RE-A 92801/2020-11-18
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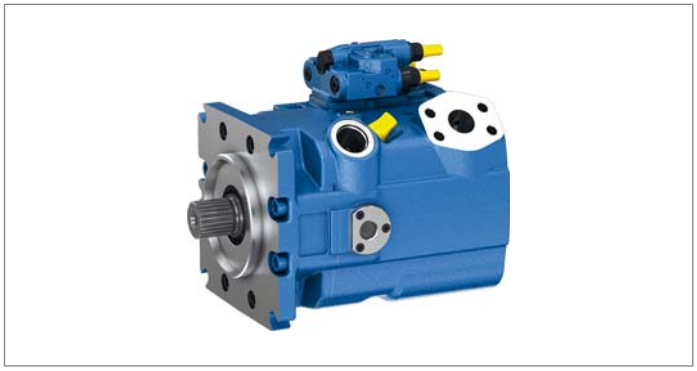
rexroth
A Bosch Company

Axial piston variable pump A15VSO, A15VLO Series 11
Americas



- Robust high-pressure pump for industrial applications
- Sizes 110 to 280
- Nominal pressure 5100 psi (350 bar)
- Maximum pressure 6100 psi (420 bar)
- Open circuit

Features

- Variable pump with axial piston rotary group in swashplate design for hydrostatic drives in open circuit.
- For use particularly in industrial application areas
- Flow is proportional to the drive speed and displacement.
- Flow can be infinitely varied by controlling the swashplate angle.
- The pump can work either self-priming or with a charge pump.
- Special control device program for industrial applications, with different control and regulation functions.
- The universal through drive is suitable for adding gear wheel pumps and axial piston pumps of up to the same size, i.e. 100% through drive.
- Compact design
- High efficiency
- High power density
- Low noise level

Contents

Type code	2
Hydraulic fluids	6
Charge pump (impeller)	7
Working pressure range	8
Technical data	9
Power controller	13
Stroke control	17
Pressure controller	24
Dimensions, size 110	31
Dimensions, size 145	35
Dimensions, size 175	40
Dimensions, size 210	45
Dimensions, size 280	50
Dimensions, through drive	55
Overview of mounting options	61
Combination pumps A15V... + A15V...	62
Connector for solenoids	63
Installation instructions	64
Project planning notes	66
Safety instructions	67

Type code

01	02	03	04	05	06	07	08	09	10		11	12	13	14	15	16	17	18	19		20
										/	**11**			**V**					**0**	**–**	

Axial piston unit

01	Variable swashplate design, nominal pressure 5100 psi (350 bar), maximum pressure 6100 psi (420 bar)	unpainted	**A15V**
		painted	**LA15V**

Operating mode[1)]

			110	145	175	210	280	
02	Pump, open circuit	without charge pump	●	●	●	●	●	**SO**
		with charge pump	–	●	●	●	●	**LO**

Size (NG)

		110	145	175	210	280
03	Geometric displacement, see table of values on page 9	**110**	**145**	**175**	**210**	**280**

Swiveling range

			110	145	175	210	280	
04	One-sided swiveling	$V_{g\,max}$: + 50% to + 100%[3)] $V_{g\,min}$: – 5% to + 30%	●	●	●	●	●	
	Two-sided swiveling [2)]	$V_{g\,max}$: + 50% to + 100%[3)] $V_{g\,min}$: – 100% to – 50%[4)]	●	●	●	●	●	**M**

Position 05, 06, 07 with the relevant control axis combination option, controller group a) to e) is described below

Type code position	05	06	07
Combination options	a) **Power controller**	No other controller, without code	
	Not for swiveling range "M"	b) Pressure controller	No other controller, without code
			c) Stroke control
			d) Load-sensing
			e) Override DG
		c) Stroke control	No other controller, without code
			d) Load-sensing
		d) Load-sensing	No other controller, without code
	b) **Pressure controller**	No other controller, without code	
		b) Pressure controller[5)]	No other controller, without code
			e) Override DG
		d) Load-sensing	No other controller, without code
		e) Override DG	No other controller, without code
	c) **Stroke control**	No other controller, without code	
	Not for swiveling range "M"	b) Pressure controller	No other controller, without code
			e) Override DG
		d) Load-sensing	No other controller, without code

● = Available ○ = On request – = Not available

1) Note the selection option depending on the rotary group version.
2) Not possible with charge pump (VLO).
3) Values deviating at NG 145: $V_{g\,max}$: + 75% to + 100%
4) Values deviating at NG 145: $V_{g\,min}$: – 75% to – 100%
5) Cannot be combined with the same pressure controller

01	02	03	04	05	06	07	08	09	10		11	12	13	14	15	16	17	18	19		20
										/	**11**			**V**					**0**	**–**	

					110	145	175	210	280	
Control device: Controller group a)										
a)	**Power controller**	fixed setting			●	●	●	●	●	**LR**
		Override electric-proportional	negative control	U = 24 V	●	●	●	●	●	**L4**
	Summation power controller	Override hydraulic-proportional, high pressure	negative control	with stop	○	○	○	○	●	**CR**
				without stop	○	○	○	○	●	**PR**
Controller group b)					**110**	**145**	**175**	**210**	**280**	
b)	Without additional controller (without symbol)				●	●	●	●	●	
	Pressure controller with one-side swiveling	fixed setting			●	●	●	●	●	**DR**
		remote controlled hydraulically	positive control		●	●	●	●	●	**DG**
		for parallel operation (cannot be combined with additional control: stroke control)	positive control		●	●	●	●	●	**DP**[1)]
Controller group c)					**110**	**145**	**175**	**210**	**280**	
c)	Without additional controller (without symbol)				●	●	●	●	●	
	Stroke control	electric-proportional	positive control	U = 24 V	●	●	●	●	●	**E2**
		electric, two-point	positive control	U = 24 V	●	●	●	●	●	**E6**
		hydraulic-proportional, Pilot pressure	negative control		●	●	●	●	●	**H3**
			positive control		●	●	●	●	●	**H4**
			negative control		●	●	●	●	●	**H5**
			positive control		●	●	●	●	●	**H6**
Controller group d)					**110**	**145**	**175**	**210**	**280**	
d)	Without additional controller (without symbol)				●	●	●	●	●	
	Load-sensing, pump pressure internal	fixed setting			●	●	●	●	●	**S0**
	Pressure controller	remote controlled hydraulically	positive control		●	●	●	●	●	**DG**
Controller group e)					**110**	**145**	**175**	**210**	**280**	
e)	Without additional controller (without symbol)				●	●	●	●	●	
	Electric directional valve and pressure relief valve mounted	only in combination with DG	De-energized standby	U = 24 V	●	●	●	●	●	**V2**
	Override DG electric-proportional	with integrated pilot control valve and only in combination with DG	positive control	U = 24 V	●	●	●	●	●	**T6**
			negative control	U = 24 V	●	●	●	●	●	**T8**

● = Available ○ = On request – = Not available

1) Cannot be combined with additional control: stroke control

01	02	03	04	05	06	07	08	09	10		11	12	13	14	15	16	17	18	19		20
										/	**11**			**V**					**0**	**–**	

			110	145	175	210	280	
Depressurized basic position and external control pressure supply[6]								
08	Basic position maximum swivel angle ($V_{g\,max}$)							
	Without external control pressure supply (standard for power and pressure controllers)		●	●	●	●	●	**A**
	With external control pressure supply (integrated shuttle valve, standard for negative stroke control)		●	●	●	●	●	**B**
	Basic position minimum swivel angle ($V_{g\,min}$)							
	With external control pressure supply (integrated shuttle valve, standard for positive stroke control)		●	●	●	●	●	**C**
Connector for solenoids[7]			**110**	**145**	**175**	**210**	**280**	
09	Without connector (without solenoid, only for hydraulic control)		●	●	●	●	●	**0**
	HIRSCHMANN connector		●	●	●	●	●	**H**
Swivel angle sensor			**110**	**145**	**175**	**210**	**280**	
10	Without swivel angle sensor (only for A15VLO)		●	●	●	●	●	**0**
	Optical swivel angle indicator (only for A15VSO)		●	●	●	●	●	**V**
	With electrical swivel angle sensor[8] (as per data sheet 95150)	Power supply 5V DC	●	●	●	●	●	**B**
		Power supply 8V – 32V DC	●	●	●	●	●	**K**
Series								
11	Series 1, index 1							**11**
Version of port and fastening threads								
12	Connection ports based on ISO 11926 with O-ring seal (ANSI), fastening threads according to ASME B1.1 at working ports and through drive							**A**
Direction of rotation			**110**	**145**	**175**	**210**	**280**	
13	Viewed on drive shaft	clockwise	●	●	●	●	●	**R**
		counter-clockwise	●	●	●	●	●	**L**
Sealing material			**110**	**145**	**175**	**210**	**280**	
14	FKM (fluoroelastomer)		●	●	●	●	●	**V**
Mounting flange			**110**	**145**	**175**	**210**	**280**	
15	SAE J744	152-4	●	●	–	–	–	**D4**
		165-4	–	–	●	●	●	**E4**
Drive shaft (permissible input torque, see page 12)			**110**	**145**	**175**	**210**	**280**	
16	Splined shaft ANSI B92.1a	1 3/4 in 13T 8/16DP	●	●	●	●	–	**T1**
		2 in 15T 8/16DP	–	●	●	●	–	**T2**
		2 1/4 in 17T 8/16DP	–	–	–	–	●	**T3**
	Parallel keyed shaft DIN 6885 (not for A15VLO)	ø45	●	–	–	–	–	**B1**
		ø50	–	●	●	●	–	**B2**
		ø60	–	–	–	–	●	**B4**
	Parallel keyed shaft SAE J744	2 in	–	–	–	–	○	**L2**
Rotary group version			**110**	**145**	**175**	**210**	**280**	
17	Standard version without charge pump		●	–	–	–	–	**E**
	Efficiency and speed optimized (version with and without charge pump)		–	●	●	●	●	**P**

● = Available ○ = On request – = Not available

6) For description, see "Control device".
Tables from page 13
7) Connectors for other electric components may deviate
8) Please contact us if the swivel angle sensor is used for control

01	02	03	04	05	06	07	08	09	10		11	12	13	14	15	16	17	18	19		20
										/	**11**			**V**					**0**	**–**	

Through drives (for mounting options, see page 61)

	Flange SAE J744			Hub for splined shaft[9]								
18	Diameter	Attachment[9][10]	Designation	Diameter		Designation	**110**	**145**	**175**	**210**	**280**	
	82-2 (A)		A3	5/8 in	9T 16/32DP	S2	●	●	●	●	●	**A3S2**
	101-2 (B)		B3	7/8 in	13T 16/32DP	S4	●	●	●	●	●	**B3S4**
				1 in	15T 16/32DP	S5	●	●	●	●	●	**B3S5**
			B5	7/8 in	13T 16/32DP	S4	●	●	●	●	●	**B5S4**
				1 in	15T 16/32DP	S5	●	●	●	●	●	**B5S5**
	127-2 (C)		C3	1 1/4 in	14T 12/24DP	S7	●	●	●	●	●	**C3S7**
				1 1/2 in	17T 12/24DP	S9	●	●	●	●	●	**C3S9**
			C5	1 1/4 in	14T 12/24DP	S7	○	○	●	●	●	**C5S7**
	124-4 (C)		C4	1 1/4 in	14T 12/24DP	S7	●	●	●	●	○	**C4S7**
	152-4 (D)		D4	1 3/4 in	13T 8/16DP	T1	●	●	●	●	●	**D4T1**
				2 in	15T 8/16DP	T2	–	○	○	○	○	**D4T2**
	165-4 (E)		E4	2 in	15T 8/16DP	T2	–	–	●	●	●	**E4T2**
				2 1/4 in	17T 8/16DP	T3	–	–	–	–	●	**E4T3**
	Prepared for through drive, with pressure-resistant plugged cover. Please note also the notice on page 70 (see also data sheet 95581)						●	●	●	●	●	**U000**

Pressure sensors and other sensors

19	Without sensor	**0**

Standard/special version

20	Standard version	**0**
	Special version	**S**

● = Available ○ = On request – = Not available

Notes

- Note the project planning notes on page 66.
- In addition to the type code, please specify the relevant technical data when placing your order.
- For details of the mounting situation of combination pumps, see page 61.

9) In accordance with ANSI B92.1a

10) The through drives A3, B3 and C3 are equipped with universal through drives with two mounting positions. For painting units, observe the mounting holes pattern when viewed on through drive with control at top (see page 61).

Hydraulic fluids

The A15VSO, A15VLO variable pump is designed for operation with HLP mineral oil according to DIN 51524. See the following data sheets for application instructions and requirements for hydraulic fluids before the start of project planning:

- 90220: Hydraulic fluids based on mineral oils and related hydrocarbons
- 90221: Environmentally acceptable hydraulic fluids
- 90222: Fire-resistant, water-free hydraulic fluids (HFDR/HFDU)

Selection of hydraulic fluid

Bosch Rexroth evaluates hydraulic fluids on the basis of the Fluid Rating according to the technical data sheet 90235.

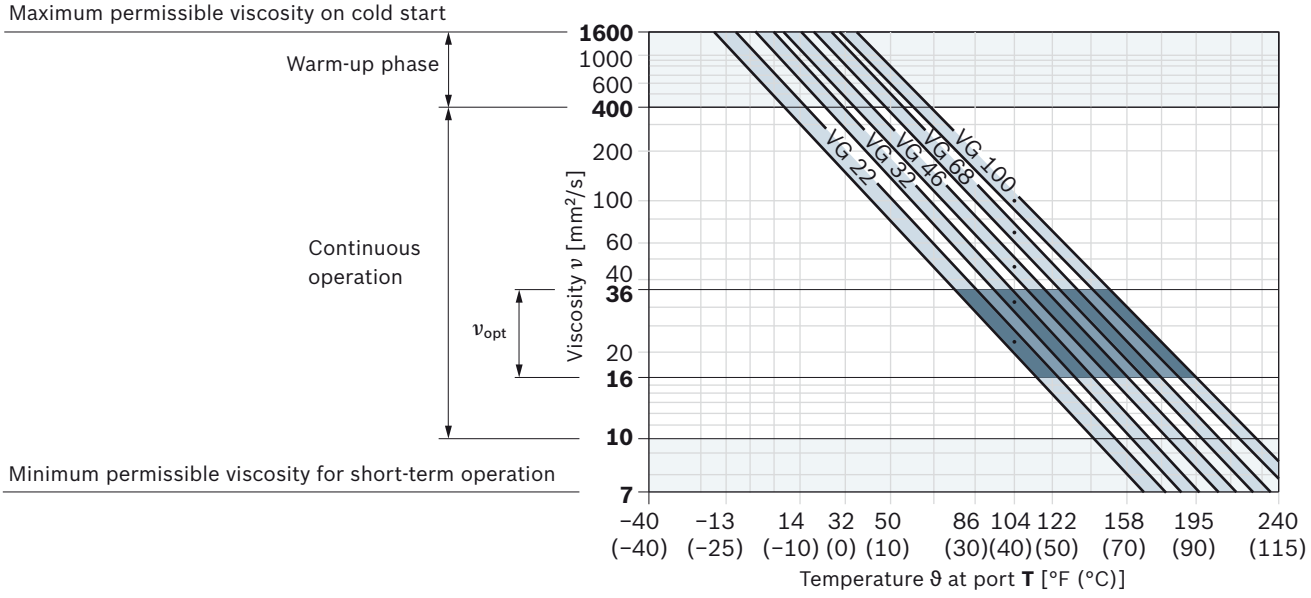
Hydraulic fluids with positive evaluation in the Fluid Rating are provided in the following technical data sheet: 90245: Bosch Rexroth Fluid Rating List for Rexroth hydraulic components (pumps and motors)

Selection of hydraulic fluid shall make sure that the operating viscosity in the operating temperature range is within the optimum range (v_{opt}; see selection diagram).

