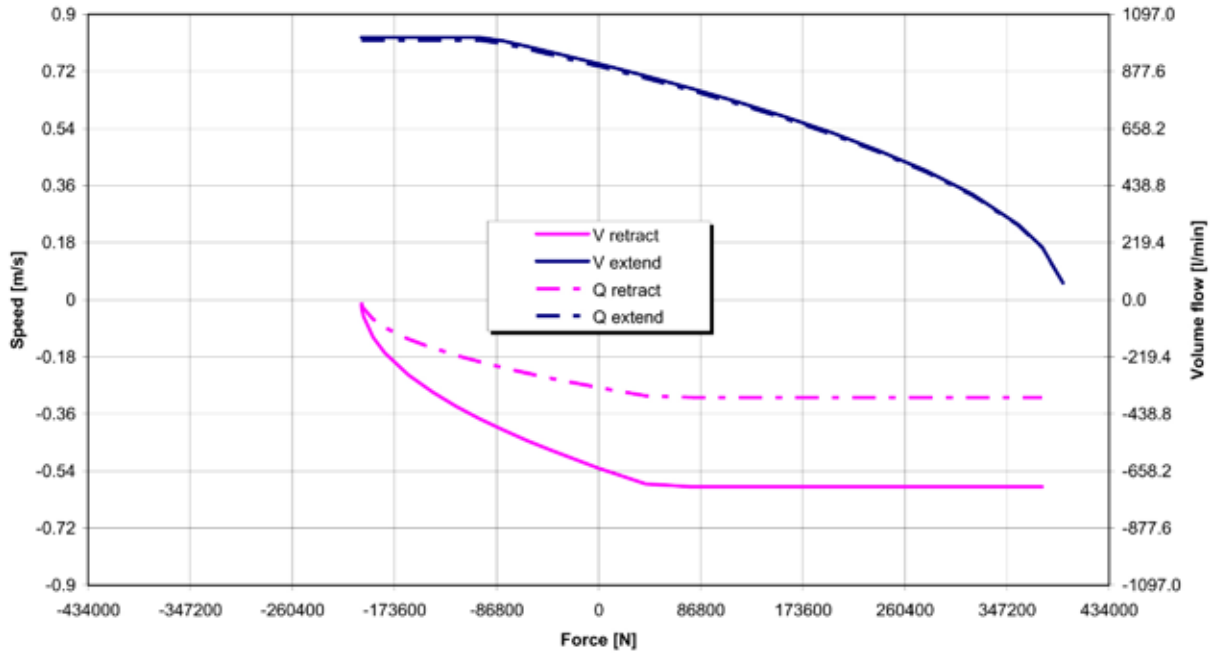
AXC125056 xxxx 3: Performance diagram cylinder d piston = 125mm, d rod = 56mm, p0 = 200bar (Allowed working points in-between the curves)



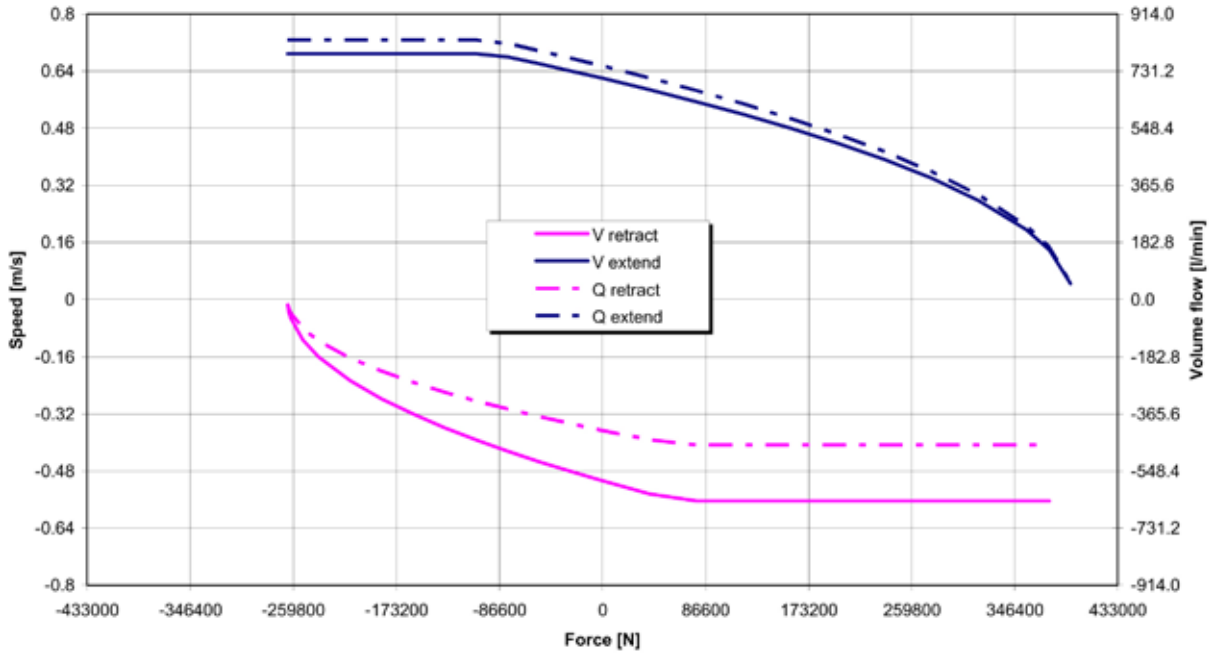
AXC160110 xxxx 1 + 2: Performance diagram cylinder d piston = 160mm, d rod = 110mm, p0 = 200bar
(Allowed working points in-between the curves)



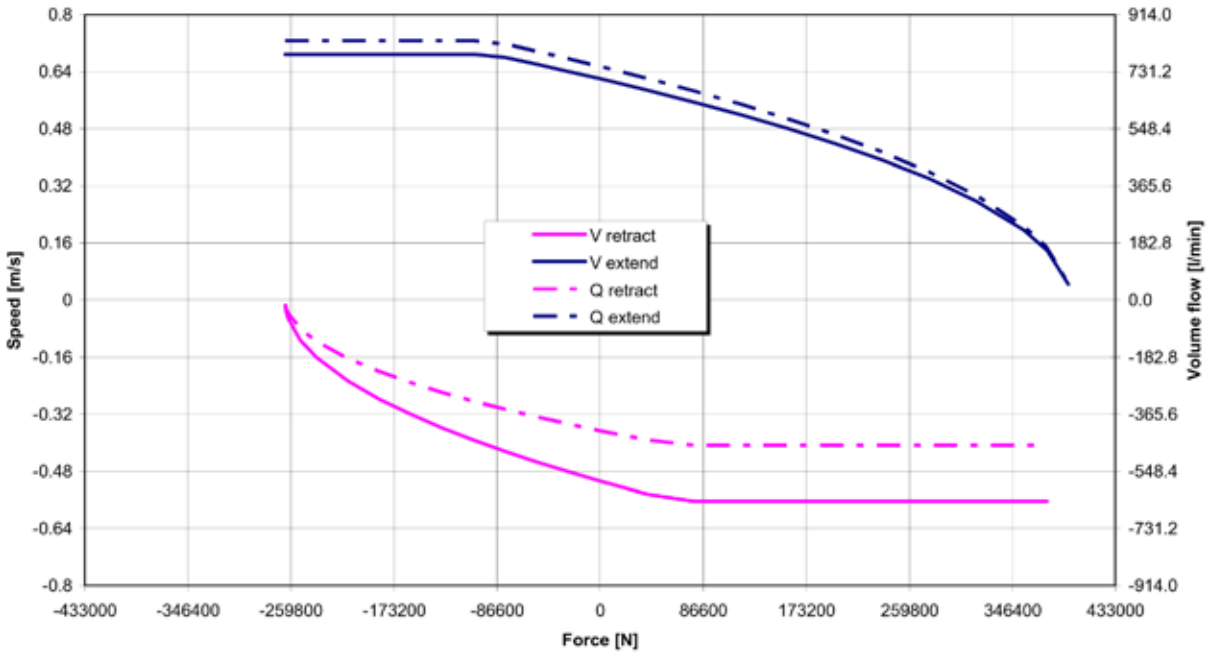
AXC160110 xxxx 3: Performance diagram cylinder d piston = 160mm, d rod = 110mm, p0 = 200bar
(Allowed working points in-between the curves)



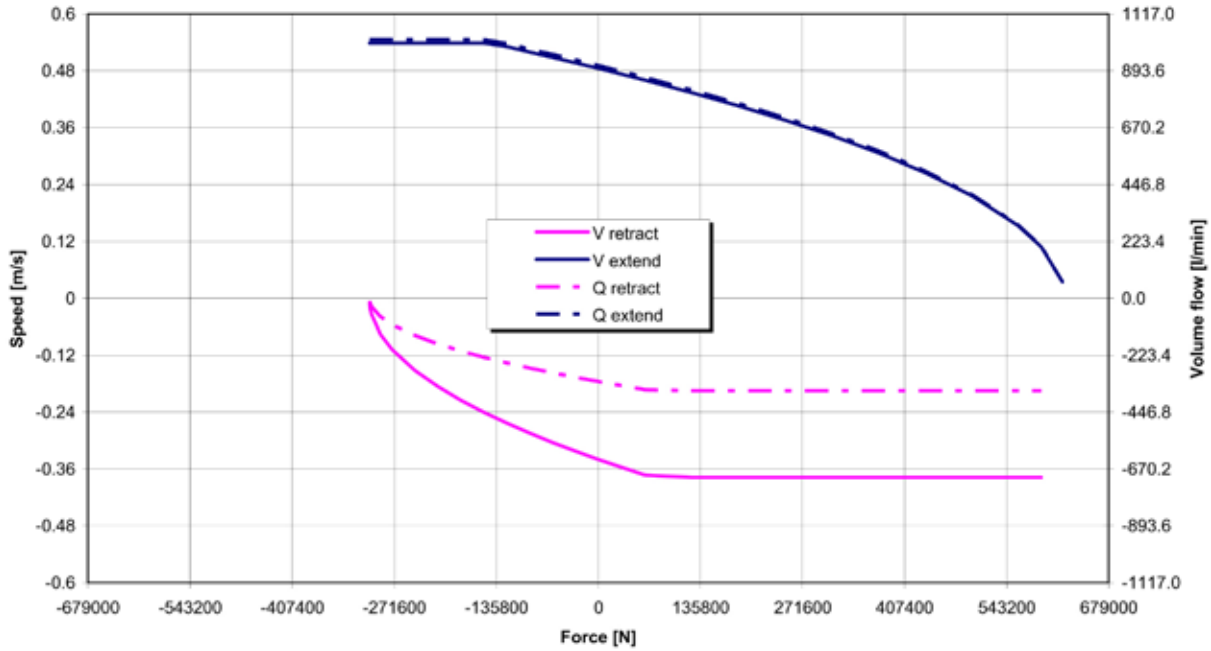
AXC160090 xxxx 1 + 2: Performance diagram cylinder d piston = 160mm, d rod = 90mm, p0 = 200bar
(Allowed working points in-between the curves)



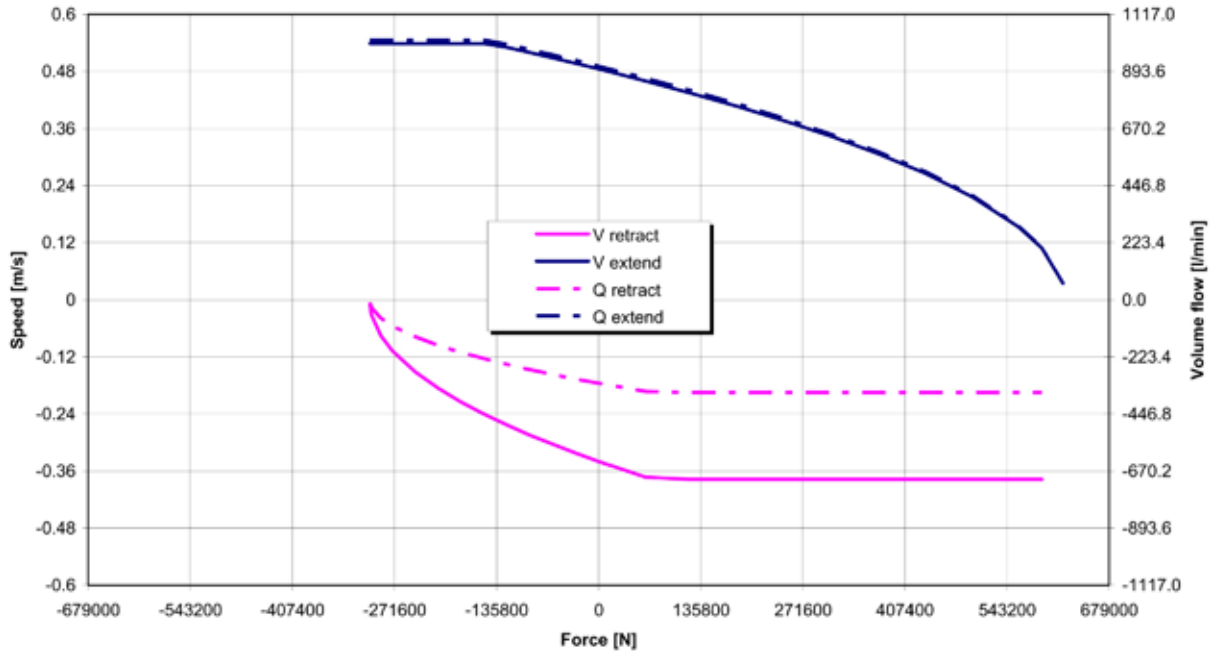
AXC160090 xxxx 3: Performance diagram cylinder d piston = 160mm, d rod = 90mm, p0 = 200bar
(Allowed working points in-between the curves)



AXC200140 xxxx 1 + 2: Performance diagram cylinder d piston = 200mm, d rod = 140mm, p0 = 200bar (Allowed working points in-between the curves)



AXC200140 xxxx 3: Performance diagram cylinder d piston = 200mm, d rod = 140mm, p0 = 200bar (Allowed working points in-between the curves)



3.4 Calculation formula

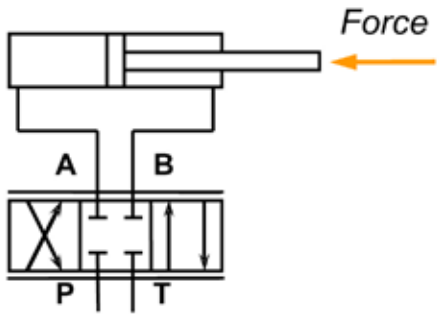
Extend:

$$Velocity = K_1 \cdot \sqrt{\frac{-Force\ [N] \cdot K_2 + p_0\ [bar] - p_T\ [bar] \cdot K_3}{K_4}}, \left[\frac{mm}{s}\right],$$

$$Volume\ flow_{(P \to A)} = Velocity \cdot K_5, \left[\frac{l}{\min}\right]$$

$$Volume\ flow_{(B \to T)} = Velocity \cdot K_6, \left[\frac{l}{\min}\right]$$

$$Deceleration_{max} = \frac{K_7 + Force\ [N]}{Mass\ [kg]}, \left[\frac{mm}{s^2}\right]$$



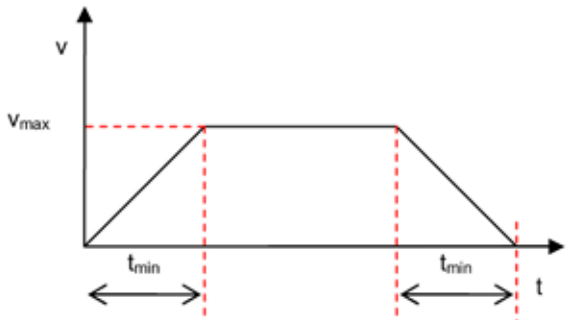
Retract:

$$Velocity = K_1 \cdot \sqrt{\frac{Force\ [N] \cdot K_2 + K_3 \cdot p_0\ [bar] - p_T\ [bar]}{K_4}}, \left[\frac{mm}{s}\right],$$

$$Volume\ flow_{(P \to B)} = Velocity \cdot K_6, \left[\frac{l}{\min}\right]$$

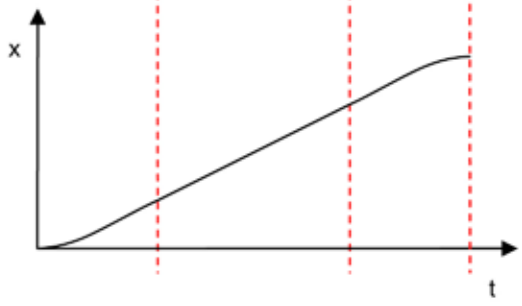
$$Volume\ flow_{(A \to T)} = Velocity \cdot K_5, \left[\frac{l}{\min}\right]$$

$$Deceleration_{max} = \frac{K_8 - Force\ [N]}{Mass\ [kg]}, \left[\frac{mm}{s^2}\right]$$



Acceleration / Deceleration:

$$Time_{min} = \frac{K_9}{\sqrt{Stroke\ [mm] \cdot Mass\ [kg]}}, [s]$$



$$Acceleration \leq \frac{Target\ \ speed}{Time_{min}}$$

$$Deceleration = minimum\ of \left(Deceleration_{max.}, \frac{Target\ speed}{Time_{min}} \right)$$

$$Stroke_{min} = \frac{(Velocity_{max})^2}{2 \cdot Acceleration} + \frac{(Velocity_{max})^2}{2 \cdot Deceleration}$$

Typ			Stroke	Perfomance class	K1	K2	K3	K4	K5	K6	K7	K8	K9
AXC	040	028	xxxx	1	0.143	0.0080	0.510	7.653	0.075	0.038	12694	23861	0.000167
AXC	040	028	xxxx	2	0.143	0.0080	0.510	7.653	0.075	0.038	12694	23861	0.000167
AXC	040	028	xxxx	3	0.478	0.0080	0.510	53.571	0.075	0.038	12694	23861	0.000167
AXC	050	036	xxxx	1	0.764	0.0051	0.482	50.638	0.118	0.057	16598	41779	0.000135
AXC	050	036	xxxx	2	0.764	0.0051	0.482	50.638	0.118	0.057	16598	41779	0.000135
AXC	050	036	xxxx	3	0.306	0.0051	0.482	50.638	0.118	0.057	16598	41779	0.000135
AXC	063	045	xxxx	1	0.193	0.0032	0.490	7.350	0.187	0.092	27775	64141	0.000107
AXC	063	045	xxxx	2	0.193	0.0032	0.490	7.350	0.187	0.092	27775	64141	0.000107
AXC	063	045	xxxx	3	0.481	0.0032	0.490	51.450	0.187	0.092	27775	64141	0.000107
AXC	063	036	xxxx	1	0.193	0.0032	0.673	11.109	0.187	0.126	73762	34014	0.000100
AXC	063	036	xxxx	2	0.193	0.0032	0.673	11.109	0.187	0.126	73762	34014	0.000100
AXC	063	036	xxxx	3	0.481	0.0032	0.673	77.764	0.187	0.126	73762	34014	0.000100
AXC	080	056	xxxx	1	0.179	0.0020	0.510	7.653	0.302	0.154	50777	95443	0.000083
AXC	080	056	xxxx	2	0.179	0.0020	0.510	7.653	0.302	0.154	50777	95443	0.000083
AXC	080	056	xxxx	3	0.298	0.0020	0.510	53.571	0.302	0.154	50777	95443	0.000083
AXC	080	045	xxxx	1	0.179	0.0020	0.684	11.389	0.302	0.206	124449	53233	0.000078
AXC	080	045	xxxx	2	0.179	0.0020	0.684	11.389	0.302	0.206	124449	53233	0.000078
AXC	080	045	xxxx	3	0.298	0.0020	0.684	79.722	0.302	0.206	124449	53233	0.000078
AXC	100	070	xxxx	1	0.115	0.0013	0.510	7.653	0.471	0.240	79339	149130	0.000067
AXC	100	070	xxxx	2	0.115	0.0013	0.510	7.653	0.471	0.240	79339	149130	0.000067
AXC	100	070	xxxx	3	0.229	0.0013	0.510	7.653	0.471	0.240	79339	149130	0.000067
AXC	100	056	xxxx	1	0.143	0.0013	0.686	11.468	0.471	0.323	196883	82498	0.000062
AXC	100	056	xxxx	2	0.143	0.0013	0.686	11.468	0.471	0.323	196883	82498	0.000062
AXC	100	056	xxxx	3	0.229	0.0013	0.686	11.468	0.471	0.323	196883	82498	0.000062
AXC	125	056	xxxx	1	0.245	0.0008	0.799	15.213	0.736	0.589	487564	94873	0.000048
AXC	125	056	xxxx	2	0.245	0.0008	0.799	15.213	0.736	0.589	487564	94873	0.000048
AXC	125	056	xxxx	3	0.245	0.0008	0.799	15.213	0.736	0.589	487564	94873	0.000048
AXC	125	090	xxxx	1	0.245	0.0008	0.482	7.234	0.736	0.355	103740	261117	0.000054
AXC	125	090	xxxx	2	0.245	0.0008	0.482	7.234	0.736	0.355	103740	261117	0.000054
AXC	125	090	xxxx	3	0.245	0.0008	0.482	7.234	0.736	0.355	103740	261117	0.000054
AXC	125	070	xxxx	1	0.245	0.0008	0.686	11.468	0.736	0.505	307630	128903	0.000050
AXC	125	070	xxxx	2	0.245	0.0008	0.686	11.468	0.736	0.505	307630	128903	0.000050
AXC	125	070	xxxx	3	0.245	0.0008	0.686	11.468	0.736	0.505	307630	128903	0.000050
AXC	160	110	xxxx	1	0.149	0.0005	0.527	7.933	1.206	0.636	225237	357217	0.000041
AXC	160	110	xxxx	2	0.149	0.0005	0.527	7.933	1.206	0.636	225237	357217	0.000041
AXC	160	110	xxxx	3	0.149	0.0005	0.527	7.933	1.206	0.636	225237	357217	0.000041
AXC	160	090	xxxx	1	0.149	0.0005	0.684	11.389	1.206	0.825	497797	212934	0.000039
AXC	160	090	xxxx	2	0.149	0.0005	0.684	11.389	1.206	0.825	497797	212934	0.000039
AXC	160	090	xxxx	3	0.149	0.0005	0.684	11.389	1.206	0.825	497797	212934	0.000039
AXC	200	140	xxxx	1	0.096	0.0003	0.510	7.653	1.885	0.961	317357	596519	0.000033
AXC	200	140	xxxx	2	0.096	0.0003	0.510	7.653	1.885	0.961	317357	596519	0.000033
AXC	200	140	xxxx	3	0.096	0.0003	0.510	7.653	1.885	0.961	317357	596519	0.000033

3.5 Cylinders

Based on cylinder series HMI according to ISO 6020/2, Parker manufactures compact tie rod cylinders with integrated transducer and manifolds for valve assembly.
The non-contacting transducer is surrounded by the cylinder and therefore protected against damage and pollution.
The rod seals are integrated in a gland. This design makes maintenance (gland replacement) in the field quick and easy.
As low cylinder friction is crucial in a dynamic application, Parker uses low friction seals on piston and gland.
For precise position accuracy it is advantageous to mount the valve directly on the cylinder. Corresponding to the required flow rate, manifolds are available for different valve sizes (NG6, NG10 and NG16).
In a cylinder with an integrated transducer, bore size determines the stroke limits between minimum and maximum.
See catalogue HY07-1175/UK, “HMI/HMD Hydraulic Cylinders” for technical limitations with regard to e.g. buckling and cushioning.