Viscosity and temperature of hydraulic fluids

	Viscosity	Shaft seal	Temperature[3]	Comment
Cold start	v_{max} ≤ 1600 cSt	NBR[2]	ϑ_{St} ≥ −40 °F (−40 °C)	t ≤ 3 min, without load (p ≤ 725 psi (50 bar)), n ≤ 1000 rpm. Permissible temperature difference between axial piston unit and hydraulic fluid in the system maximum 45°F (25 K)
		FKM	ϑ_{St} ≥ −13 °F (−25 °C)	
Warm-up phase	v = 1600 ... 400 cSt			t ≤ 15 min, p ≤ 0.7 × p_{nom} and n ≤ 0.5 × n_{nom}
Continuous operation	v = 400 ... 10 cSt[1]	NBR[2]	ϑ ≤ +185 °F (+85 °C)	measured at port **T**
		FKM	ϑ ≤ +230 °F (+110 °C)	
	v_{opt} = 36 ... 16 cSt			Range of optimum operating viscosity and efficiency
Short-term operation	v_{min} = 10 ... 7 cSt	NBR[2]	ϑ ≤ +185 °F (+85 °C)	t ≤ 3 min, p ≤ 0.3 × p_{nom} , measured at port **T**
		FKM	ϑ ≤ +230 °F (+110 °C)	

▼ **Selection diagram**



1) This corresponds, for example on the VG 46, to a temperature range of 39.2 °F to +185 °F (+4 °C to +85 °C) (see selection diagram)

2) Special version, please contact us

3) If the temperature at extreme operating parameters cannot be adhered to, please contact us.

Filtration of the hydraulic fluid

Finer filtration improves the cleanliness level of the hydraulic fluid, which increases the service life of the axial piston unit.

A cleanliness level of at least 20/18/15 under ISO 4406 should be maintained.

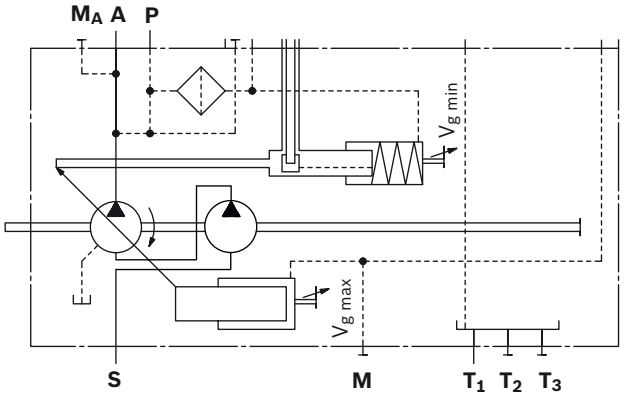
At a hydraulic fluid viscosity of less than 10 cSt (mm²/s) (e.g. due to high temperatures during short-term operation) at the drain port, a cleanliness level of at least 19/17/14 under ISO 4406 is required.

For example, viscosity is 10 cSt (mm²/s) at:

- HLP 32 a temperature of 163.4 °F (73 °C)
- HLP 46 a temperature of 185 °F (85 °C)

Charge pump (impeller)

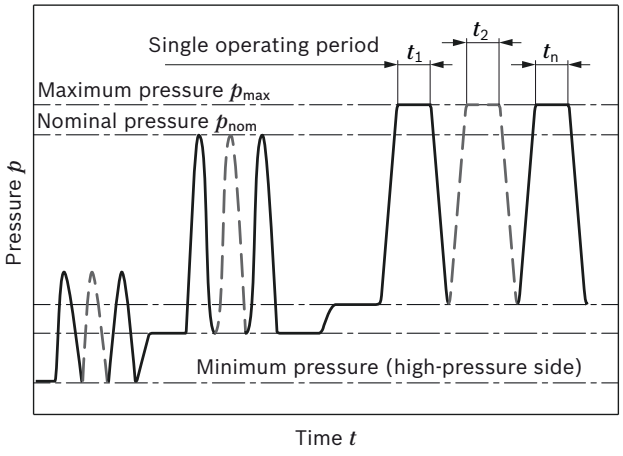
The charge pump is a centrifugal pump with which the A15VLO is filled and therefore can be operated at higher rotational speeds. This also facilitates cold starting at low temperatures and high viscosity of the hydraulic fluid. Externally increasing the inlet pressure is therefore unnecessary in most cases. Charging the reservoir with compressed air is not permissible.



Working pressure range

Pressure at working port A		**Definition**
Nominal pressure p_{nom}	5100 psi (350 bar)	The nominal pressure corresponds to the maximum design pressure.
Maximum pressure p_{max}	6100 psi (420 bar)	The maximum pressure corresponds to the maximum working pressure within a single operating period. The sum of the single operating periods must not exceed the total operating period (maximum number of cycles: approx. 1 million).
Single operating period	1 s	
Total operating period	300 h	
Minimum pressure $p_{A\ abs}$ (High-pressure side)	220 psi (15 bar)[1)2)]	Minimum pressure at the high-pressure side (**A**) which is required in order to prevent damage to the axial piston unit. The minimum pressure depends on the rotational speed and the swivel angle.
Rate of pressure change $R_{A\ max}$	232000 psi/s (16000 bar/s)	Maximum permissible pressure build-up and reduction speed during a pressure change across the entire pressure range.
Pressure at suction port S (inlet)		
Version without charge pump (A15VSO)		Minimum pressure at suction port **S** (inlet) which is required to prevent damage to the axial piston unit. The minimum pressure depends on the rotational speed and displacement volume of the axial piston unit (see diagram on page 11 and footnote [4)] Technical data on page 9 and 10).
Minimum pressure $p_{S\ min}$	≥ 12 psi (0.8 bar) absolute	
Maximum pressure $p_{S\ max}$	≤ 435 psi (30 bar)	
Version with charge pump (A15VLO)		
Minimum pressure $p_{S\ min}$	≥ 10.5 psi (0.7 bar) absolute	
Maximum pressure $p_{S\ max}$	≤ 30 psi (2 bar) absolute	
Case pressure at port T_1, T_2, T_3		
Max. static pressure $p_{L\ max}$	45 psi (3 bar)	Maximum 18 psi (1.2 bar) higher than inlet pressure at port **S**, but not higher than $p_{L\ max}$. A drain line to the reservoir is required.
Pressure peaks $p_{L\ peak}$	75 psi (5 bar)	t < 0.1 s

▼ **Pressure definition**



Total operating period = $t_1 + t_2 + ... + t_n$

Notice
Working pressure range applies when using hydraulic fluids based on mineral oils. Please contact us for values for other hydraulic fluids.

1) Lower values on request
2) See also footnote 4 on page 9 and 10

Technical data

Without charge pump (A15VSO) rotary group version E and P

Size			NG		110	145	175	210	280
Displacement, geometric, per revolution			$V_{g\,max}$	in³	6.71	8.85	10.68	12.81	17.09
				cm³	110.0	145.0	175.0	210.0	280.0
			$V_{g\,min}$	in³ (cm³)	0	0	0	0	0
Rotational speed maximum[1]	at $V_{g\,max}$[2] version **E**		n_{nom}	rpm	2400	–	–	–	–
	at $V_{g\,max}$[2] version **P**				–	2300	2150	2100	1800
	at $V_g \le V_{g\,max}$[3] version **E**		n_{max}	rpm	2400	–	–	–	–
	at $V_g \le V_{g\,max}$[3] version **P**				–	2600	2500	2350[4]	2150[4]
Flow	at n_{nom} and $V_{g\,max}$		q_v	gpm	70	88	99	117	133
				l/min	264	334	376	441	504
Power	at n_{nom}, $V_{g\,max}$ and Δp = 5100 psi (350 bar)		P	hp	207	261	294	349	394
				kW	154	195	219	257	294
Torque	at $V_{g\,max}$ and Δp = 5100 psi (350 bar) [2]		M	lb-ft	452	596	719	863	1151
				Nm	613	808	975	1170	1560
Rotary stiffness of drive shaft	1 3/4 in 13T 8/16DP	T1	c	lb-ft/rad	–	173327	179227	187340	–
				kNm/rad	–	235	243	254	–
	2 in 15T 8/16DP	T2	c	lb-ft/rad	–	210942	219794	231595	–
				kNm/rad	–	286	298	314	–
	2 1/4 in 17T 8/16DP	T3	c	lb-ft/rad	–	–	–	–	382795
				kNm/rad	–	–	–	–	519
	W45	B1	c	lb-ft/rad	178489	–	–	–	–
				kNm/rad	242	–	–	–	–
	W50	B2	c	lb-ft/rad		246345	263309	281011	–
				kNm/rad	–	334	357	381	–
	W60	B4	c	lb-ft/rad	–	–	–	–	475727
				kNm/rad	–	–	–	–	645
	2 in	L2	c	lb-ft/rad	–	–	–	–	358455
				kNm/rad	–	–	–	–	486
Moment of inertia rotary group		version **E**	J_{TW}	lb-ft²	0.5221	–	–	–	–
				kgm²	0.022	–	–	–	–
		version **P**	J_{TW}	lb-ft²	–	0.8306	1.0679	1.4238	2.3019
				kgm²	–	0.035	0.045	0.06	0.097
Maximum angular acceleration[5]		version **E**	α	rad/s²	7465	–	–	–	–
		version **P**	α	rad/s²	–	6298	5609	5014	4200
Case volume			V	gal (l)	0.58 (2.2)	0.71 (2.7)	0.95 (3.6)	1.06 (4)	1.72 (6.5)
Weight (without through drive) approx.			m	lbs (kg)	141 (64)	174 (79)	214 (97)	245 (111)	315 (143)

1) The values are applicable:
   – for the optimum viscosity range from v_{opt} = 36 to 16 cSt
   – with hydraulic fluid based on mineral oils
2) The values apply at absolute pressure p_{abs} = 15 psi (1 bar) at suction port **S**.
3) Maximum rotational speed (speed limit) for increased inlet pressure p_{abs} at suction port **S** and $V_g < V_{g\,max}$, see diagram page 11.
4) The rotational speed can be increased under the following conditions:

NG	Speed [rpm]	Pressure at port A $p_{A\,abs}$ [psi (bar)]	Swivel angle [%]
280	2300	minimum 510 (35)	minimum 10
210	2500	minimum 510 (35)	minimum 10

5) The data are valid for values between the minimum required and maximum permissible rotational speed. Valid for external excitation (e.g. diesel engine 2 to 8 times rotary frequency; cardan shaft twice the rotary frequency). The limit value is only valid for a single pump. The load capacity of the connection parts must be considered.

Technical data

With charge pump (A15VLO) rotary group version P

Size			NG		145	175	210	280
Displacement, geometric, per revolution			$V_{g\,max}$	in³	8.85	10.68	12.81	17.09
				cm³	145.0	175.0	210.0	280.0
			$V_{g\,min}$	in³	0	0	0	0
				cm³	0	0	0	0
Rotational speed maximum[1]	at $V_{g\,max}$[2]		n_{nom}	rpm	2600[3]	2500[3]	2350[4]	2150[4]
	at $V_g \le V_{g\,max}$		n_{max}	rpm	2600[3]	2500[3]	2350[4]	2150[4]
Flow	at n_{nom} and $V_{g\,max}$		q_v	gpm	100	116	130	159
				l/min	377	438	493	602
Power	at n_{nom}, $V_{g\,max}$ and Δp = 5100 psi (350 bar)		P	hp	295	342	386	470
				kW	220	255	288	351
Torque	at $V_{g\,max}$ and Δp = 5100psi (350 bar)[2]		M	lb-ft	596	719	863	1151
				Nm	808	975	1170	1560
Rotary stiffness of drive shaft	1 3/4 in 13T 8/16DP	T1	c	lb-ft/rad	173327	179227	187340	–
				kNm/rad	235	243	254	–
	2 in 15T 8/16DP	T2	c	lb-ft/rad	210942	219794	231595	–
				kNm/rad	286	298	314	–
	2 1/4 in 17T 8/16DP	T3	c	lb-ft/rad	–	–	–	382795
				kNm/rad	–	–	–	519
Moment of inertia			J_{TW}	lb-ft²	0.8306	1.0679	1.4238	2.3019
				kgm²	0.035	0.047	0.063	0.1
Maximum angular acceleration[5]			α	rad/s²	6298	5609	5014	4100
Case volume			V	gpm	0.77	0.95	0.98	1.48
				(l)	(2.9)	3.6	3.7	5.6
Weight (without through drive) approx.			m	lbs	203	243	276	326
				(kg)	92	110	125	148

Determining the operating characteristics see on page 11

Notes

- Theoretical values, without efficiency and tolerances; values rounded
- Operation above the maximum values or below the minimum values may result in a loss of function, a reduced service life or in the destruction of the axial piston unit. We recommend checking loads through tests or calculation/simulation and comparing them with the permissible values.

1) The values are applicable:
   – for the optimum viscosity range from ν_{opt} = 36 to 16 cSt
   – with hydraulic fluid based on mineral oils
2) The values apply at absolute pressure p_{abs} = 15 psi (1 bar) at suction port **S**.
3) Maximum rotational speed (speed limit) for increased inlet pressure p_{abs} at suction port S and $V_g < V_{g\,max}$, see diagram page 11.
4) The rotational speed can be increased under the following conditions:

NG	Speed [rpm]	Pressure at port A $p_{A\,abs}$ [psi (bar)]	Swivel angle [%]
280	2300	minimum 510 (35)	minimum 10
210	2500	minimum 510 (35)	minimum 10

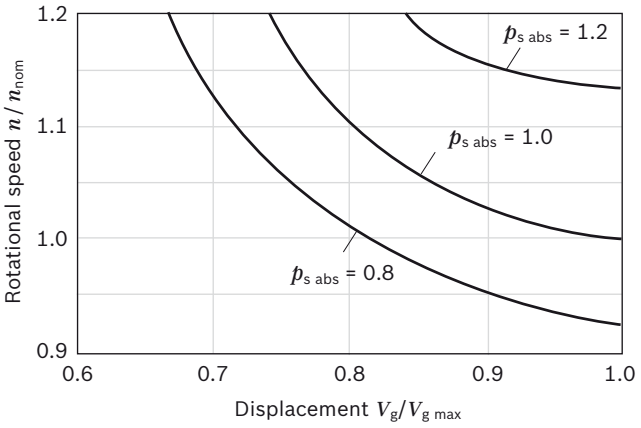
5) The data are valid for values between the minimum required and maximum permissible rotational speed. Valid for external excitation (e.g. diesel engine 2 to 8 times rotary frequency; cardan shaft twice the rotary frequency). The limit value is only valid for a single pump. The load capacity of the connection parts must be considered.