3.6 Valves

The three performance classes vary by valve type.

3.6.1 Performance class 1

For class 1 and standard performance, the most cost-effective solution is series D*FB*C*0NMW0 (NG6, 10 and 16) with off-board electronics. These valves without spool position feedback have low hysteresis and a positive overlap in the center position.

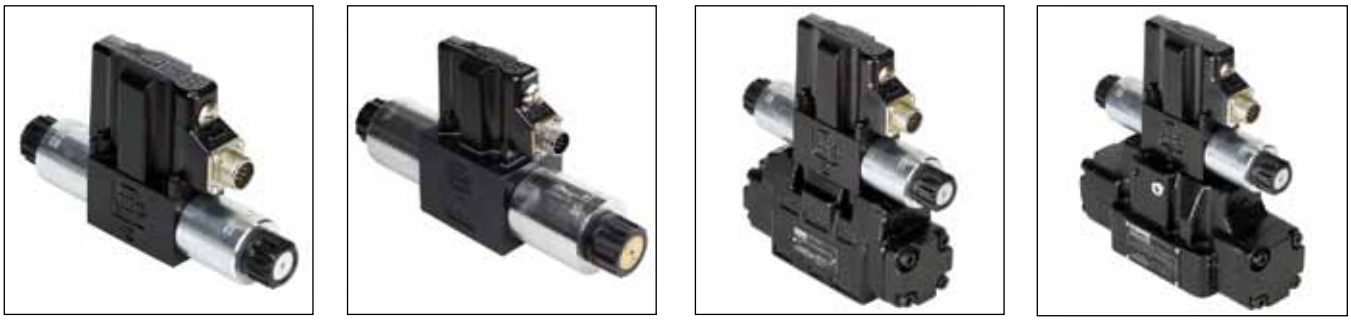
See catalogue HY11-3500/UK, “Hydraulic Valves. Industrial Standard” for technical details.

D*FB*C*0WMW0 valves

3.6.2 Performance class 2

For class 2 and medium performance, the most cost-effective solution is valve series D*FB*C0NF00 (NG6, 10 and 16) with onboard electronics.

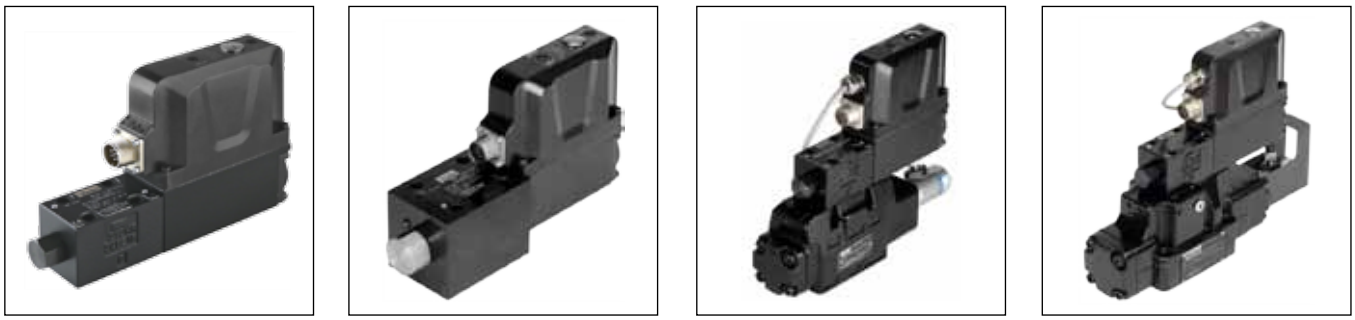
See catalogue HY11-3500/UK, “Hydraulic Valves. Industrial Standard” for technical details.



D*FB*C0WF00 valves

3.6.3 Performance class 3

For class 3 and best performance, the optimal solution is the DF*plus* valve series. These high-response valves with dynamics of up to 350Hz (NG6 -3DB at ±5% input signal) combine the frequency response of high-demand servovalves with the robustness of normal solenoid valves.

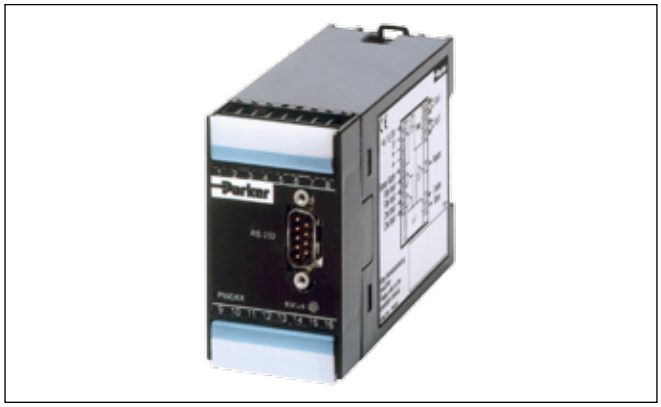


DF*plus* valves

3.7 Controller

3.7.1 Performance class 1

In performance class 1 the cylinder and the valve are controlled by the digital module PWDXX.
This controller offers good performance at low cost. The compact module for rail mounting is easy to install and operate. All valve and parameters of the controller have factory settings so that the electro-hydraulic axis is ready for use.



PWDXX

3.7.2 Performance classes 2 and 3

For performance classes 2 and 3 the electro-hydraulic controller Compax3F is used and offers a variety of control options.
Via ProfibusDP interface, the Compax3F can easily communicate with a PLC.
All parameters of the controller are factory set so that the electro-hydraulic axis is ready for use.

See catalogue HY11-3500/UK, “Hydraulic Valves. Industrial Standard” for technical details.

Compax3F

4. Technical data

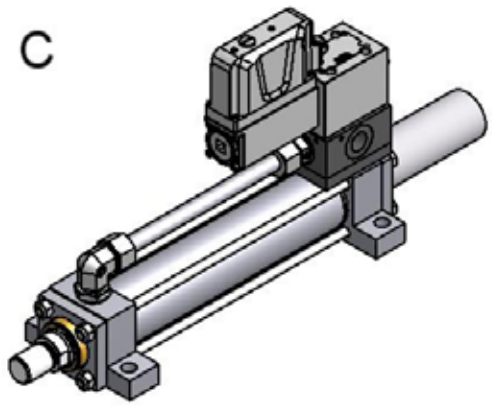
General		
Mounting interface		See chapter 5.1
Mounting position		unrestricted
Ambient temperature	[°C]	-20…+50
Vibration resistance	[g]	25 acc. DIN IEC68, part 2-6
Hydraulic		
Max. operting pressure	[bar]	Ports P, A, B 210
	[bar]	Port T max. 35port Y max 35 [1)]
Fluid		Hydraulic oil as per DIN 51524…535, other on request
Fluid temperature	[°C]	-20...+60
Viscosity		
permitted	[cSt]	20...380
recommended	[cSt]	30...80
Filtration		ISO 4406 (1999) 18/16/13 (acc. NAS 1638: 7)
Cylinder		
Max. operting pressure	[bar]	210
max. Speed	[mm/s]	1000
Valve		
Current consumption max.		
Performance class 1	[A]	2,95
Performance class 2	[A]	3
Performance class 3	[A]	3,5
Switch-on current typical	[A]	22 for 0.2 ms
Electrical connection valve		
Performance class 1		Connector as per EN 175301-803
Performance class 2+3		6 + PE acc. EN 175201-804
Wiring min.	[mm²]	7x1.0 (AWG 18) overall braid shield
Position feedback		
Plug-in connection		M16 per IEC 130-9, 8-pin
Resolution	[µm]	5
Non-linearity	[µm]	± 30
Hysteresis		< 1 LSB
Repeatability		< 2 LSB
Sampling rate		
Nom. length < 100	[kHz]	2
Nom. length < 1000	[kHz]	1
Nom. length < 1400	[kHz]	0,67
Nom. length < 2600	[kHz]	0,5
Temperature coefficient		< (6 µm + 5 ppm * nominal length) / K
Interface		
Performance class 1		analogue, 4..20mA
Performance class 2-3		digital, synchronous serial
Pressure transducer (only control option 1, 3, 5)		
Pressure connection		G1/4 BSP
Plug-in connection		4-pole; M12x1; IP67
Accuracy		± 0,5 % FS
Pressure range	[bar]	250
Overload pressure	[bar]	500
Burst pressure	[bar]	750
Electrical connection		short circuit protection; reverse polarity protection; protection class 3
Temperature coefficient		≤ ± 0,3 % FS/10 K
Electrical characteristics valve		
Protection class		IP65 in accordance with EN 60529 (plugged and mounted)
Supply voltage/ripple	[V]	DC 22 ... 30, ripple <5% eff., surge free
Pre-fusing	[A]	4.0 medium lag
EMC		EN 50081-2 / EN50082-2
Wiring lenght max.	[m]	50

[1)] For applications with pT>35 bar the Y-port has to be connected by an extra sandwich plate and the plug in the Y-port has to be removed.