Determining the characteristics		
Flow	$q_v = \frac{V_g \times n \times \eta_v}{1000}$	[l/min]
	$q_v = \frac{V_g \times n \times \eta_v}{231}$	[gpm]
Torque	$M = \frac{V_g \times \Delta p}{20 \times \pi \times \eta_{hm}}$	[Nm]
	$M = \frac{V_g \times \Delta p}{24 \times \pi \times \eta_{hm}}$	[lb-ft]
Power	$P = \frac{2 \pi \times M \times n}{60000} = \frac{q_v \times \Delta p}{600 \times \eta_t}$	[kW]
	$P = \frac{2 \pi \times M \times n}{33000} = \frac{q_v \times \Delta p}{1714 \times \eta_t}$	[hp]

Key

V_g	=	Displacement per revolution [in³ (cm³)]
Δp	=	Differential pressure [psi (bar)]
n	=	Rotational speed [rpm]
η_v	=	Volumetric efficiency
η_{hm}	=	Hydraulic-mechanical efficiency
η_t	=	Total efficiency ($\eta_t = \eta_v \times \eta_{hm}$)

▼ **Maximum permissible rotational speed (speed limit)**
($p_{S\,abs}$ = Inlet pressure [bar])

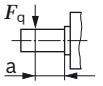


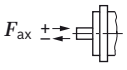
Notes

- The maximum permissible rotational speed n_{max} must not be exceeded (see table of values on page 9).

Permissible radial and axial forces of the drive shafts

Size	**NG**		**110**	**110**	**145**	**145**	**145**	**175**	**175**	**175**	**210**	**210**	**210**	**280**	**280**
Drive shaft			1 3/4 in	W45	1 3/4 in	2 in	W50	1 3/4 in	2 in	W50	1 3/4 in	2 in	W50	2 1/4 in	W60
Maximum radial force at distance a (from shaft collar)	$F_{q\,max}$	lb	1798	1798	2473	2473	2473	2765	2765	3147	3805	3805	3822	4046	5305
		N	8000	8000	11000	11000	11000	12300	12300	14000	16925	16925	17000	18000	23600
	a	in	1.32	0.98	1.32	1.57	1.08	1.32	1.57	1.06	1.32	1.57	1.06	1.57	1.14
		mm	33.5	25	33.5	40	27.5	33.5	40	27	33.5	40	27	40	29
Maximum axial force	$+F_{ax\,max}$	lb	270	270	304	304	304	315	315	315	326	326	326	405	405
		N	1200	1200	1350	1350	1350	1400	1400	1400	1450	1450	1450	1800	1800
	$-F_{ax\,max}$	lb	112	112	135	135	135	146	146	146	157	157	157	191	191
		N	500	500	600	600	600	650	650	650	700	700	700	850	850





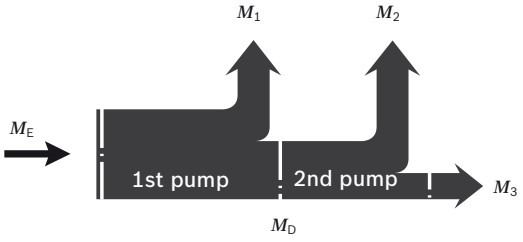
Notes

- The values given are maximum values and do not apply to continuous operation. All loads of the drive shaft reduce the bearing service life!

Permissible input and through-drive torques

Size			NG		110	145	175	210	280
Torque at $V_{g\,max}$ and Δp = 5100 psi (350 bar)[1]			M_{max}	lb-ft	452	596	719	863	1151
				Nm	610	808	975	1170	1560
Maximum input torque at drive shaft[2]									
	T1	1 3/4 in	$M_{E\,max}$	lb-ft	1210	1210	1210	1210	–
				Nm	1640	1640	1640	1640	–
	T2	2 in	$M_{E\,max}$	lb-ft	–	1969	1969	1969	–
				Nm	–	2670	2670	2670	–
	T3	2 1/4 in	$M_{E\,max}$	lb-ft	–	–	–	–	3231
				Nm	–	–	–	–	4380
	B1	Ø 45	$M_{E\,max}$	lb-ft	774	–	–	–	–
				Nm	1050	–	–	–	–
	B2	Ø 50	$M_{E\,max}$	lb-ft	–	1106	1106	1106	–
				Nm	–	1500	1500	1500	–
	B4	Ø 60	$M_{E\,max}$	lb-ft	–	–	–	–	2065
				Nm	–	–	–	–	2800
	L2	2 in	$M_{E\,max}$	lb-ft	–	–	–	–	2065
				Nm	–	–	–	–	2800
Maximum through-drive torque			$M_{D\,max}$	lb-ft	708	819	988	1412	1641
				Nm	960	1110	1340	1915	2225

▼ Distribution of torques



Torque at 1st pump	M_1		
Torque at 2nd pump	M_2		
Torque at 3rd pump	M_3		
Input torque	M_E	=	$M_1 + M_2 + M_3$
	M_E	<	$M_{E\,max}$
Through-drive torque	M_D	=	$M_2 + M_3$
	M_D	<	$M_{D\,max}$

External control pressure supply (type code position 08 B and C)

Control systems with external control pressure supply need a flow appropriate to the adjustment time and size.
See also page 18

Size	Flow [gpm (l/min)] with 100 ms swivel time
110	2.64 (10)
145	3.43 (13)
175	3.70 (14)
210	4.49 (17)
280	5.81 (22)

1) Efficiency not considered
2) For drive shafts free of radial force

Power controller

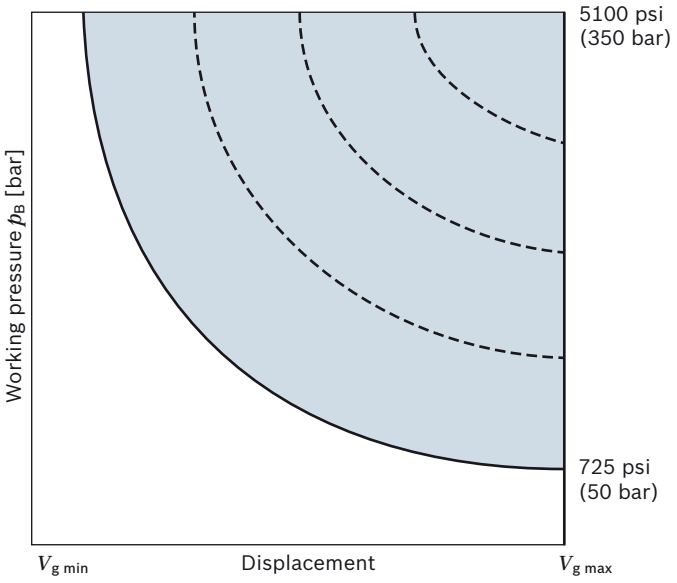
LR – Power controller, fixed setting

The power controller regulates the displacement of the pump depending on the working pressure so that a given drive power is not exceeded at constant drive speed.
The precise control with a hyperbolic characteristic curve, provides an optimum utilization of available power.
The working pressure acts on a rocker via a measuring spool moved together with the control. An externally adjustable spring force counteracts this, it determines the power setting. The depressurized basic position is $V_{g\,max}$.
If the working pressure exceeds the set spring force, the control valve will be actuated by the rocker and the pump will swivel back from the basic position $V_{g\,max}$ toward $V_{g\,min}$.
Here, the leverage at the rocker may be shortened and the operating pressure may rise in the same relation as the displacement is reduced ($p_B \times V_g$ = constant; p_B = operating pressure; V_g = displacement).
The hydraulic output power (characteristic curve LR) is influenced by the efficiency of the pump.
Setting range for beginning of control 725 psi (50 bar) to 5100 psi (350 bar), see table on the right.
When ordering, state in plain text:

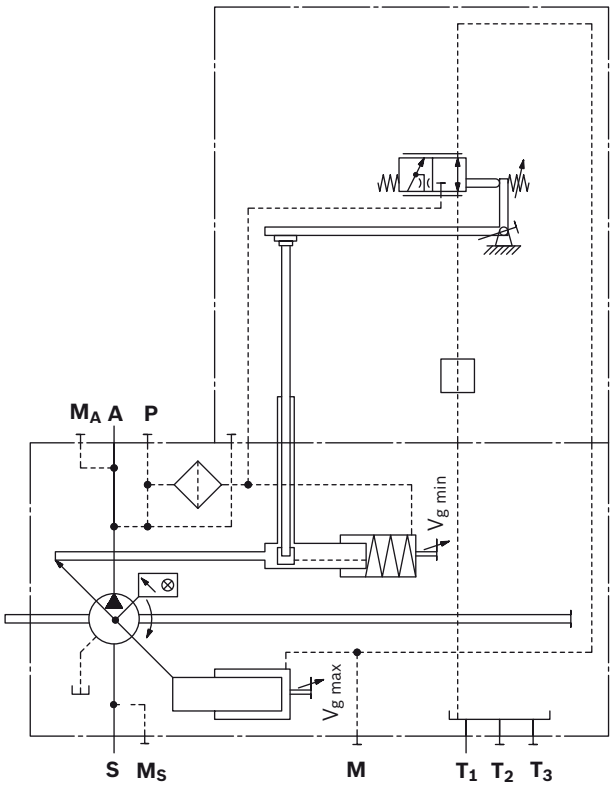
- Drive power P [hp (kW)]
- Drive speed n [rpm]
- Maximum flow $q_{V\,max}$ [gpm (l/min)]

Please contact us if you need a performance chart.

▼ **Characteristic curve LR**



▼ **Circuit diagram LR**



	Rotational speed [rpm]		
	1000	1500	1800
Size	Minimum adjustable drive power [hp (kW)] (at 725 psi (50 bar) beginning of control)		
110	15 (11)	23 (17)	27 (20)
145	19 (14)	29 (21)	34 (25)
175	23 (17)	34 (25)	41 (30)
210	27 (20)	41 (30)	49 (36)
280	35 (26)	53 (39)	64 (47)

L4 – Power controller, electric-proportional override (negative control)

A control current acts against the adjustment spring of the power controller via a proportional solenoid.
The mechanically adjusted basic power setting can be reduced by means of different control current settings.
Increasing control current = reduced power.
The following amplifiers are recommended for industrial applications and are available for controlling the proportional solenoids:

- Analog amplifier VT-VSPA1-1 data sheet 30111
- Digital amplifier VT-VSPD-1 data sheet 30523

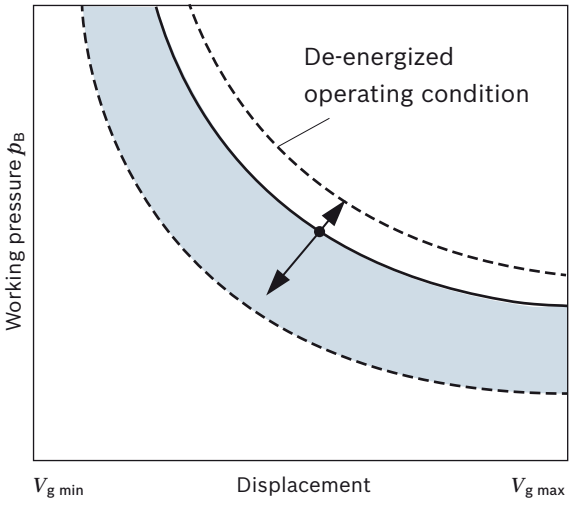
Further information can also be found on the Internet at www.boschrexroth.com/industrial-hydraulics-catalog/

Technical data, solenoid	L4
Voltage	24 V (±20%)
Control current	
Beginning of control	200 mA
End of control	600 mA
Current limit	0.77 A
Nominal resistance (at 20°C)	22.7 Ω
Dither frequency	100 Hz
Duty cycle	100%
Type of protection: see connector version page 63	

When ordering, state in plain text:

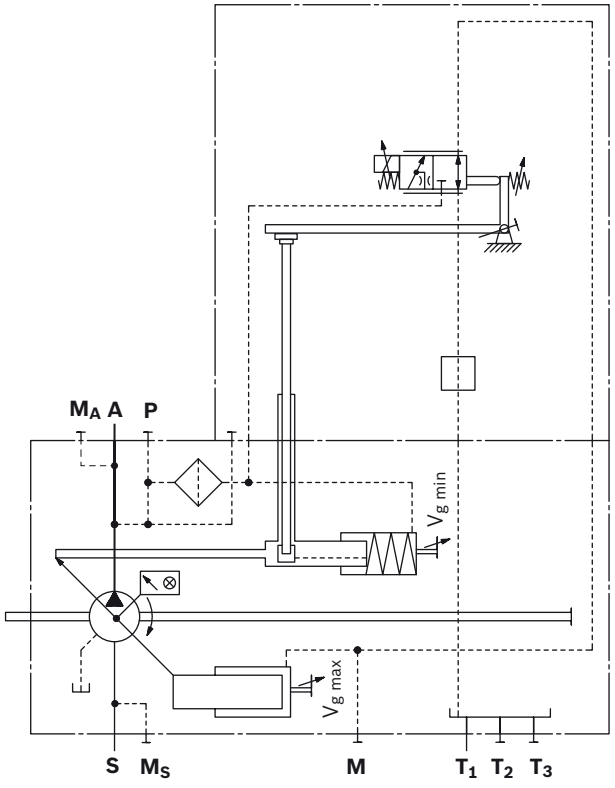
- Drive power P [hp (kW)] at start of control
- Drive speed n [rpm]
- Maximum flow $q_{V\,max}$ [gpm (l/min)]

▼ **Effect of power override through current increase or de-energized operating condition**



Notice
In operating condition **L4** de-energized (jump 200 to 0 mA): Power increase by a factor of 1 of the table values.

▼ **Circuit diagram L4**



Reduction of power by control current to the proportional solenoids with **L4**[1)]

Power reduction/control current [hp (kW)/100 mA]

	Rotational speed [rpm]		
Size	**1000**	**1500**	**1800**
110	16.5 (12.3)	24.8 (18.5)	29.6 (22.1)
145	19.8 (14.8)	29.8 (22.2)	35.7 (26.6)
175	22.5 (16.8)	33.8 (25.2)	40.5 (30.2)
210	25.3 (18.9)	38.1 (28.4)	45.6 (34.0)
280	30.7 (22.9)	46.1 (34.4)	55.3 (41.2)

1) Values in the tables are reference points. Determination of the exact power override on request.

CR – Summation power control of two power-controlled pumps, high-pressure-related override (with stop)

With two pumps of the same size working in different operating circuits, the CR controller limits the overall power.

The CR works like the normal LR with a fixed maximum power setting along the power hyperbola. The high-pressure-related override reduces the power set point in dependence on the working pressure of the other pump. That happens proportionally below the beginning of control and is blocked by a stop when the minimum power is reached. Here, the **CR** port of the one pump has to be connected to the $\mathbf{M}_A$ port of the other pump.

The maximum power of the first pump is reached when the second pump is working at idle when depressurized. When defining the maximum power, the idle power of the second pump has to be taken into account.

The minimum power of each pump is reached when both pumps are working at high pressure. The minimum power usually equates to 50% of the total power.

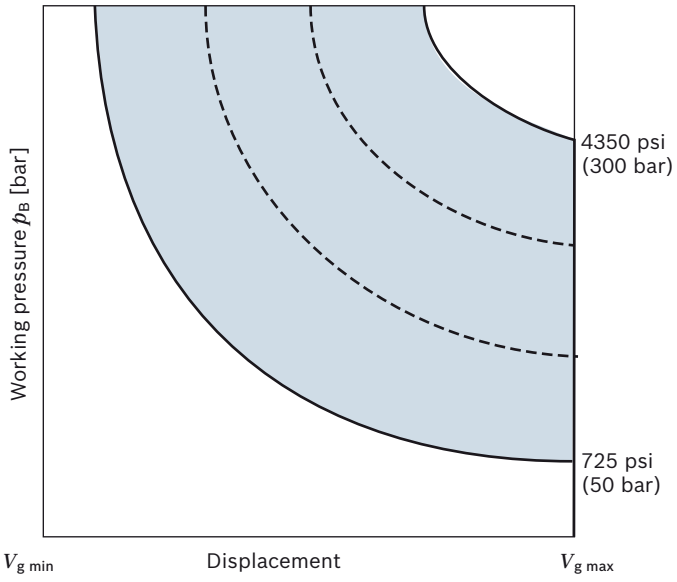
Power that is released by the pressure controller or other overrides remains unconsidered.

Setting range for beginning of control is 725 psi (50 bar) to 4350 psi (300 bar).

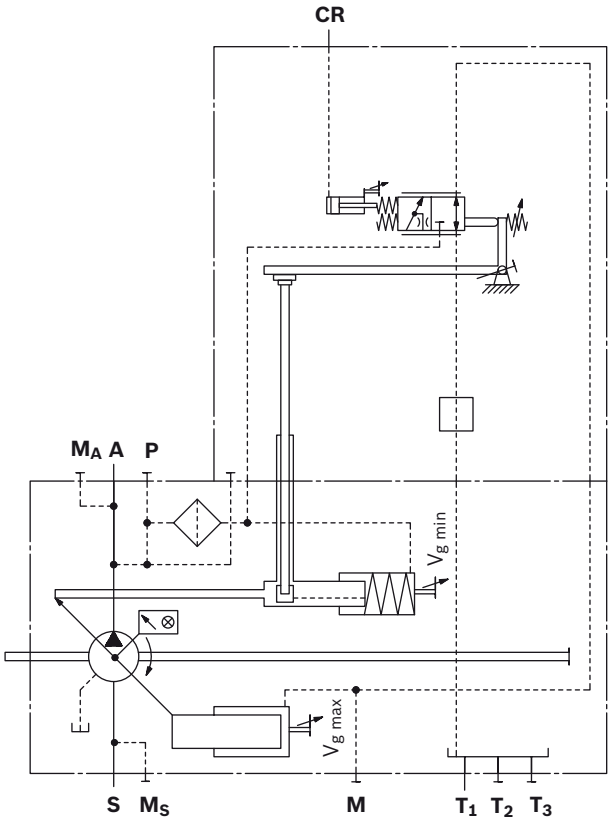
When ordering, please specify separately for each pump:

- Maximum drive power P_{max} [hp (kW)]
- Minimum drive power P_{min} [hp (kW)]
- Drive speed n [rpm]
- Maximum flow $q_{V\,max}$ [gpm (l/min)]

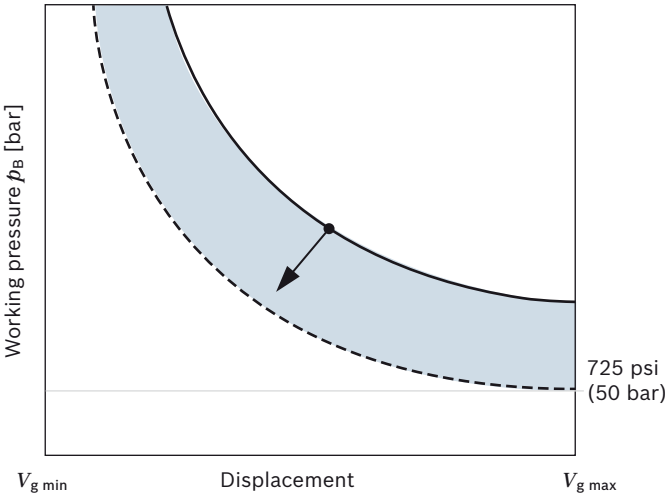
▼ **Characteristic curve CR**



▼ **Circuit diagram CR**



▼ **Effect of power override of a pump with increasing pressure in the 2nd pump**



PR – Summation power control of a power-controlled pump and a constant pump

Together with the mounted fixed pump, the PR controller on an A15V(L)O effects a limitation of the overall power. The PR works like the normal LR with a fixed maximum power setting along the power hyperbola.

The high-pressure-dependent override reduces the power specification in proportion to the working pressure of the fixed pump. Here, port **PR** of the A15V(L)O must be connected to the working pressure of the fixed pump. The power of the controlled pump can then be reduced to zero in a borderline case.

The maximum power of the controlled pump is reached when the fixed pump works at idle when depressurized. When defining the maximum power, the idle power of the fixed pump has to be taken into account.

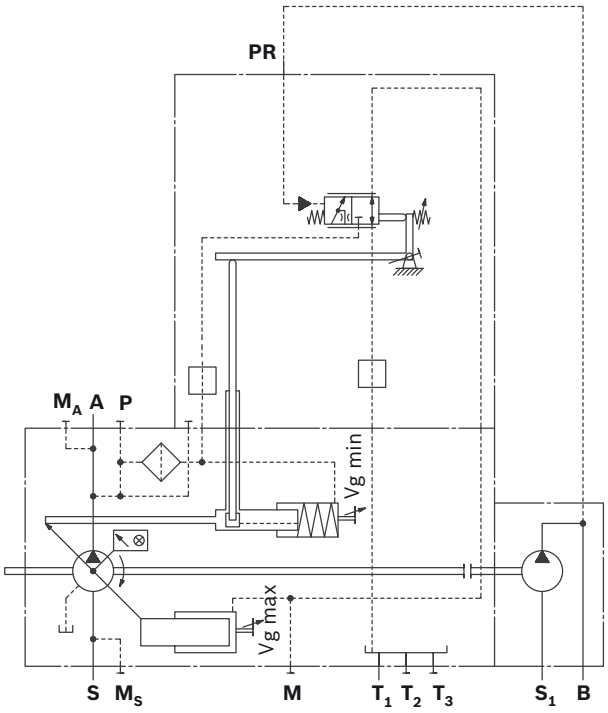
Power that is released by the pressure controller or other overrides remains unconsidered.

Setting range for beginning of control is 725 psi (50 bar) to 5100 psi (350 bar).

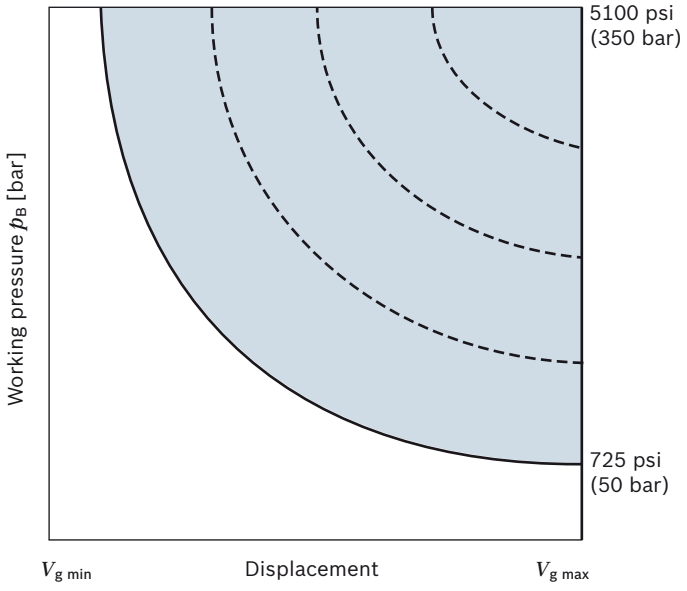
When ordering, state in plain text:

- Maximum drive power P_{max} [hp (kW)]
- Drive speed n [rpm]
- Maximum flow $q_{V\,max}$ [gpm (l/min)]
- Size of the fixed pump

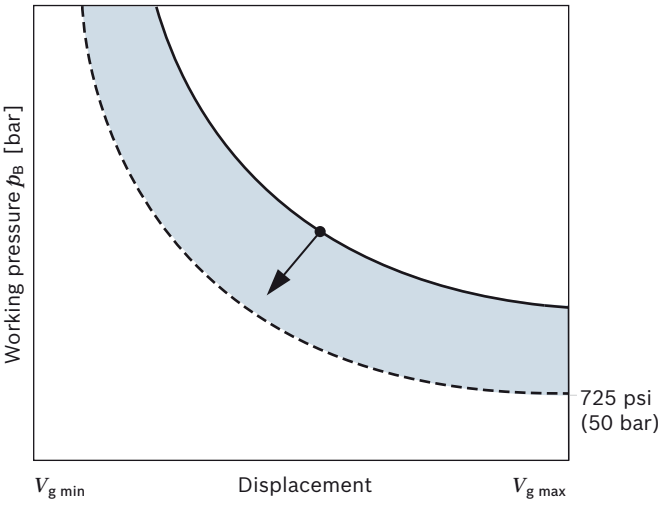
▼ **Circuit diagram PR**



▼ **Characteristic curve PR**



▼ **Effect of power override of a pump with increasing pressure in the 2nd pump**



Stroke control

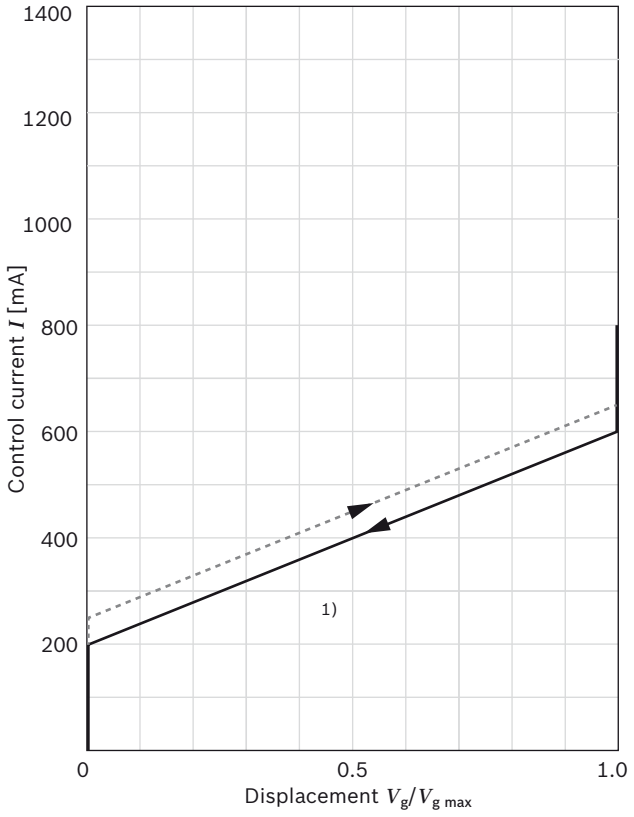
E2 – Stroke control electric-proportional (positive control)

With the electrical stroke control with proportional solenoid, the pump displacement is steplessly adjusted in proportion to the current via the magnetic force.
Basic position without pilot signal is $V_{g\,min}$. The mechanical depressurized basic position is $V_{g\,min}$ (see type code 08, letter C).
With increasing control current and flow, the pump swivels to a higher displacement (from $V_{g\,min}$ to $V_{g\,max}$).
The required control fluid is taken from the working pressure or the external control pressure applied to port **P**.
If the pump is to be adjusted from the basic position $V_{g\,min}$ or from a low working pressure, port **P** must be supplied with an external control pressure of at least 435 psi (30 bar), maximum 725 psi (50 bar).

Notice

If there is no external control pressure applied to **P**, the version "Maximum swivel angle ($V_{g\,max}$), without external control pressure supply" must be ordered (see type code position 08, A).

▼ **Characteristic curve E2**



The following amplifiers are recommended for industrial applications and are available for controlling the proportional solenoids:

- Analog amplifier VT-VSPA1-1 data sheet 30111
- Analog amplifier VT-SSPA1-1 data sheet 30116
- Analog amplifier module VT-MSPA1-150 data sheet 30224
- Amplifier module VT-MSPA1-2X data sheet 30232

Further information can also be found on the Internet at www.boschrexroth.com/industrial-hydraulics-catalog/

Technical data, solenoid	E2
Voltage	24 V (±20%)
Control current	
Start of control at $V_{g\,min}$	200 mA
End of control at $V_{g\,max}$	600 mA[1)]
Current limit	0.77 A
Nominal resistance (at 20°C)	22.7 Ω
Dither frequency	100 Hz
Duty cycle	100%
Type of protection: see connector version page 63	

When ordering, state in plain text:

- Drive speed n [rpm]
- Maximum flow $q_{V\,max}$ [gpm (l/min)]
- Minimum flow $q_{V\,min}$ [gpm (l/min)]

See circuit diagram on page 18

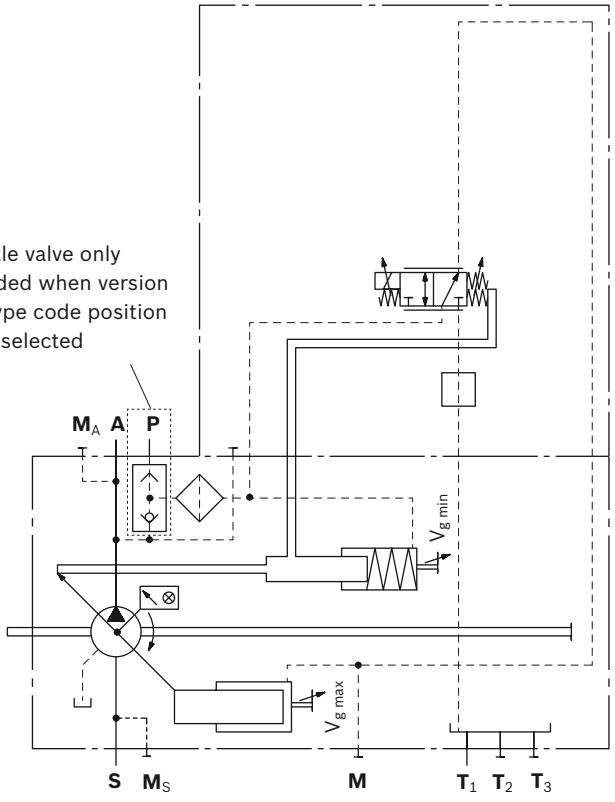
Notice!

The spring feedback in the controller is not a safety device.
The controller can stick in an undefined position due to internal contamination (contaminated hydraulic fluid, abrasion or residual contamination from system components). As a result, the flow in the axial piston unit will no longer respond correctly to the operator's specifications.
Check whether the application on your machine requires additional safety measures to bring the driven consumer to a safe position (immediate stop). If necessary, make sure these are appropriately implemented.