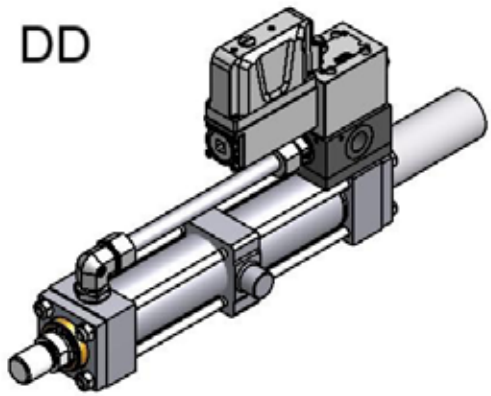
5. Dimensions

5.1 Mounting styles

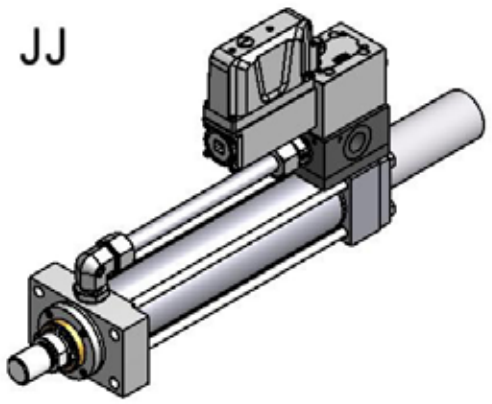
C



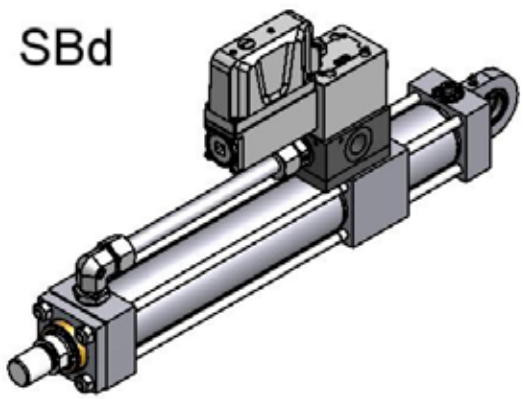
DD



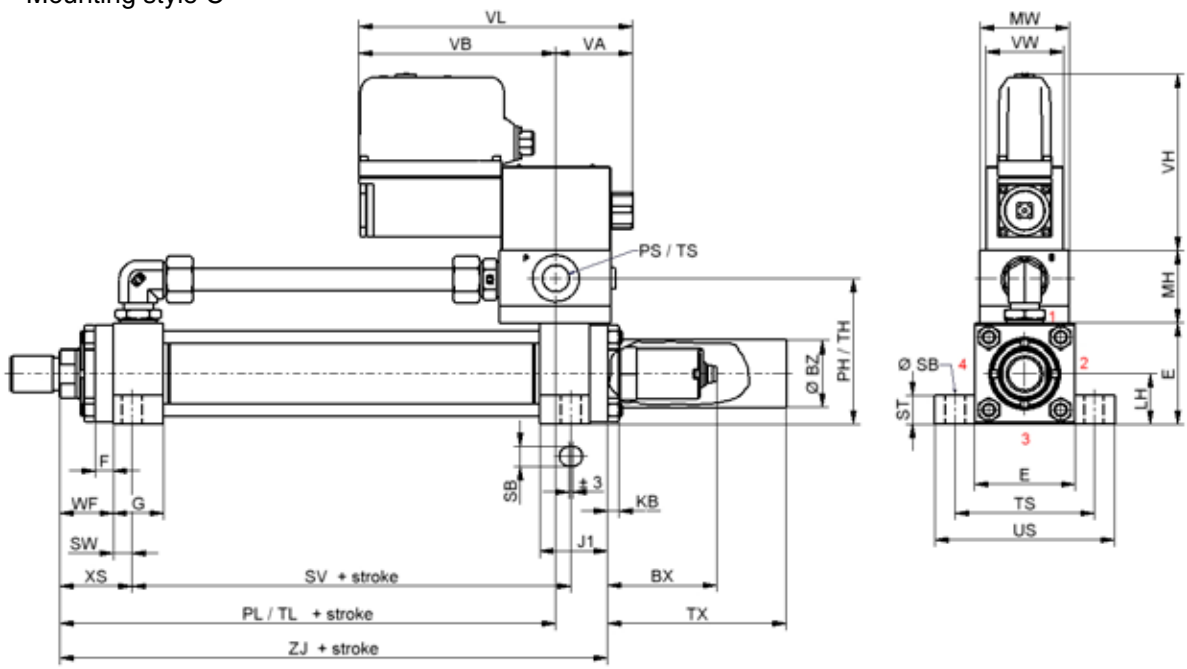
JJ



SBd



5.1.1 Mounting style C



Bore	Valve	E	F	G	J1	KB	LH h10	SB	ST	SW	TS	US	WF	XS	min. stroke	+stroke PL	+stroke TL	+stroke SV	+stroke ZJ	"BX max."	"BZ max."	TX
40	NG6	64	10	45	55	6,5	31	11	12,5	10	83	103	35	45	50	129	129	105	170	121	54 [1]	-
50	NG6	76	16	45	61	10	37	14	19	13	102	127	41	54	45	135	135	99	182	115	54 [1]	-
63	NG10	90	16	45	61	10	44	18	26	17	124	161	48	65	45	145	145	93	191	98	60	160
80	NG10	115	20	50	70	13	57	18	26	17	149	186	51	68	76	164	164	110	215	94	60	160
100	NG10	130	22	50	72	13	63	26	32	22	172	216	57	79	76	177	177	107	230	92	60	160
125	NG16	165	22	58	58	18	82	26	32	22	210	254	57	79	56	183	205	131	232	114	60	176
160	NG16	205	25	58	58	22	101	33	38	29	260	318	57	86	100	196	218	130	245	114	60	176
200	NG16	245	25	76	76	24	122	39	44	35	311	381	57	92	65	243	265	172	299	114	60	176

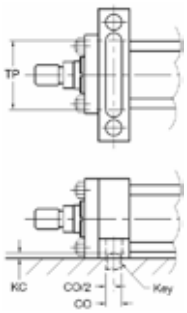
Bore	Valve	PH	TH	PS / TS	MH	MW	Performance_1 VL	VA	VB	VH	VW	Performance_1 VL	VA	VB	VH	VW	Performance_1 VL	VA	VB	VH	VW
40	NG6	96,5	96,5	G1/2"	50	70	222	111	111	100 [2]	46	221	111	111	125	46	251	57	195	147	51
50	NG6	108,5	108,5	G1/2"	50	70	222	111	111	100 [2]	46	221	111	111	125	46	251	57	195	147	51
63	NG10	130	130	G3/4"	65	80	299	150	150	129 [2]	70	299	150	150	158	70	272	205	57	159	70
80	NG10	155	155	G3/4"	65	80	299	150	150	129 [2]	70	299	150	150	158	70	272	205	57	159	70
100	NG10	170	170	G3/4"	65	80	206	103	103	188	70	205	103	103	208	70	280	185	95	238	70
125	NG16	284	224	G1 1/4"	154	140	228	127	101	212	92	228	127	101	232	92	328	227	101	251	92
160	NG16	324	264	G1 1/4"	154	140	228	127	101	212	92	228	127	101	232	92	328	227	101	251	92
200	NG16	364	304	G1 1/4"	154	140	228	127	101	212	92	228	127	101	232	92	328	227	101	251	92
200	NG16	364	304	G1 1/4"	154	140	228	127	101	212	92	228	127	101	232	92	328	227	101	251	92

All dimensions in mm.

[1] Across corners dimension of transducer housing. Protection tube for this bore is not available.

[2] The space necessary to remove the plug per EN 175301-803, design type AF is at least 15 mm.

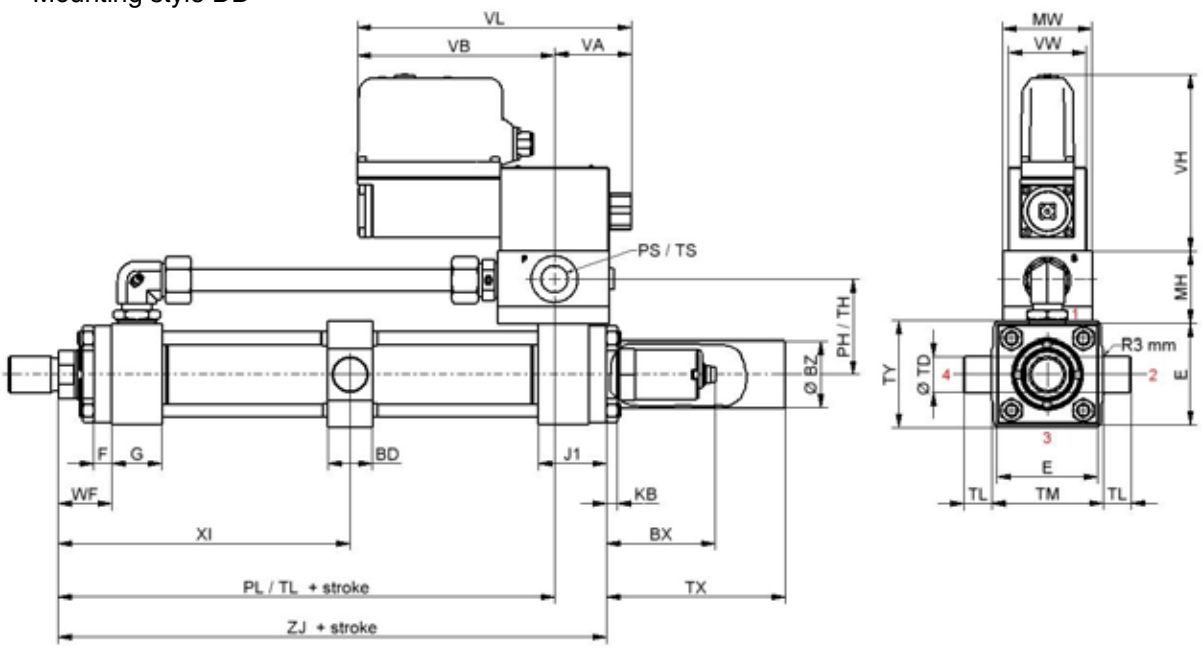
Foot mounted cylinders use a separate key (supplied) fitted between keyways machined in the foot mounting at the head end of the cylinder and the machine bed. To order, select 'K' in the 'Mounting Modification' field of the model code. The key supplied corresponds to BS4235/ DIN6885 type B.



Bore Ø	CO N9	KC min.	TP min.	Key Width	Key Height	Key Length	Key Part No.
40	12	4	55	12	8	55	0941540040
50	12	4.5	70	12	8	70	0941540050
63	16	4.5	80	16	10	80	0941540063
80	16	5	105	16	10	105	0941540080
100	16	6	120	16	10	120	0941540100
125	20	6	155	20	12	155	0941540125
160	32*	8	190	32	18	190	0941540160
200	40	8	220	40	22	220	0941540200

* Not to ISO 6020/2

5.1.2 Mounting style DD



XI → Please specify dimension in clear text for order.

Bore	Valve	BD	E	F	G	J1	KB	TD f8	TL	TM	TY	WF	min. stroke	XI min	+ stroke				BX max.	BZ max.	TX
															XI max.	PL	TL	ZJ			
40	NG6	30	64	10	45	55	6,5	20	16	76	76	35	50	97	70	129	129	170	121	54 [1]	-
50	NG6	40	76	16	45	61	10	25	20	89	89	41	45	107	75	135	135	193	115	54 [1]	-
63	NG10	40	90	16	45	61	10	32	25	100	95	48	80	114	67	145	145	191	98	60	160
80	NG10	50	115	20	50	70	13	40	32	127	127	51	76	127	80	164	164	215	94	60	160
100	NG10	60	130	22	50	72	13	50	40	140	140	57	76	138	85	177	177	230	92	60	160
125	NG16	73	165	22	58	58	18	63	50	178	178	57	56	153	100	183	205	232	114	60	176
160	NG16	90	205	25	58	58	22	80	63	215	216	57	100	161	80	196	218	245	114	60	176
200	NG16	110	245	25	76	76	24	100	80	279	280	57	65	190	115	243	265	299	114	60	176

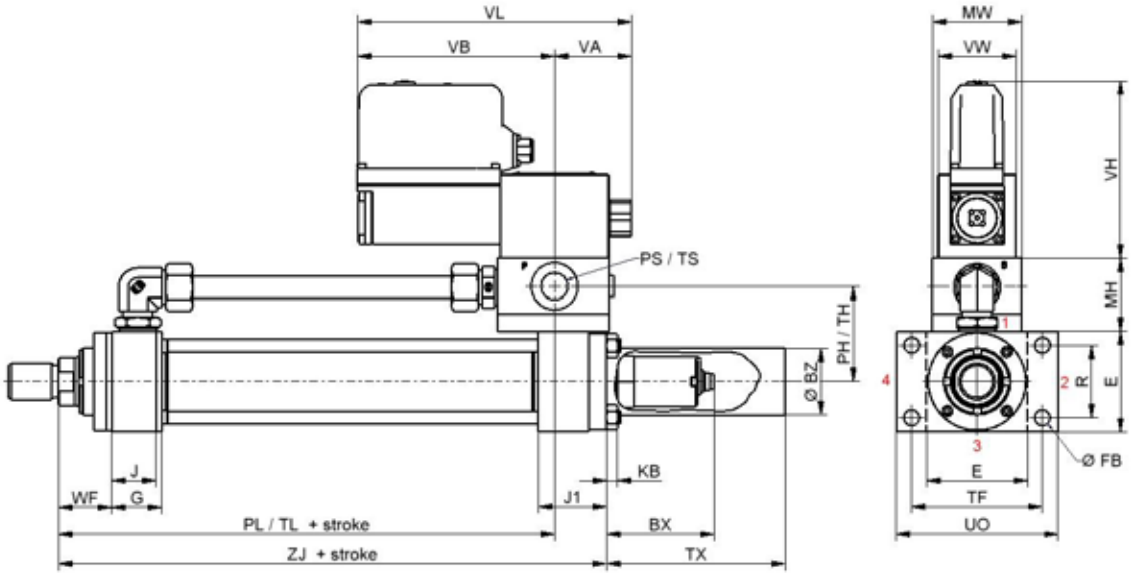
Bore	Valve	PH	TH	PS / TS	MH	MW	Performance_1					Performance_2					Performance_3				
							VL	VA	VB	VH	VW	VL	VA	VB	VH	VW	VL	VA	VB	VH	VW
40	NG6	64.5	64.5	G1/2"	50	70	222	111	111	100 [2]	46	221	111	111	125	46	251	57	195	147	51
50	NG6	70.5	70.5	G1/2"	50	70	222	111	111	100 [2]	46	221	111	111	125	46	251	57	195	147	51
63	NG10	85	85	G3/4"	65	80	299	150	150	129 [2]	70	299	150	150	158	70	272	205	57	159	70
80	NG10	97.5	97.5	G3/4"	65	80	299	150	150	129 [2]	70	299	150	150	158	70	272	205	57	159	70
100	NG10	122.5	122.5	G3/4"	65	80	206	103	103	188	70	205	103	103	208	70	280	185	95	238	70
125	NG16	201.5	141.5	G1 1/4"	154	140	228	127	101	212	92	228	127	101	232	92	328	227	101	251	92
160	NG16	221.5	161.5	G1 1/4"	154	140	228	127	101	212	92	228	127	101	232	92	328	227	101	251	92
200	NG16	241.5	181.5	G1 1/4"	154	140	228	127	101	212	92	228	127	101	232	92	328	227	101	251	92

All dimensions in mm.

[1] Across corners dimension of transducer housing. Protection tube for this bore is not available.

[2] The space necessary to remove the plug per EN 175301-803, design type AF is at least 15 mm.

5.1.3 Mounting style JJ



Bore	Valve	E	FB	G	J	J1	KB	R	TF	UO	WF	min. stroke	+ stroke PL	+ stroke TL	+ stroke ZJ	BX max.	BZ max.	TX
40	NG6	64	11	45	38	55	6,5	41	87	110	35	70	129	129	170	121	54 [1]	-
50	NG6	76	14	45	38	61	10	52	105	130	41	75	135	135	182	115	54 [1]	-
63	NG10	90	14	45	38	61	10	65	117	145	48	85	145	145	191	98	60	160
80	NG10	115	18	50	45	70	13	83	149	180	51	80	164	164	215	94	60	160
100	NG10	130	18	50	45	72	13	97	162	200	57	85	177	177	230	92	60	160
125	NG16	165	22	58	58	58	18	126	208	250	57	100	183	205	232	114	60	176
160	NG16	205	26	58	58	58	22	155	253	300	57	80	196	218	245	114	60	176
200	NG16	245	33	76	76	76	24	190	300	360	57	115	243	265	299	114	60	176

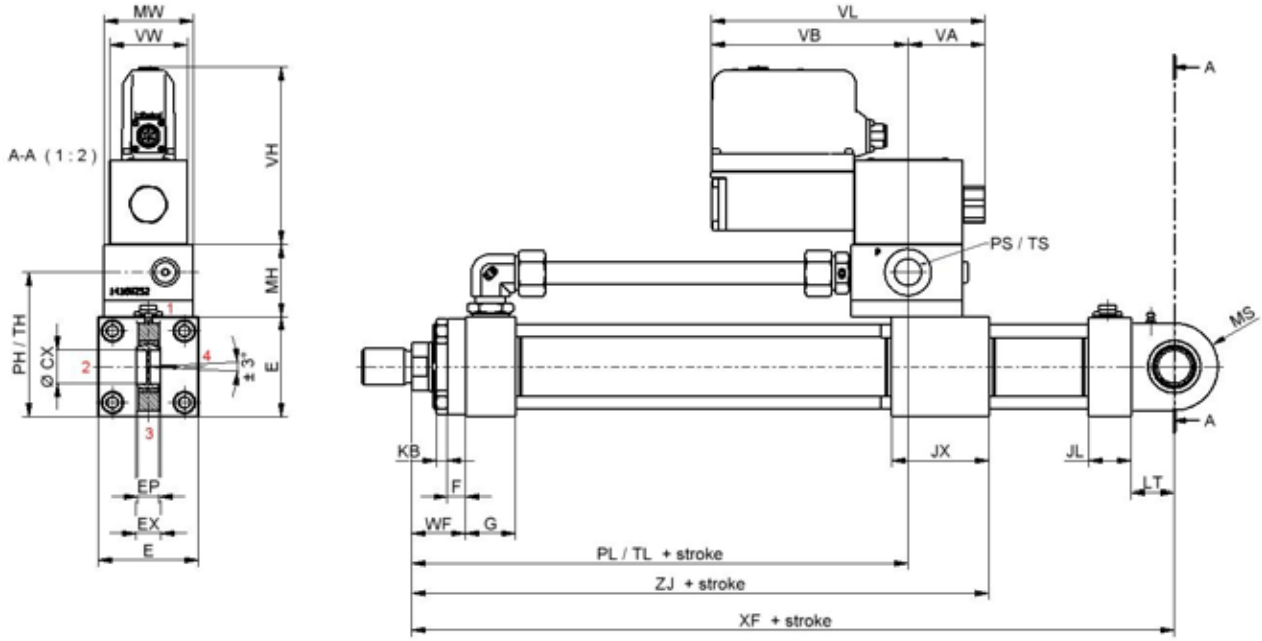
Bore	Valve	PH	TH	PS / TS	MH	MW	Performance_1 VL	VA	VB	VH	VW	Performance_2 VL	VA	VB	VH	VW	Performance_3 VL	VA	VB	VH	VW
40	NG6	64.5	64.5	G1/2"	50	70	222	111	111	100 [2]	46	221	111	111	125	46	251	57	195	147	51
50	NG6	70.5	70.5	G1/2"	50	70	222	111	111	100 [2]	46	221	111	111	125	46	251	57	195	147	51
63	NG10	85	85	G3/4"	65	80	299	150	150	129 [2]	70	299	150	150	158	70	272	205	57	159	70
80	NG10	97.5	97.5	G3/4"	65	80	299	150	150	129 [2]	70	299	150	150	158	70	272	205	57	159	70
100	NG10	122.5	122.5	G3/4"	65	80	206	103	103	188	70	205	103	103	208	70	280	185	95	238	70
125	NG16	201.5	201.5	G1 1/4"	154	140	228	127	101	212	92	228	127	101	232	92	328	227	101	251	92
160	NG16	221.5	221.5	G1 1/4"	154	140	228	127	101	212	92	228	127	101	232	92	328	227	101	251	92
200	NG16	241.5	241.5	G1 1/4"	154	140	228	127	101	212	92	228	127	101	232	92	328	227	101	251	92
200	NG16	241.5	241.5	G1 1/4”	154	140	228	127	101	212	92	228	127	101	232	92	328	227	101	251	92

All dimensions in mm.

[1] Across corners dimension of transducer housing. Protection tube for this bore is not available.

[2] The space necessary to remove the plug per EN 175301-803, design type AF is at least 15 mm.

5.1.4 Mounting style SBd



Bore	Valve	CX [1] -0,012	E	EP	EX	F	G	JL	JX	KB	LT	MS max.	WF	min. stroke	+ stroke			
															PL	TL	XF	ZJ
40	NG6	20	64	13	16	10	45	38	77	6,5	25	29	35	50	129	129	360	192
50	NG6	25	76	17	20	16	45	38	87	10	31	33	41	45	135	135	365	208
63	NG10	30	90	19	22	16	45	38	87	10	38	40	48	80	145	145	383	217
80	NG10	40	115	23	28	20	50	45	84	13	48	50	51	76	164	164	410	229
100	NG10	50	130	30	35	22	50	45	74	13	58	62	57	76	177	177	436	232
125	NG16	60	165	38	44	22	58	58	58	18	72	80	57	56	205	205	487	232
160	NG16	80	205	47	55	25	58	58	58	22	92	100	57	100	218	218	528	245
200	NG16	100	245	57	70	25	76	76	76	24	116	120	57	65	265	265	632	299

Bore	Valve	PH	TH	PS / TS	MH	MW	Performance_1					Performance_2					Performance_3				
							VL	VA	VB	VH	VW	VL	VA	VB	VH	VW	VL	VA	VB	VH	VW
40	NG6	96,5	96,5	G1/2"	50	70	222	111	111	100 [2]	46	221	111	111	125	46	251	57	195	147	51
50	NG6	108,5	108,5	G1/2"	50	70	222	111	111	100 [2]	46	221	111	111	125	46	251	57	195	147	51
63	NG10	130	130	G3/4"	65	80	299	150	150	129 [2]	70	299	150	150	158	70	272	205	57	159	70
80	NG10	155	155	G3/4"	65	80	299	150	150	129 [2]	70	299	150	150	158	70	272	205	57	159	70
100	NG10	170	170	G3/4"	65	80	206	103	103	188	70	205	103	103	208	70	280	185	95	238	70
125	NG16	284	224	G1 1/4"	154	140	228	127	101	212	92	228	127	101	232	92	328	227	101	251	92
160	NG16	324	264	G1 1/4"	154	140	228	127	101	212	92	228	127	101	232	92	328	227	101	251	92
200	NG16	364	304	G1 1/4"	154	140	228	127	101	212	92	228	127	101	232	92	328	227	101	251	92
200	NG16	364	304	G1 1/4”	154	140	228	127	101	212	92	228	127	101	232	92	328	227	101	251	92

All dimensions in mm.