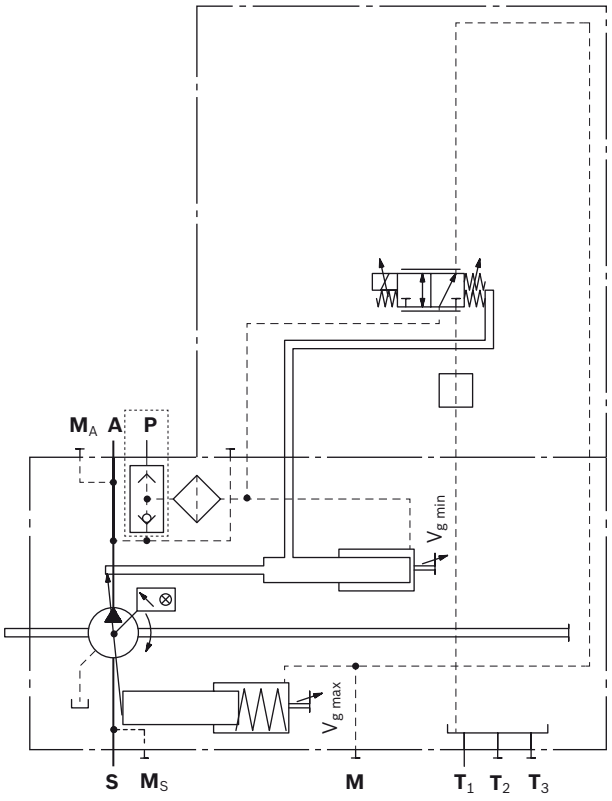
1) Because of the control hysteresis, a control current of up to 650 mA may be required for the $V_{g\,max}$ position.

▼ **Circuit diagram E2**
Basic position A/B, depressurized at maximum swivel angle ($V_{g\,max}$)

Shuttle valve only included when version "B" type code position 08 is selected



▼ **Circuit diagram E2**
Basic setting C, depressurized at minimum swivel angle ($V_{g\,min}$)



E6 – Stroke control, electric, two point (positive control)

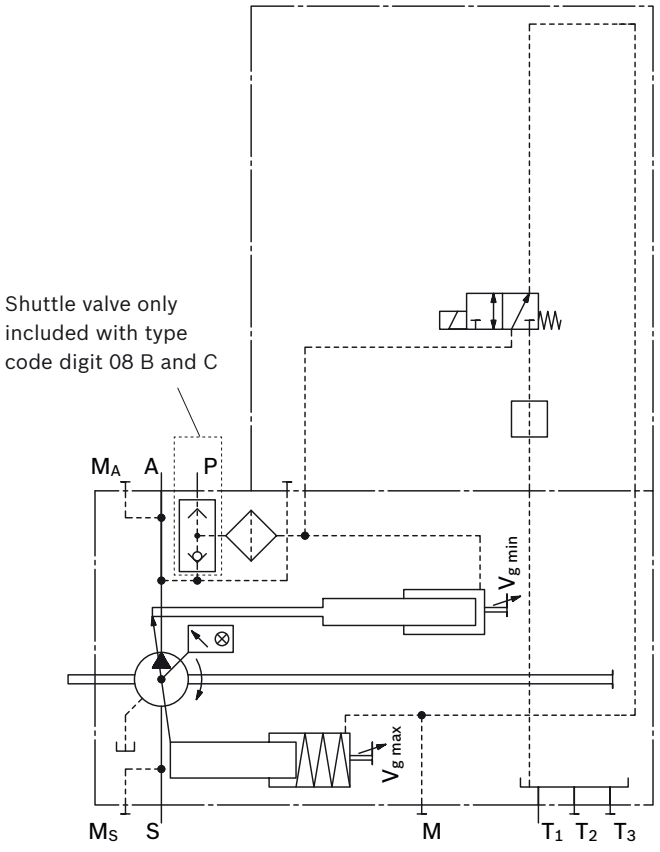
With the electric two-point stroke control with switching solenoid, the displacement of the pump is adjusted between $V_{g\,min}$ and $V_{g\,max}$.
Basic setting without current is $V_{g\,min}$. This includes the mechanically depressurized basic setting $V_{g\,min}$ (see type code digit 08).
When the solenoid is energized, the pump swivels from $V_{g\,min}$ to $V_{g\,max}$.
The required control power is taken from the working pressure or the external control pressure applied to port **P**.
To enable the pump to be adjusted from the basic setting $V_{g\,min}$ or from a low working pressure, port **P** must be supplied with an external control pressure of at least 435 psi (30 bar), maximum 725 psi (50 bar).

Notice

If no external control pressure is connected to **P**, the version "Maximum swivel angle ($V_{g\,max}$), without external control pressure supply" must be ordered (see type code digit 08, A).

Technical data, solenoid	E6
Voltage	24 V
Nominal resistance (at 20°C)	21.7 Ω
Nominal power	26.5 W
Test current	0.67 A
Duty cycle	100%
Type of protection: see connector version page 63	

▼ **Circuit diagram E6**



Notice

The spring feedback in the controller is not a safety device.
The controller can stick in an undefined position due to internal contamination (contaminated hydraulic fluid, abrasion or residual contamination from system components). As a result, the flow in the axial piston unit will no longer respond correctly to the operator's specifications.
Check whether your application requires that remedial measures be taken on your machine in order to bring the driven consumer into a safe position (e.g. immediate stop). If necessary, make sure these are appropriately implemented.

H3 – Stroke control, hydraulic-proportional, pilot pressure (negative control)

With pilot-pressure related control, the pump displacement is adjusted in proportion to the pilot pressure applied at port **H3**.

Basic position without pilot signal is $V_{g\,max}$.

The mechanical depressurized basic position is $V_{g\,max}$ (see type code 08, letter B).

- Control from $V_{g\,max}$ to $V_{g\,min}$; with increasing pilot pressure, the pump swivels to a smaller displacement.
- Setting range for start of control (at $V_{g\,max}$) is 75 psi (5 bar) to 145 psi (10 bar), standard is 145 psi (10 bar). State start of control in plain text when ordering.
- Maximum permissible pilot pressure $p_{St\,max}$ = 1450 psi (100 bar)

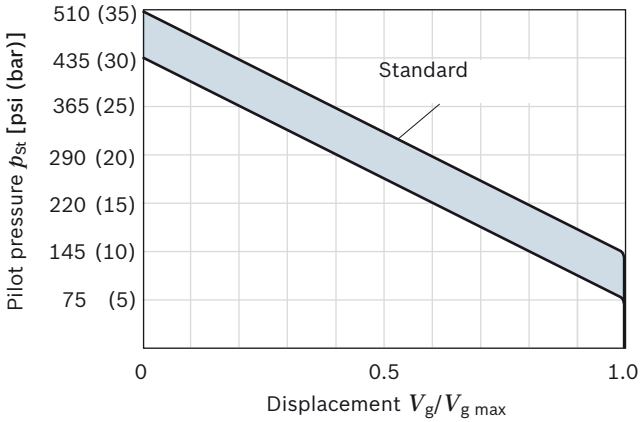
The necessary control fluid is taken from the working pressure or the external control pressure applied to port **P**.

If the pump is to be adjusted from the basic position $V_{g\,min}$ or from a low working pressure, port **P** must be supplied with an external control pressure of at least 435 psi (30 bar), maximum 725 psi (50 bar).

Notice

If there is no external control pressure applied to **P**, the version "Maximum swivel angle ($V_{g\,max}$), without external control pressure supply" must be ordered (see type code position 08, letter A).

▼ **Characteristic curve H3 (negative)**



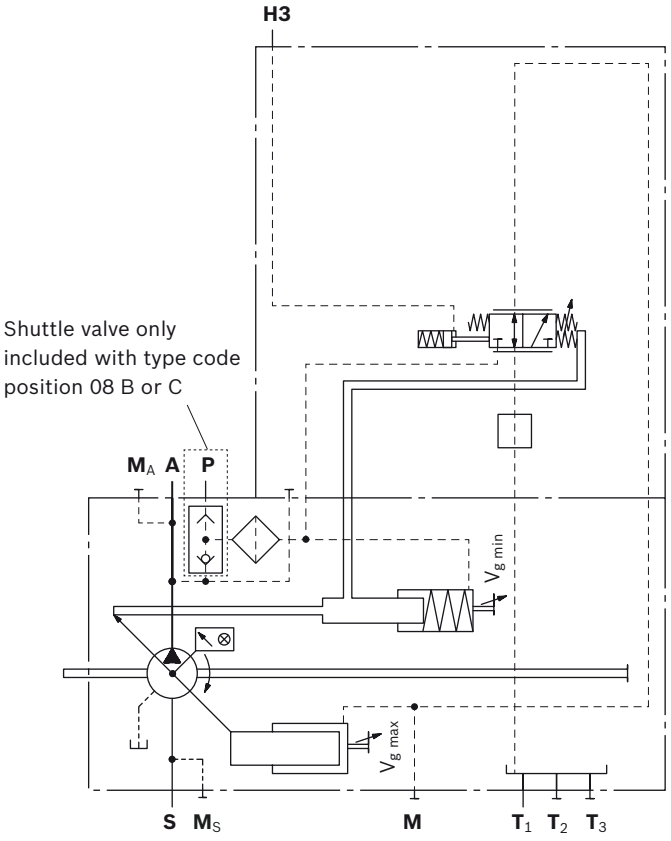
Pilot pressure increase $V_{g\,max}$ to $V_{g\,min}$:

Δp = 365 psi (25 bar)

When ordering, state in plain text:

- Beginning of control [psi (bar)] at $V_{g\,max}$

▼ **Circuit diagram H3**



Notice!

The spring feedback in the controller is not a safety device.

The controller can stick in an undefined position due to internal contamination (contaminated hydraulic fluid, abrasion or residual contamination from system components). As a result, the flow in the axial piston unit will no longer respond correctly to the operator's specifications.

Check whether the application on your machine requires additional safety measures to bring the driven consumer to a safe position (immediate stop). If necessary, make sure these are appropriately implemented.

H4 – Stroke control, hydraulic-proportional, pilot pressure (positive control)

With pilot-pressure related control, the pump displacement is adjusted in proportion to the pilot pressure applied at port **H4**.

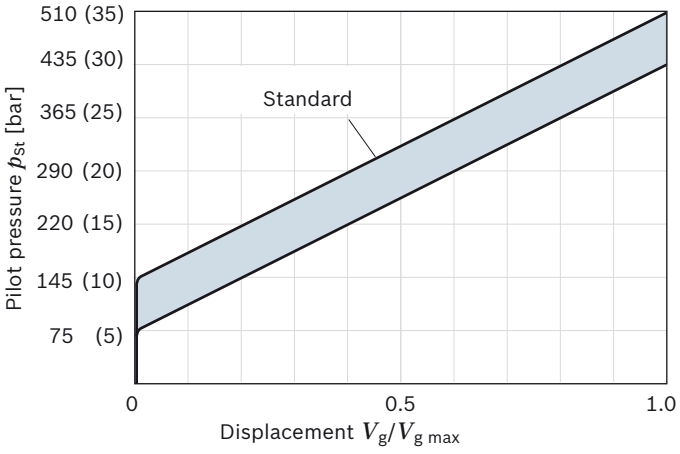
Basic position without pilot signal is $V_{g\,min}$. The mechanical depressurized basic position is $V_{g\,min}$ (see type code position 08, letter C).

- Control from $V_{g\,min}$ to $V_{g\,max}$; with increasing pilot pressure the pump swivels to a larger displacement.
- Setting range for start of control (at $V_{g\,min}$) is 75 psi (5 bar) to 145 psi (10 bar), standard is 145 psi (10 bar). State start of control in plain text when ordering.
- Maximum permissible pilot pressure $p_{St\,max}$ = 1450 psi (100 bar)

The required control fluid is taken from the working pressure or the external control pressure applied to port **P**. If the pump is to be adjusted from the basic position $V_{g\,min}$ or from a low working pressure, port **P** must be supplied with an external control pressure of at least 435 psi (30 bar), maximum 725 psi (50 bar).

Notice
If there is no external control pressure applied to **P**, the version "Maximum swivel angle ($V_{g\,max}$), without external control pressure supply" must be ordered (see type code position 08, letter A).

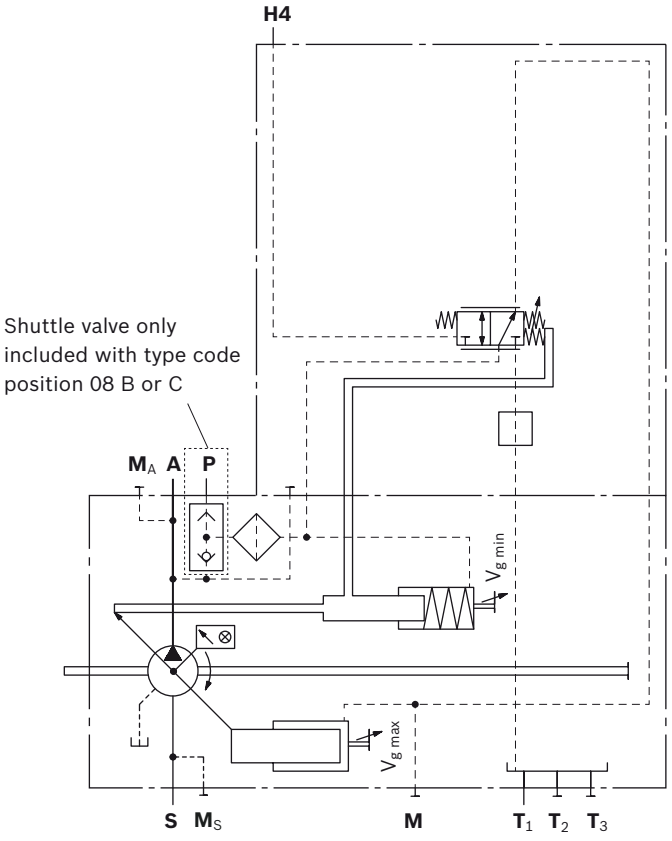
▼ **Characteristic curve H4 (positive)**



Pilot pressure increase $V_{g\,min}$ to $V_{g\,max}$:
Δp = 365 psi (25 bar)
When ordering, state in plain text:

- Beginning of control [psi (bar)] at $V_{g\,min}$

▼ **Circuit diagram H4**



Notice!
The spring feedback in the controller is not a safety device.
The controller can stick in an undefined position due to internal contamination (contaminated hydraulic fluid, abrasion or residual contamination from system components). As a result, the flow in the axial piston unit will no longer respond correctly to the operator's specifications.
Check whether the application on your machine requires additional safety measures to bring the driven consumer to a safe position (immediate stop). If necessary, make sure these are appropriately implemented.

H5 – Stroke control, hydraulic-proportional, pilot pressure (negative control)

With pilot-pressure related control, the pump displacement is adjusted in proportion to the pilot pressure applied at port **H5**.