[1] Dimension tolerance -0.012 mm

[2] The space necessary to remove the plug per EN 175301-803, design type AF is at least 15 mm.

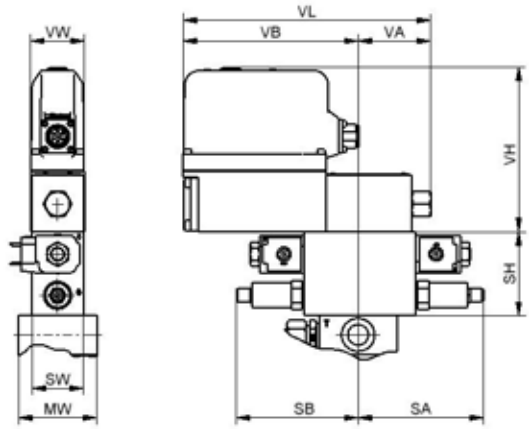
5.2 Manifolds options

5.2.1 Blocking valves in ports A and B

Blocking valves in ports A and B hold the cylinder in position when the controller is disabled. Otherwise the cylinder could drift out of the position.

Bore	Valve	SA	SB	SA [1]	SB [1]	SH	SW
40	NG6	100.2	96.8	112.2	108.8	75	46
50	NG6	100.2	96.8	112.2	108.8	75	46
63	NG10	124.8	117.8	136.8	129.8	80	70
80	NG10	124.8	117.8	136.8	129.8	80	70
100	NG10	124.8	117.8	136.8	129.8	80	70
125	NG16	2)	2)	2)	2)	2)	2)
160	NG16	2)	2)	2)	2)	2)	2)
200	NG16	2)	2)	2)	2)	2)	2)

All dimensions in mm.
1) Only for control option 2 and 3
2) for bore 125 to 200 in preparation

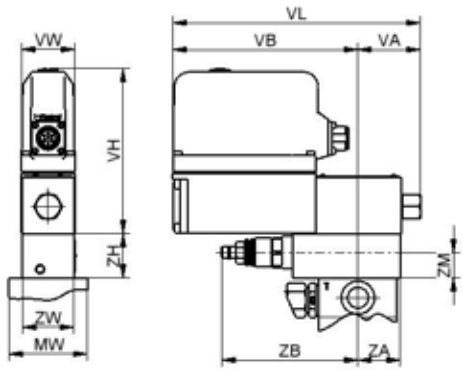


5.2.2 Over pressure protection of rod side

The use of pressure relief valves is recommended to avoid cylinder damage through excess pressure caused by the area ratio of the cylinder or external loads.

Bore	Valve	ZA	ZB	ZH	ZM	ZW
40	NG6	37.9	121.5	40	23	46
50	NG6	37.9	121.5	40	23	46
63	NG10	58	114.6	50	25	70
80	NG10	58	114.6	50	25	70
100	NG10	58	114.6	50	25	70
125	NG16	213.3	60.7	80	53	90
160	NG16	213.3	60.7	80	53	90
200	NG16	213.3	60.7	80	53	90

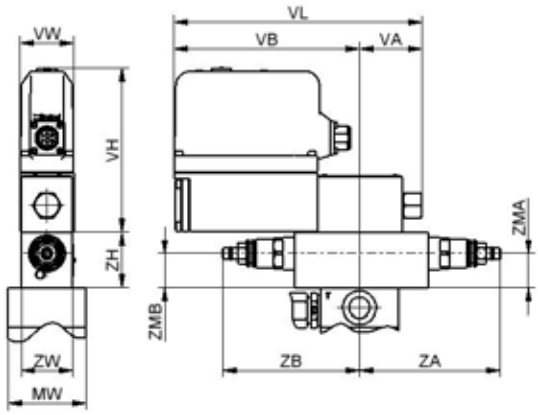
All dimensions in mm.



5.2.3 Pressure overload protection of piston and rod side

Bore	Valve	ZA	ZB	ZH	ZMA	ZMB	ZW
40	NG6	126.1	122.1	50	31	31	46
50	NG6	126.1	122.1	50	31	31	46
63	NG10	114.6	114.6	50	25	25	70
80	NG10	114.6	114.6	50	25	25	70
100	NG10	114.6	114.6	50	25	25	70
125	NG16	213.3	60.7	80 [1]	53	---	90
160	NG16	213.3	60.7	80 [1]	53	---	90
200	NG16	213.3	60.7	80 [1]	53	---	90

All dimensions in mm.
[1] For bore 125 to 200mm select over pressure protection only for rod or piston side.



5.3 Buckling / Piston Rod size selection

To select a piston rod for compression (push) applications:

1. Determine 'Mounting Type', '-Style' and 'Rod End Connection' to be used. See table 'Stroke Factor Selection' to identify which factor suits the application.
2. Using the 'Stroke Factor', determine the 'Basic Length' from the equation

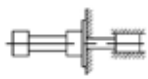
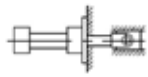
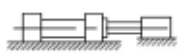
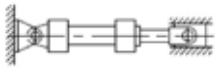
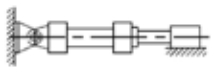
   Basic Length = Net Stroke x Stroke Factor

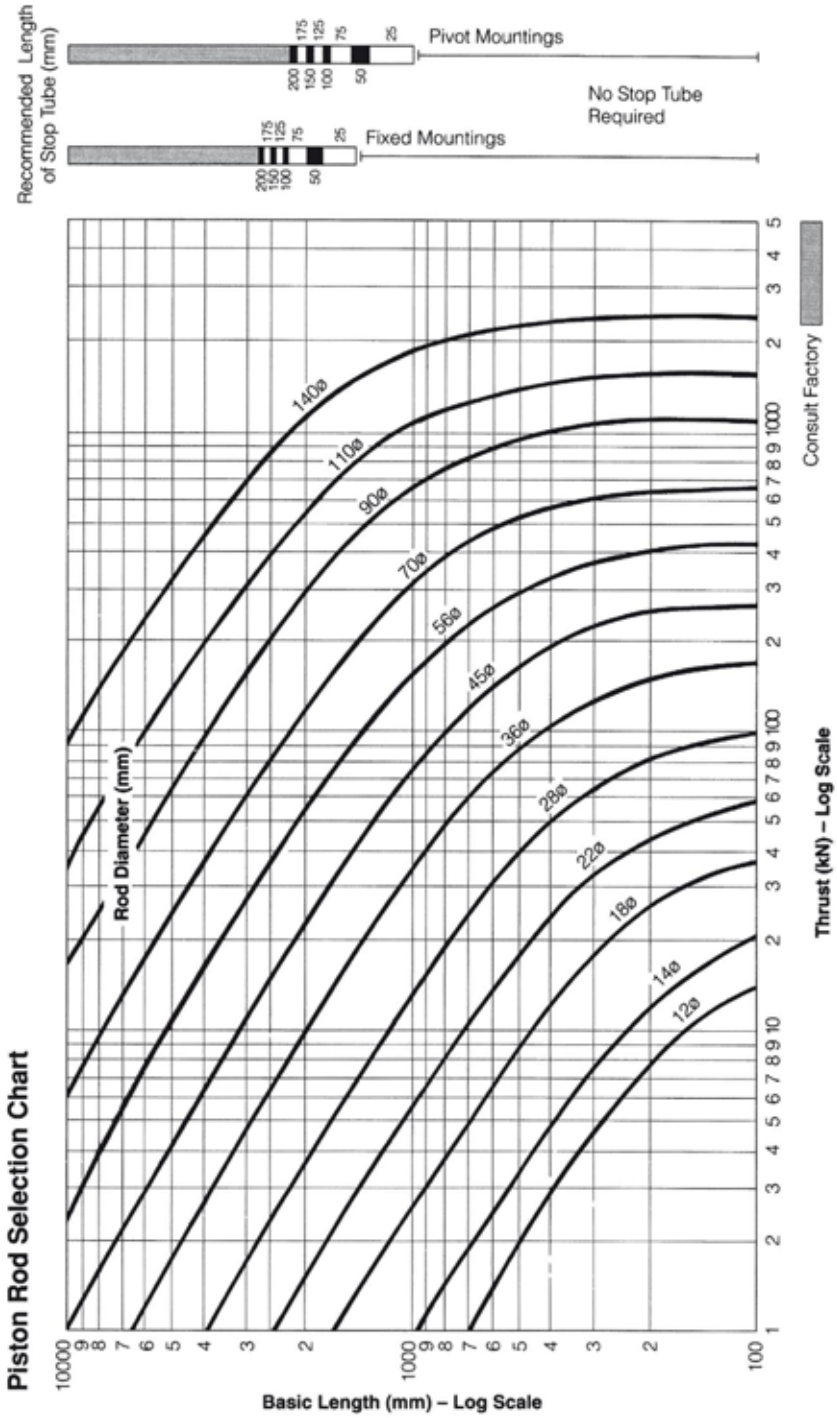
   (See 'Piston Rod Selection Chart' for the standard rod extension beyond the face of the gland retainer. For rod extensions exceeding the standard, add the increase to the net stroke to obtain the 'Basic Length'.) Calculate the load by multiplying the full cylinder bore area by the system pressure, or see push- and pull force charts.
3. Using the 'Piston Rod Selection Chart', look along the values of 'Basic Length' and 'Push Force' as found in 1. and 2. above, and note the point of intersection.

The correct piston rod diameter can be read from the curved line above the point of intersection.
For tensile (pull) loads, the rod size is selected by specifying standard cylinders with standard rod diameters and using them at or below the rated pressure.

See catalogue HY07-1175/UK, "HMI/HMD Hydraulic Cylinders" for technical details.

Stroke Factor Selection

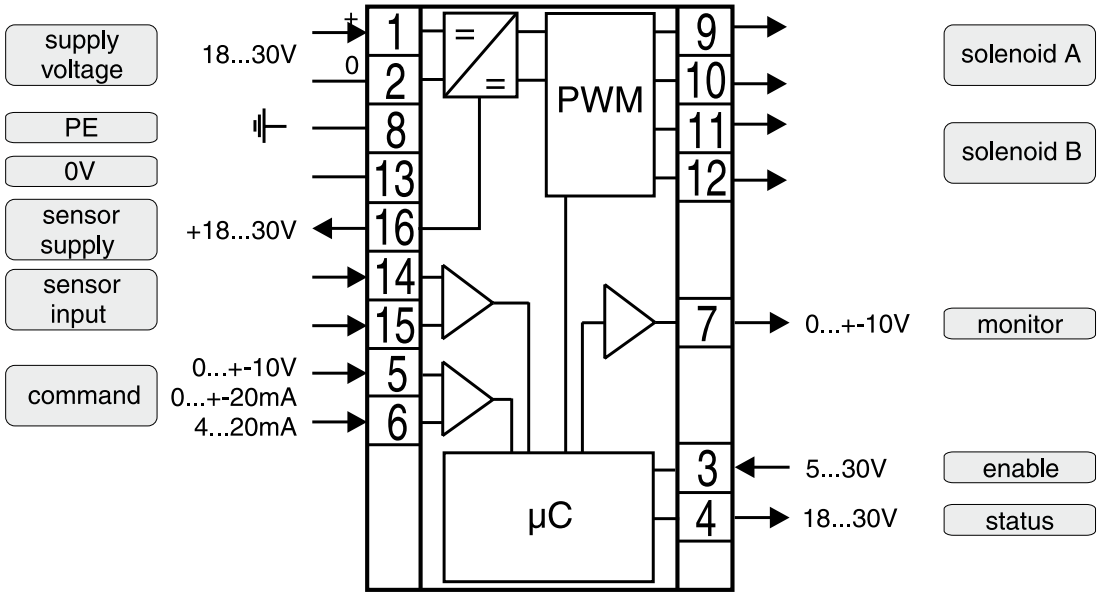
Rod End Connection	Mounting Style	Type of Mounting	Stroke Factor
Fixed and Rigidly Guided	JJ, C		0.5
Pivoted and Rigidly Guided	JJ, C		0.7
Pivoted and Rigidly Guided	DD		1.5
Supported but not Rigidly Guided	JJ, C		2.0
Pivoted and Rigidly Guided	SBd		2.0
Supported but not Rigidly Guided	SBd		4.0


Recommended Length of Stop Tube (mm)
Pivot Mountings
No Stop Tube Required
Fixed Mountings
Piston Rod Selection Chart
Rod Diameter (mm)
140ø
110ø
90ø
70ø
56ø
45ø
36ø
28ø
22ø
18ø
14ø
12ø
Consult Factory
Thrust (kN) – Log Scale
Basic Length (mm) – Log Scale

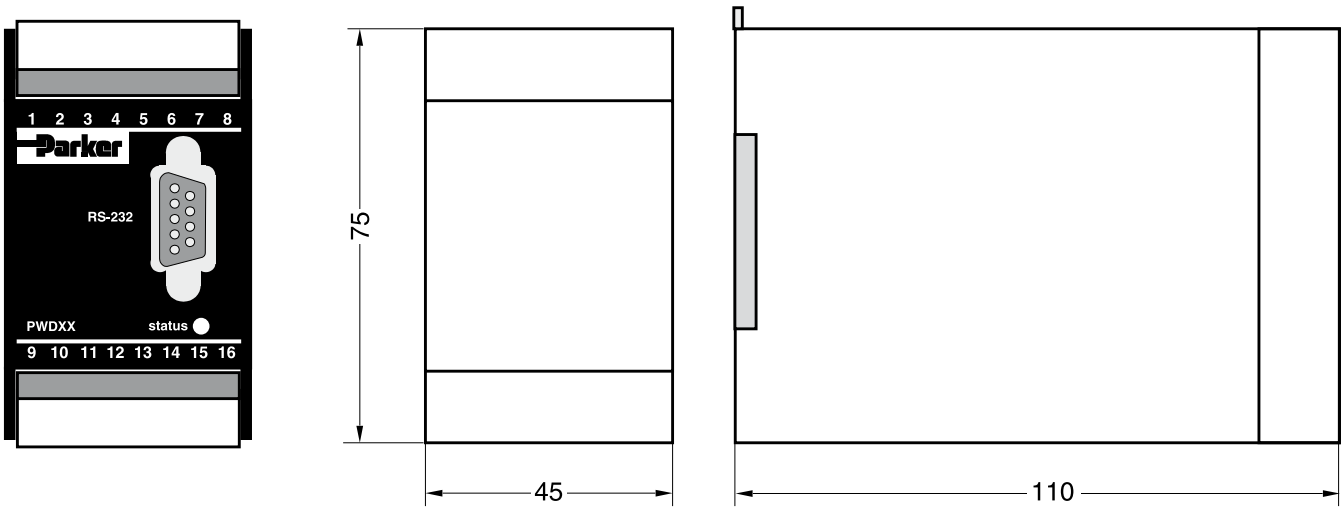
6. Electronic Interface

6.1 Controller

6.1.1 Performance class 1

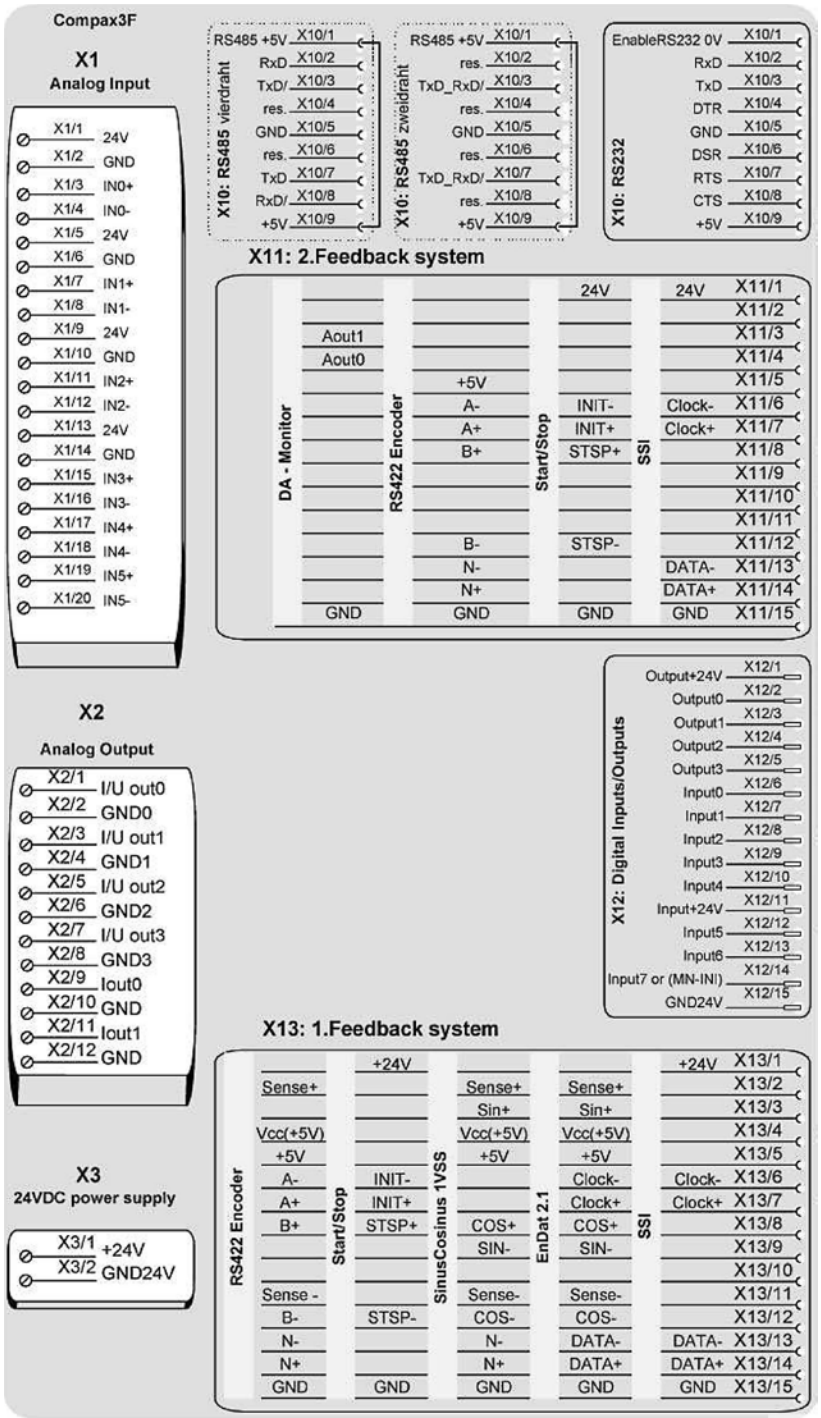


6.1.1.1 Front view / Dimensions



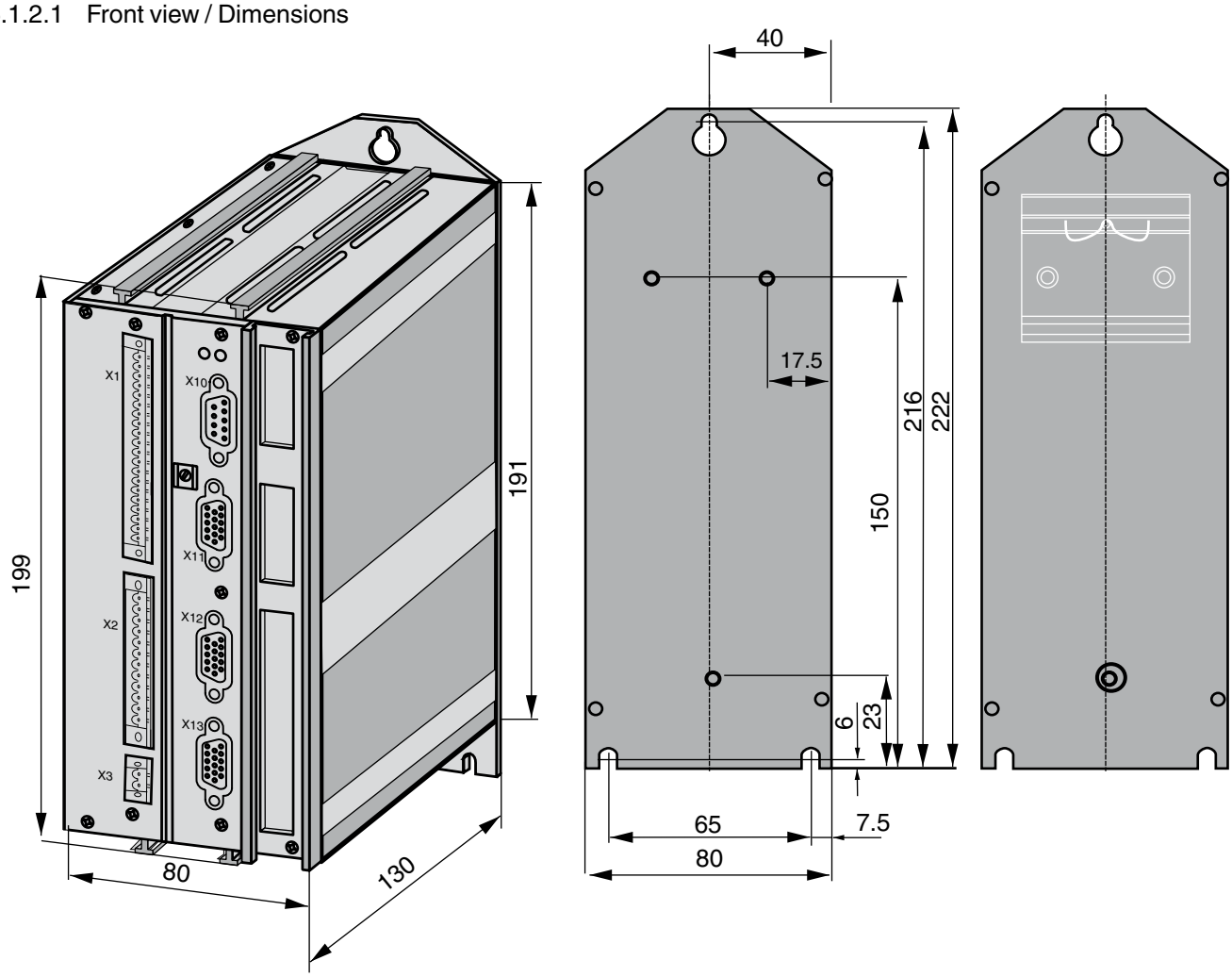
All dimensions are in millimeters.