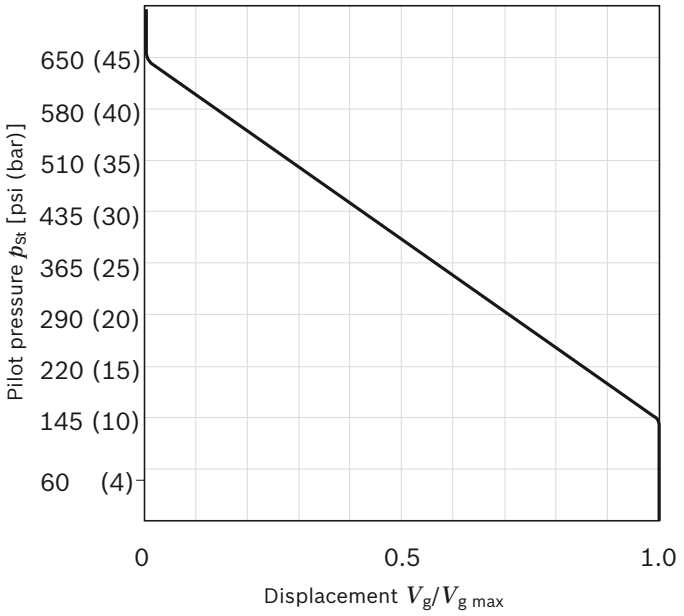
Basic position without pilot signal is $V_{g\,max}$, which includes the mechanically depressurized basic position $V_{g\,max}$ (see type code digit 08).

- Maximum permissible pilot pressure $p_{St\,max}$ = 1450 psi (100 bar)
- Control from $V_{g\,max}$ to $V_{g\,min}$
  With increasing pilot pressure the pump swivels to a smaller displacement.
- Beginning of control (at $V_{g\,max}$) 145 psi (10 bar)

The required control power is taken from the working pressure or the external control pressure applied to port **P**. If the pump is to be adjusted at low working pressure, port **P** must have an external control pressure supply of at least 435 psi (30 bar), maximum 725 psi (50 bar).

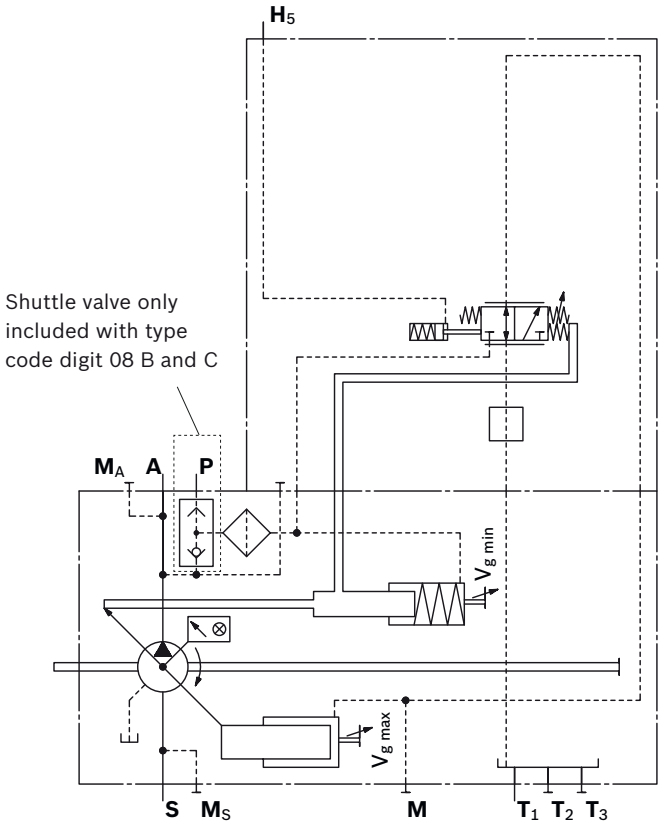
Notice
If no external control pressure is connected to **P**, the version "Maximum swivel angle ($V_{g\,max}$), without external control pressure supply" must be ordered (see type code digit 08, A).

▼ **Characteristic curve H5 (negative)**



Pilot pressure increase $V_{g\,max}$ to $V_{g\,min}$: Δp = 510 psi (35 bar)

▼ **Circuit diagram H5**



Notice!
The spring feedback in the controller is not a safety device.
The controller can stick in an undefined position due to internal contamination (contaminated hydraulic fluid, abrasion or residual contamination from system components). As a result, the flow in the axial piston unit will no longer respond correctly to the operator's specifications.
Check whether the application on your machine requires additional safety measures to bring the driven consumer to a safe position (immediate stop). If necessary, make sure these are appropriately implemented.

H6 – Stroke control, hydraulic-proportional, pilot pressure (positive control)

With pilot-pressure related control, the pump displacement is adjusted in proportion to the pilot pressure applied at port **H6**.

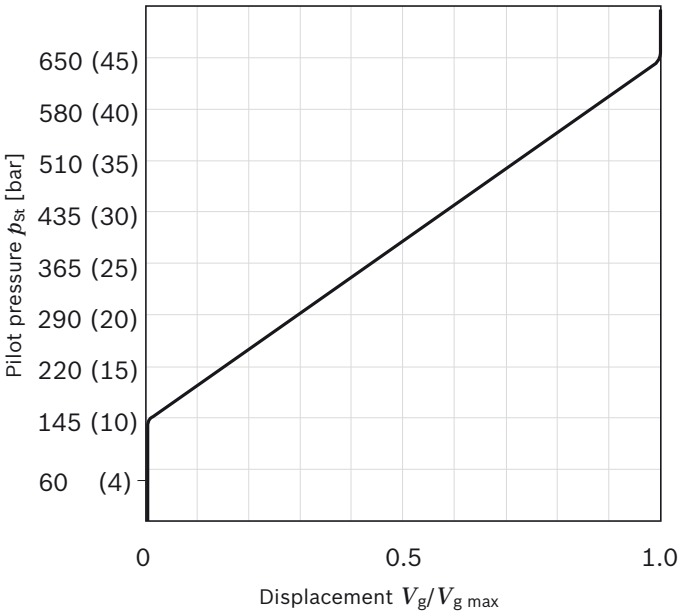
Basic position without pilot signal is $V_{g\,min}$, which includes the mechanically depressurized basic position $V_{g\,min}$ (see type code digit 08).

- Maximum permissible pilot pressure $p_{St\,max}$ = 1450 psi (100 bar)
- Control from $V_{g\,min}$ to $V_{g\,max}$
  With increasing pilot pressure the pump swivels to a bigger displacement.
- Beginning of control (at $V_{g\,min}$) 145 psi (10 bar).

The required control power is taken from the working pressure or the external control pressure applied to port **P**. If the pump is to be adjusted from the zero basic setting or from a low working pressure, port **P** must be supplied with an external control pressure of at least 435 psi (30 bar), maximum 725 psi (50 bar).

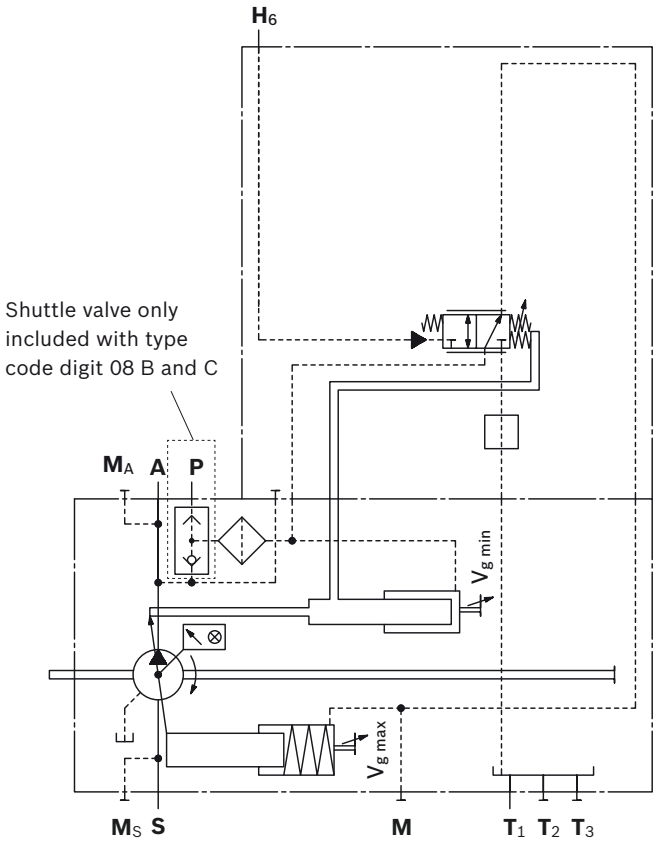
Notice
If no external control pressure is connected to **P**, the version "Maximum swivel angle ($V_{g\,max}$), without external control pressure supply" must be ordered (see type code digit 08, A).

▼ **Characteristic curve H6 (positive)**



Pilot pressure increase $V_{g\,min}$ to $V_{g\,max}$: Δp = 510 psi (35 bar)

▼ **Circuit diagram H6**



Notice!
The spring feedback in the controller is not a safety device.
The controller can stick in an undefined position due to internal contamination (contaminated hydraulic fluid, abrasion or residual contamination from system components). As a result, the flow in the axial piston unit will no longer respond correctly to the operator's specifications.
Check whether the application on your machine requires additional safety measures to bring the driven consumer to a safe position (immediate stop). If necessary, make sure these are appropriately implemented.

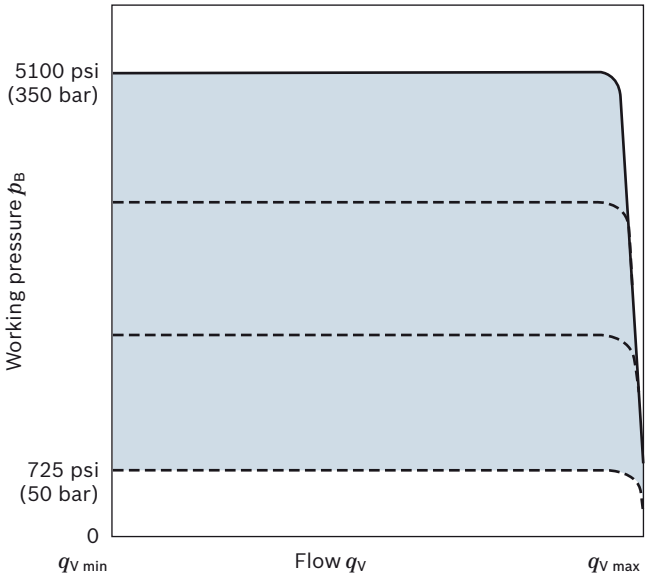
Pressure controller

DR – Pressure controller with one-sided swiveling, fixed setting

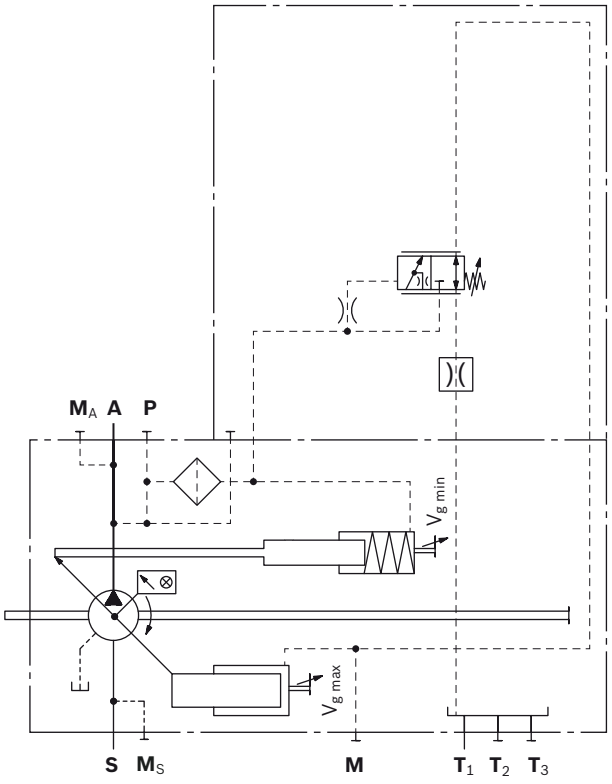
The pressure controller limits the maximum pressure at the pump outlet within the control range of the variable pump. The variable pump only supplies as much hydraulic fluid as is required by the consumers. If the working pressure exceeds the pressure command value at the pressure valve, the pump will regulate to a smaller displacement to reduce the control differential.

- Basic position in depressurized state: $V_{g\,max}$
- Setting range for pressure control 725 psi to 5100psi (50 to 350 bar), standard is 5100 psi (350 bar).

▼ **Characteristic curve DR**



▼ **Circuit diagram DR**



DRS0 – Pressure controller with load-sensing

The load-sensing controller works as a load-pressure controlled flow controller and adjusts the displacement of the pump to the volume required by the consumer. The flow of the pump is then dependent on the cross section of the external metering orifice (**1**), which is located between the pump and the consumer. Below the setting of the pressure controller and within the control range of the pump, the flow is not dependent on the load pressure.

The metering orifice is usually a separately located load-sensing directional valve (control block). The position of the directional valve spool determines the opening cross-section of the metering orifice and thus the flow of the pump.

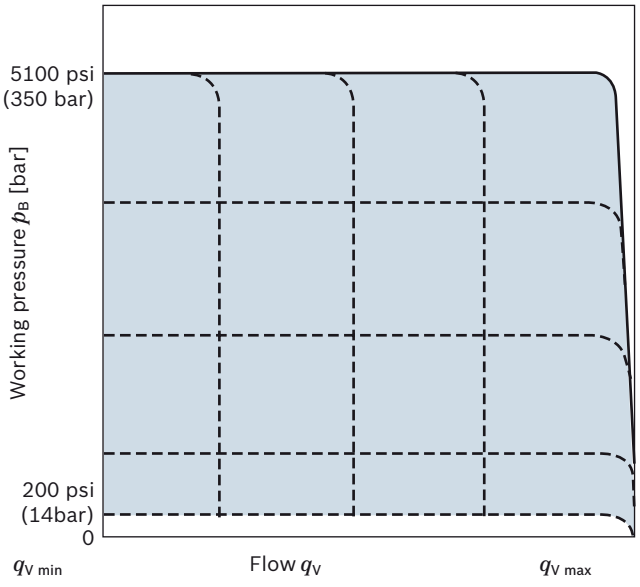
The load-sensing controller compares the pressure upstream the metering orifice to the one downstream the orifice and keeps the pressure drop (differential pressure Δp) occurring here and thus the flow constant. If the differential pressure Δp at the metering orifice rises, the pump is swiveled back (toward $V_{g\,min}$). If the differential pressure Δp drops, the pump is swiveled out (toward $V_{g\,max}$) until equilibrium at the metering orifice is restored.

$\Delta p_{metering\ orifice} = p_{pump} - p_{consumer}$

- Setting range for Δp 200 psi to 435 psi (14 bar to 30 bar) (please state in plain text)
- Standard setting 200 psi (14 bar)

The stand-by pressure in zero-stroke operation (metering orifice closed) is slightly higher than the Δp setting.