6.1.2 Performance classes 2 and 3



X1	Analog inputs
X2	Analog outputs
X3	24 VDC power supply
X10	RS232/RS485
X11	2. Feedback type
X12	Inputs/Outputs
X13	1. Feedback type
X23	ProfibusDP

6.1.2.1 Front view / Dimensions

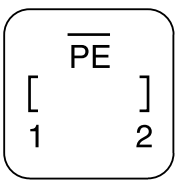


All dimensions are in millimeters.

6.2 Valves

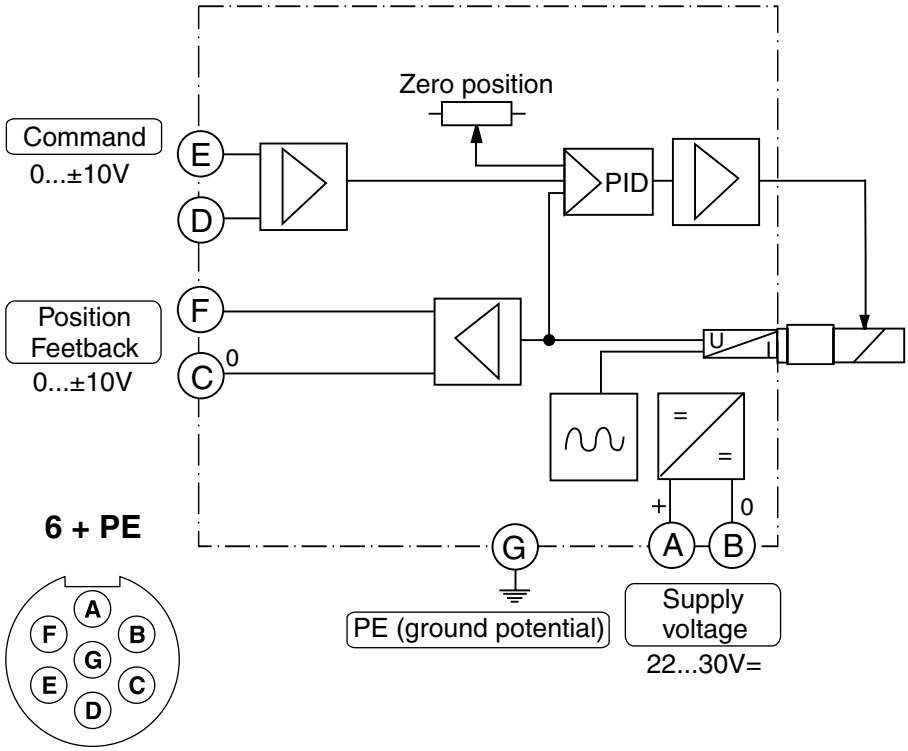
6.2.1 Performance class 1

Plug
Solenoid coil



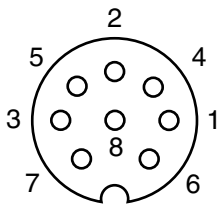
1 = coil connection
2 = coil connection
PE = ground potential

6.2.2 Performance classes 2 and 3



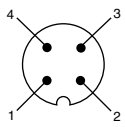
6.3 Feedback system

	Performance class 1	Performance classes 2-3
PIN	**BTL7-E_0 … S32**	**BTL7-S1_ _ … S32**
1	4..20mA	+Clk
2	0V	+Data
3	n.c.	-Clk
4	n.c.	n.c.
5	n.c.	-Data
6	GND	GND
7	+24V	+24V
8	n.c.	n.c.



6.4 Pressure transducers (Control options 1, 3, 5)

PIN	4...20 mA , 3-core
1	+Ub
2	P-Signal
3	0 V/GND
4	n.c.



7. Accessories

7.1 Cable sets

	Performance class		
	1	**2**	**3**
Position feedback <--> Controller (plug for controller side and flying leads at transducer)	–	GBK53/ [2]	GBK53/ [2]
"Position feedback <--> Controller (plugs at both ends)"	–	GBK40/ [2]	GBK40/ [2]
Pressure transducer <--> Controller	–	DSK01/ [2]	DSK01/ [2]
Interface cable PC <--> Controller	[1]	SSK01/ [2]	SSK01/ [2]
Controller --> Valve	VTK01/ [2]	VTK01/ [2]	VTK01/ [2]

Digital I/Os

I/O terminal block without luminous indicator	–	EAM06/01	EAM06/01
I/O terminal block with luminous indicator	–	EAM06/02	EAM06/02
Interface cable I/O terminal <--> Controller	–	SSK24/ [2]	SSK24/ [2]

[1] Standard Null Modem Cable
[2] Length code

Length code 1 (Example: SSK01/09: Length 25m)

Length [m]	1.0	2.5	5.0	7.5	10.0	12.5	15.0	20.0	25.0	30.0	50.0
Code	01	02	03	04	05	06	07	08	09	10	14

7.2 Manifolds

	NG6	**NG10**	**NG16**
Gauge port plate port P, T --> G1/4" (e.g. for Mini mess, pressure transducers, etc.)	H06-1044	H10-1656	H16-1658
Gauge port plate port A, B --> G1/4" (e.g. for Mini mess, pressure transducers, etc.)	H06-1039	H10-1657	
Flushing plate (P <--> T, A and B closed)	AD06-1654	AD10-1655	AD16-1660
Closing plate (P, T, A and B closed)	D51VP071C	D51VP101D	AD16-1659

Parker Worldwide

AE – UAE, Dubai
Tel: +971 4 8127100
parker.me@parker.com

AR – Argentina, Buenos Aires
Tel: +54 3327 44 4129

AT – Austria, Wiener Neustadt
Tel: +43 (0)2622 23501-0
parker.austria@parker.com

AT – Eastern Europe,
Wiener Neustadt
Tel: +43 (0)2622 23501 900
parker.easteurope@parker.com

AU – Australia, Castle Hill
Tel: +61 (0)2-9634 7777

AZ – Azerbaijan, Baku
Tel: +994 50 2233 458
parker.azerbaijan@parker.com

BE/LU – Belgium, Nivelles
Tel: +32 (0)67 280 900
parker.belgium@parker.com

BR – Brazil, Cachoeirinha RS
Tel: +55 51 3470 9144

BY – Belarus, Minsk
Tel: +375 17 209 9399
parker.belarus@parker.com

CA – Canada, Milton, Ontario
Tel: +1 905 693 3000

CH – Switzerland, Etoy
Tel: +41 (0)21 821 87 00
parker.switzerland@parker.com

CL – Chile, Santiago
Tel: +56 2 623 1216

CN – China, Shanghai
Tel: +86 21 2899 5000

CZ – Czech Republic, Klecany
Tel: +420 284 083 111
parker.czechrepublic@parker.com

DE – Germany, Kaarst
Tel: +49 (0)2131 4016 0
parker.germany@parker.com

DK – Denmark, Ballerup
Tel: +45 43 56 04 00
parker.denmark@parker.com

ES – Spain, Madrid
Tel: +34 902 330 001
parker.spain@parker.com

FI – Finland, Vantaa
Tel: +358 (0)20 753 2500
parker.finland@parker.com

FR – France, Contamine s/Arve
Tel: +33 (0)4 50 25 80 25
parker.france@parker.com

GR – Greece, Athens
Tel: +30 210 933 6450
parker.greece@parker.com

HK – Hong Kong
Tel: +852 2428 8008

HU – Hungary, Budapest
Tel: +36 1 220 4155
parker.hungary@parker.com

IE – Ireland, Dublin
Tel: +353 (0)1 466 6370
parker.ireland@parker.com

IN – India, Mumbai
Tel: +91 22 6513 7081-85

IT – Italy, Corsico (MI)
Tel: +39 02 45 19 21
parker.italy@parker.com

JP – Japan, Fujisawa
Tel: +81 (0)4 6635 3050

KR – South Korea, Seoul
Tel: +82 2 559 0400

KZ – Kazakhstan, Almaty
Tel: +7 7272 505 800
parker.easteurope@parker.com

LV – Latvia, Riga
Tel: +371 6 745 2601
parker.latvia@parker.com

MX – Mexico, Apodaca
Tel: +52 81 8156 6000

MY – Malaysia, Shah Alam
Tel: +60 3 7849 0800

NL – The Netherlands,
Oldenzaal
Tel: +31 (0)541 585 000
parker.nl@parker.com

NO – Norway, Asker
Tel: +47 66 75 34 00
parker.norway@parker.com

NZ – New Zealand, Mt Wellington
Tel: +64 9 574 1744

PL – Poland, Warsaw
Tel: +48 (0)22 573 24 00
parker.poland@parker.com

PT – Portugal, Leca da Palmeira
Tel: +351 22 999 7360
parker.portugal@parker.com

RO – Romania, Bucharest
Tel: +40 21 252 1382
parker.romania@parker.com

RU – Russia, Moscow
Tel: +7 495 645-2156
parker.russia@parker.com

SE – Sweden, Spånga
Tel: +46 (0)8 59 79 50 00
parker.sweden@parker.com

SG – Singapore
Tel: +65 6887 6300

SK – Slovakia, Banská Bystrica
Tel: +421 484 162 252
parker.slovakia@parker.com

SL – Slovenia, Novo Mesto
Tel: +386 7 337 6650
parker.slovenia@parker.com

TH – Thailand, Bangkok
Tel: +662 717 8140

TR – Turkey, Istanbul
Tel: +90 216 4997081
parker.turkey@parker.com

TW – Taiwan, Taipei
Tel: +886 2 2298 8987

UA – Ukraine, Kiev
Tel +380 44 494 2731
parker.ukraine@parker.com

UK – United Kingdom,
Warwick
Tel: +44 (0)1926 317 878
parker.uk@parker.com

US – USA, Cleveland
(industrial)
Tel: +1 216 896 3000

US – USA, Lincolnshire
(mobile)
Tel: +1 847 821 1500

VE – Venezuela, Caracas
Tel: +58 212 238 5422

ZA – South Africa,
Kempton Park
Tel: +27 (0)11 961 0700
parker.southafrica@parker.com

Catalogue HY11-3341/UK. 08/2010

European Product Information Centre
Free phone: 00 800 27 27 5374
(from AT, BE, CH, CZ, DE, EE, ES, FI, FR, IE, IL, IS, IT, LU, MT, NL, NO, PT, SE, SK, UK)
US Product Information Centre
Free phone: 1-800-27 27 537
www.parker.com

Your local authorized Parker distributor