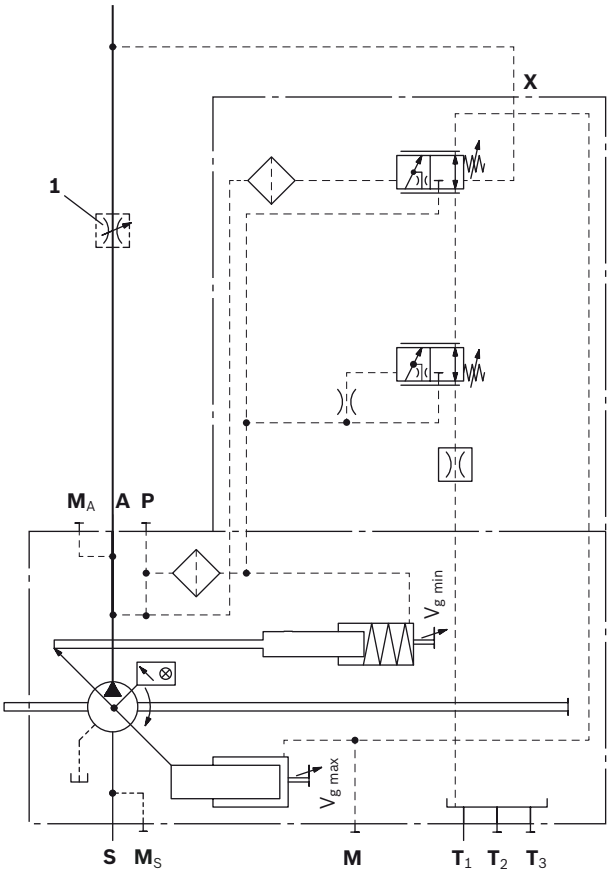
▼ **Characteristic curve DRS0**



When ordering, state in plain text:

- Pressure setting p [psi (bar)] at pressure controller DR
- Differential pressure Δp [psi (bar)] at load-sensing controller S0

▼ **Circuit diagram DRS0**



1 The metering orifice (control block) is not included in the scope of delivery.

DG – Pressure controller with one-sided deflection, hydraulically remote controlled (positive control)

The remote controlled pressure controller has a fixed setting Δp value. A separately connected pressure relief valve at port **X** (**1**) enables the pressure controller to be remote controlled.

- Setting range Δp 200 to 365 psi (14 to 25 bar)
- Recommended value 290 psi (20 bar) (standard)
- Control volume at **X**: approx. 0.42 gpm (1.6 l/min) (static) at Δp 290 psi (20 bar)

In addition a separately configured 2/2 directional valve (**2**) can be operated to start the pump with low working pressure (standby pressure).

Both functions can be used individually or in combination (see circuit diagram).

The external valves are not included in the scope of delivery.

As a separate pressure relief valve (**1**) we recommend:

- DBD.6, see data sheet 25402
- DBETA-6X, see data sheet 29262

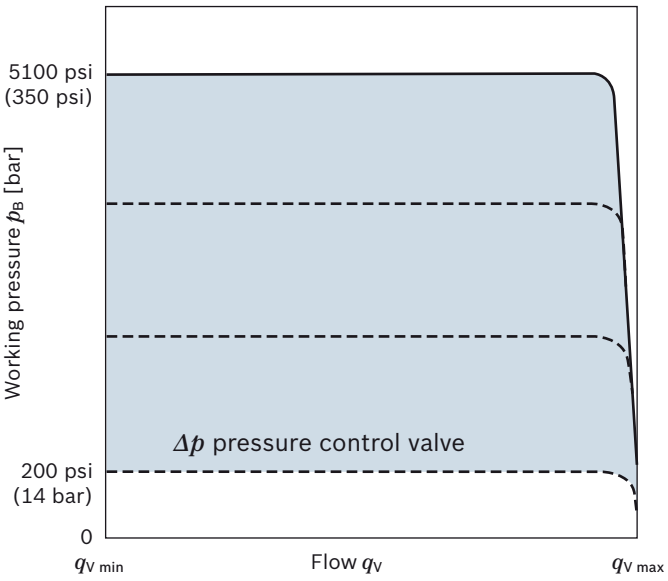
Note for setting remote-controlled pressure control

The setting value for the external pressure relief valve plus the differential pressure value at the pressure control valve determines the level of pressure control.

Example:

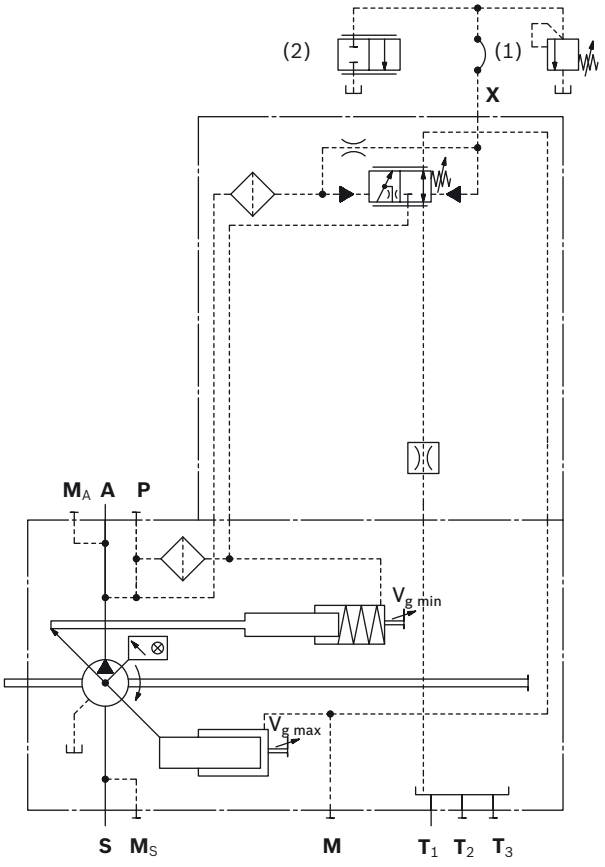
- External pressure relief valve 4800 psi (330 bar)
- Differential pressure on pressure control valve 290psi (20 bar)
- resulting pressure control of 4810 + 290 = 5100 psi (330 + 20 = 350 bar)

▼ **Characteristic curve DG**



For function and description of pressure control DR, see page 24

▼ **Circuit diagram DG**



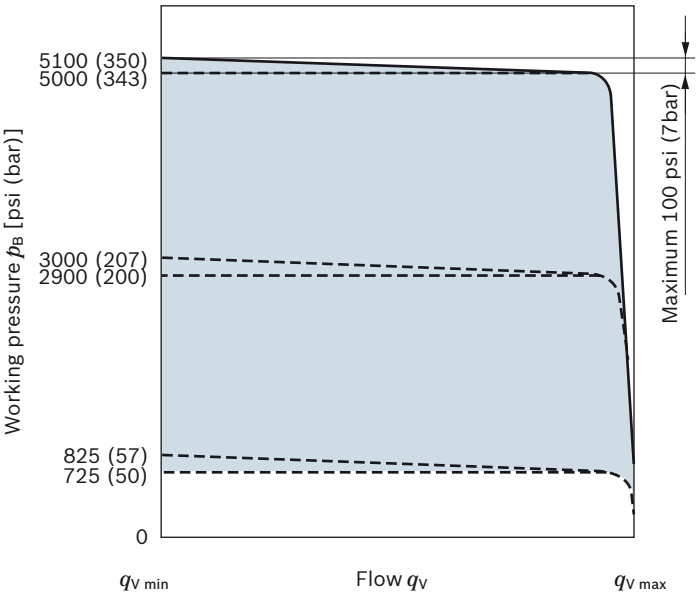
1 Pressure relief valve (not included in the scope of delivery)

2 2/2 directional valve (not included in the scope of delivery)

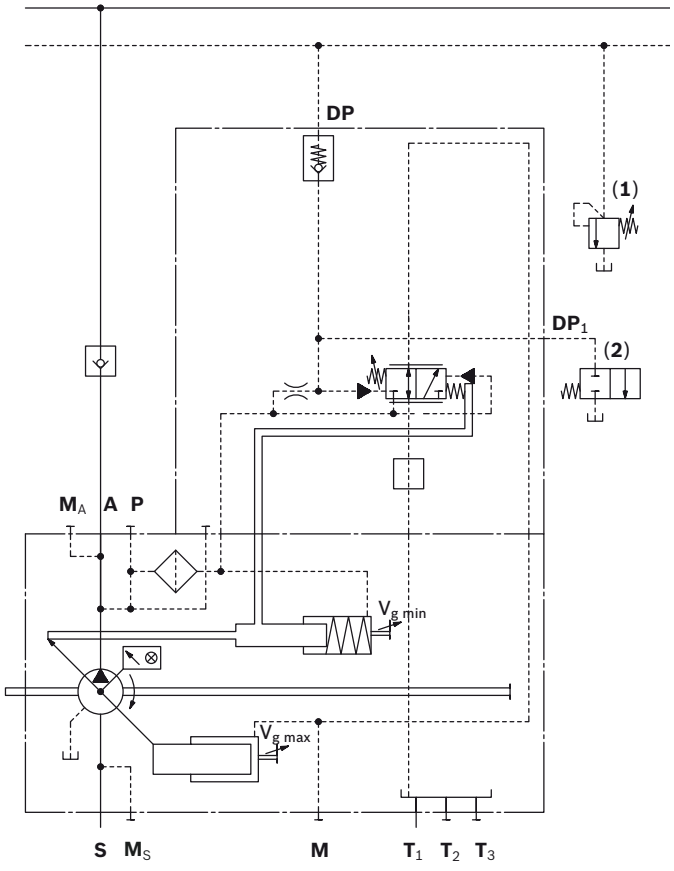
DP – Pressure controller with one-side swiveling, for parallel operation (positive control)

The pressure controller DP is suitable for pressure control of several A15VSO or A15VLO axial piston pumps in parallel operation pumping into a common pressure line.
The pressure control has a pressure increase of approx. 100 psi (7 bar) from $q_{v\ max}$ to $q_{v\ min}$. The pump regulates therefore to a pressure dependent swivel angle. This means a parallel or synchronous control behavior of several pumps.
The DP controller has a fixed Δp value which is overridden, depending on the swivel angle. Reference operating point is zero stroke.
Setting value Δp at zero stroke 400 psi (27 bar).
With the externally installed pressure relief valve (**1**) the nominal pressure command value of all pumps connected to the system is adjusted to the same value.
Setting range from 725 to 5100 psi (50 to 350 bar).
Control current for DP: approx. 0.5 gpm (1.9 l/min) (static) at Δp 400 psi (27 bar).
Each pump can be individually unloaded from the system by a separately installed 2/2 directional valve (**2**) and set to a standby position.
The check valve in the working line (port **A**) is generally to be provided by the customer. The check valve in the control line (port **DP**) is included in the scope of delivery. The external valves are not included in the scope of delivery.
As a separate pressure relief valve (**1**) we recommend: DBD.6 (manual actuation), see RE 25402

Characteristic curve DP



▼ **Circuit diagram DP**



1 Pressure relief valve
(not included in the scope of delivery)

2 2/2 directional valve
(not included in the scope of delivery)

DGV2 – With integrated pressure relief valve and electric 2/2 directional seat valve (de-energized standby)

The remote controlled pressure controller has a fixed setting Δp value. A pressure relief valve (pilot valve) integrated in the control valve allows for a fixed pressure control with switch-off through to standby = Δp value due to the integrated electric 2/2 directional seat valve.

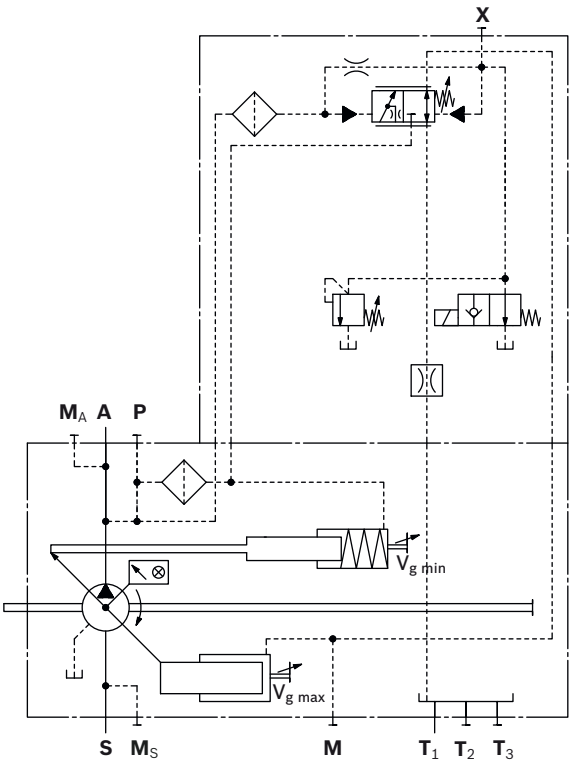
- Setting range Δp 200 to 365 psi (14 bar to 25 bar)
- Recommended value 290 psi (20 bar) (standard)
- Setting range for pressure control is 870 to 5100 psi (60 bar to 350 bar)
- Standard is 5100 psi (350 bar)

When ordering, state in plain text:

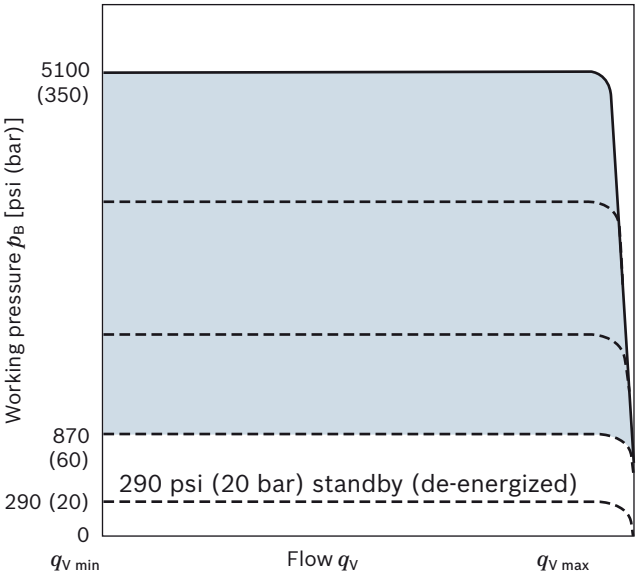
- Differential pressure Δp in psi (bar)
- Pressure setting p in psi (bar) (working pressure on port **A**)

Technical data, solenoid	DGV2
Voltage	24 V ±10 %
Current	900 mA
Nominal resistance (at 68-77 °F (20-25 °C))	28.2 Ω
Power consumption	20 W
Type of protection: see connector version page 63	

▼ **Circuit diagram DGV2**



▼ **Characteristic curve DGV2**



DGT6 – With integrated pilot control valve, electric-proportional override (positive control)

The remote controlled pressure controller has a fixed-setting Δp value. An electric pressure relief valve (pilot valve) integrated in the control valve enables remote pressure control.

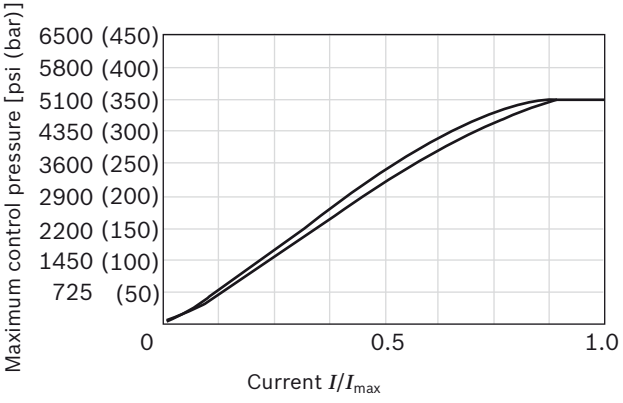
- Fixed value at Δp 200 psi (14 bar).
- Pilot valve pressure, fixed setting: 4870 psi (336 bar)
- Maximum pressure p_{max} [psi (bar)] (pressure on port **A**) with 1200 mA current: 5100 psi (350 bar)

Pilot valve T6

The electric-proportional pressure relief valve is directly controlled with a positive control as cartridge version (see data sheet 18139-04).
Electric proportional valve:
5100 psi (350 bar): KBPS**R**8AA/HCG24K40V

Notes and explanations for the DG controller can be found on page 26.

▼ **Characteristic curve T6**

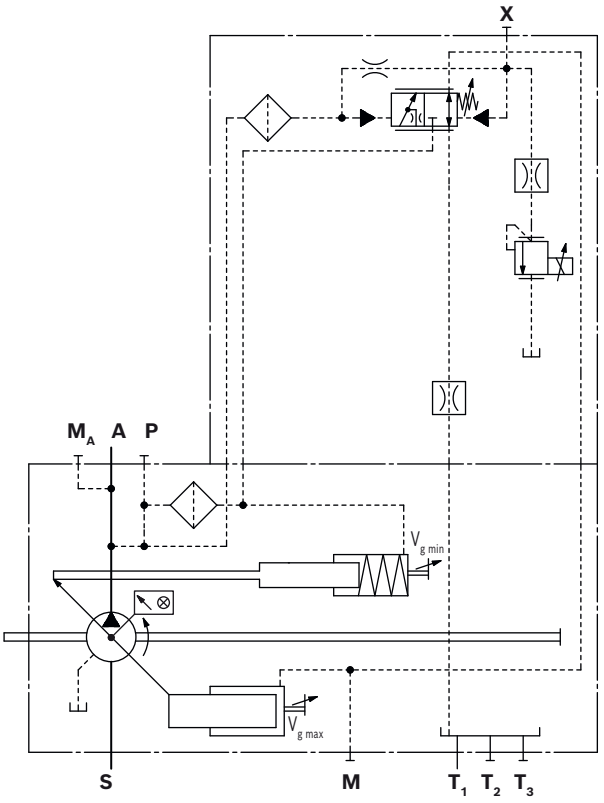


Technical data, solenoid	T6
Voltage	24 V
Control current	
Minimum pressure p_{min}	0 mA
Maximum pressure p_{max}	1200 mA
Maximum rated current	1200 mA
Nominal resistance (at 20°C)	4.8 Ω
Dither frequency	200 Hz
Duty cycle	100 %
Type of protection: see connector version page 63	

The following electronic control units and amplifiers are available for controlling the proportional solenoids:

Amplifier card	Data sheet
VT-SSPA1	30116
Analog amplifier RA	95230

▼ **Circuit diagram DGT6**



DGT8 – With integrated pilot control valve, electric-proportional override (negative control)

The remote controlled pressure controller has a fixed-setting Δp value. An electric pressure relief valve (pilot valve) integrated in the control valve enables remote pressure control.

- Fixed value at Δp 200 psi (14 bar)

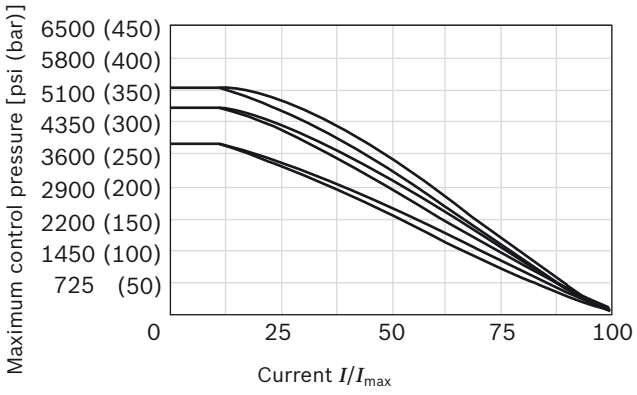
When ordering, state pressure setting in plain text:

- Maximum pressure p_{max} [psi (bar)] (pressure on port **A**) with 0 mA current.
  Standard is 5100psi (350 bar)

Pilot valve T8

The electric-proportional pressure relief valve is directly controlled with a negative control as cartridge version (see data sheet 18139-05).
Due to the pressure settings stated in plain text, the following electro-proportional pressure relief valves are used:
200...250 bar (2900...3600 psi): KBPS**N**8BA/HCG24K40V
251...315 bar (3640...4550 psi): KBPS**P**8BA/HCG24K40V
316...350 bar (4580...5100 psi): KBPS**R**8BA/HCG24K40V
Notes and explanations for the DG controller can be found on page 26.

▼ **Characteristic curve T8**

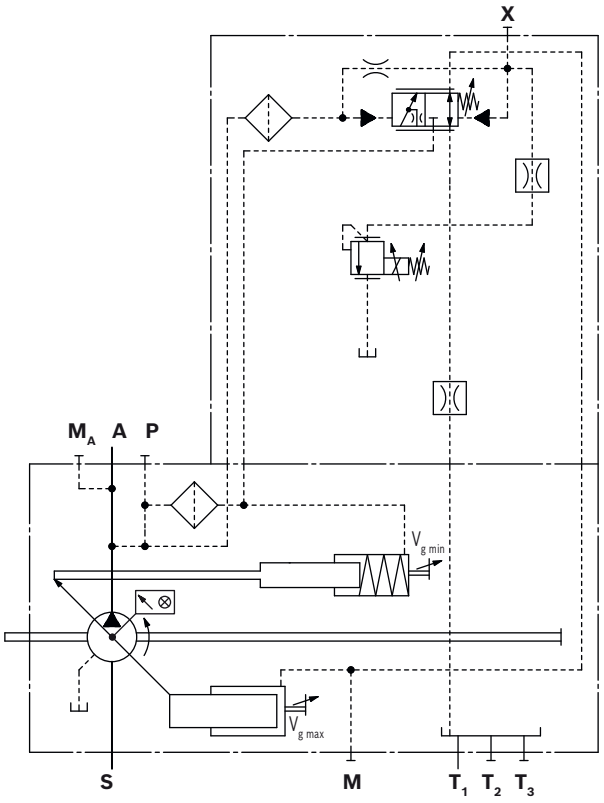


Technical data, solenoid	T8
Voltage	24 V
Control current	
Maximum pressure p_{max}	0 mA
Minimum pressure p_{min}	1200 mA
Maximum rated current	1200 mA
Nominal resistance (at 68 °F (20 °C))	4.8 Ω
Dither frequency	200 Hz
Duty cycle	100 %
Type of protection: see connector version page 63	

The following electronic control units and amplifiers are available for controlling the proportional solenoids:

Amplifier card	Data sheet
VT-SSPA1	30116
Analog amplifier RA	95230

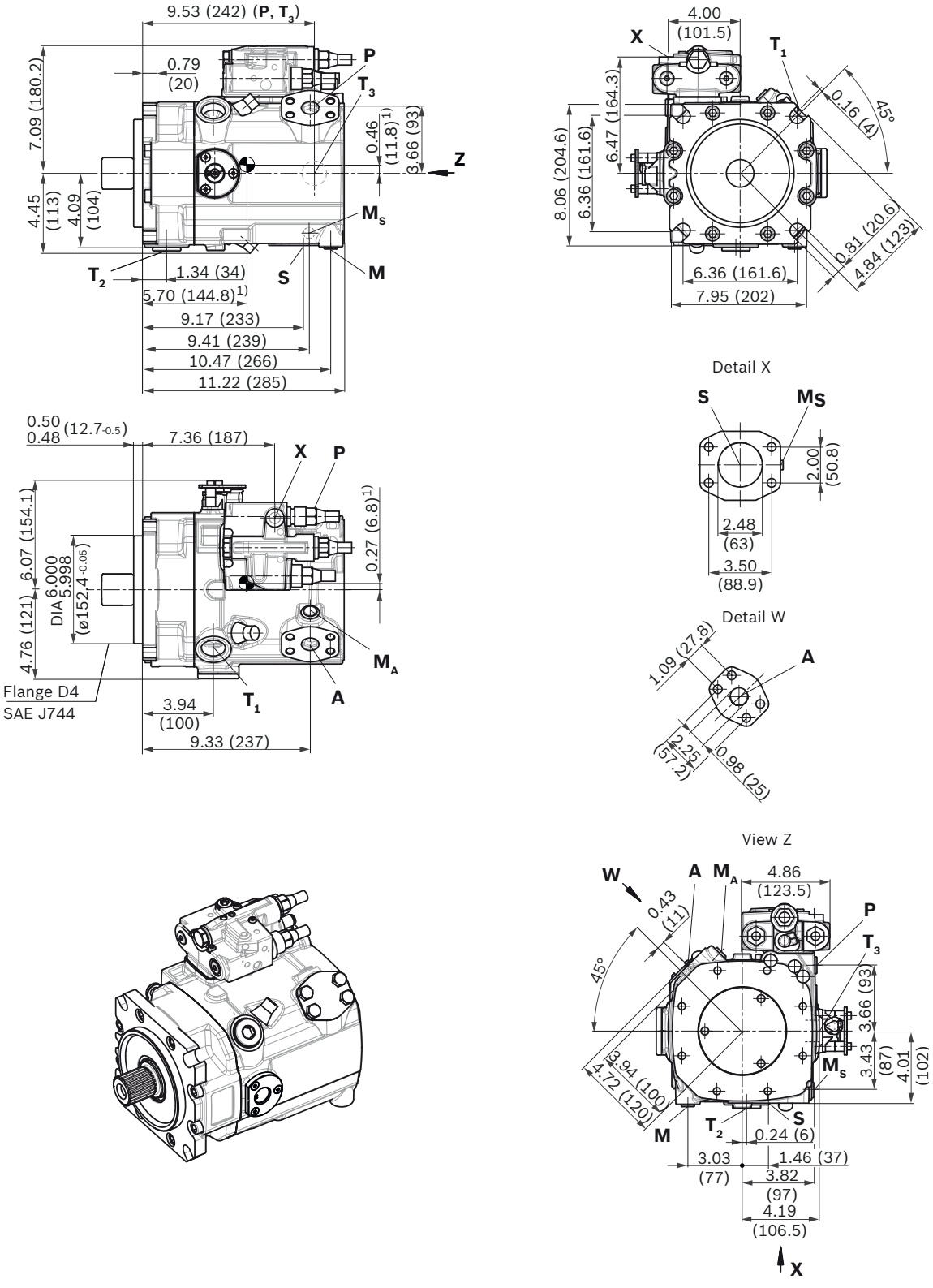
▼ **Circuit diagram DGT8**



Dimensions, size 110

LRDRS0 – Power controller with pressure controller, load-sensing and with electric swivel angle sensor

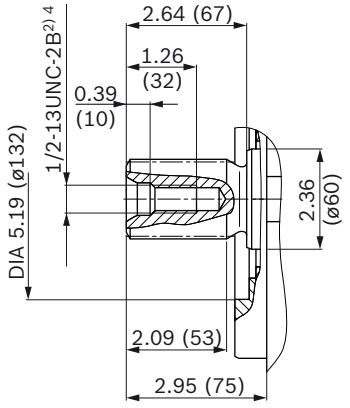
Clockwise rotation



1) Center of gravity

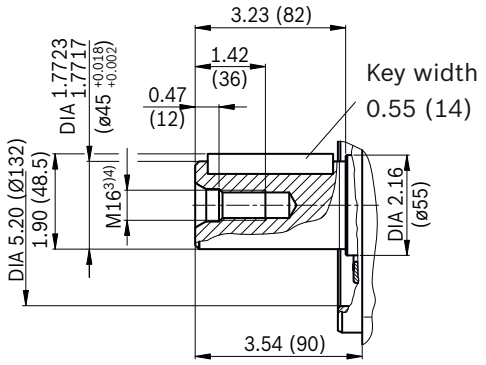
▼ **Splined shaft SAE J744**

T1 – 3/4 in 13T 8/16DP[1)]



▼ **Parallel keyed shaft DIN 6885**

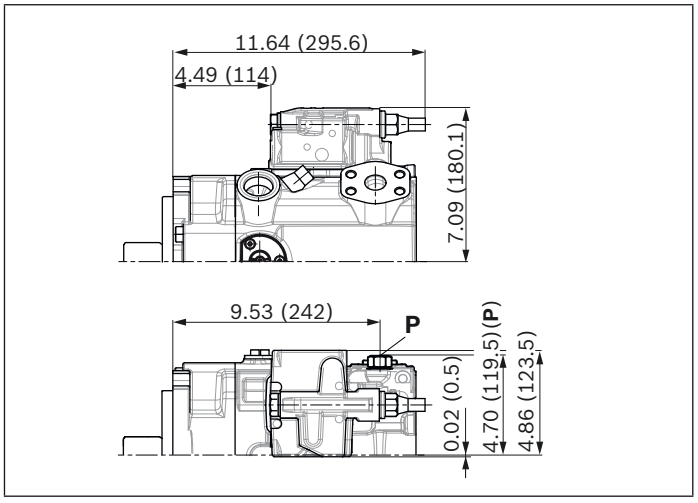
B1 – Ø45 A 14x9x80



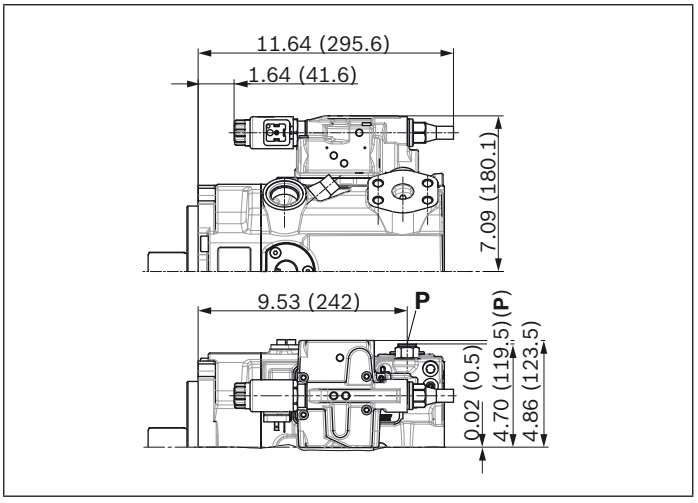
Ports		Standard	Size[4)]	p_{max} [psi (bar)][5)]	State[8)]
A	Working port Fastening thread	SAE J518 ASME B1.1	1 in 7/16-14UNC-2B; 19 (0.75) deep	6100 (420)	O
S	Suction port (without charge pump) Fastening thread	SAE J518 ASME B1.1	2 1/2 in 1/2-13UNC-2B; 19 (0.75) deep	435 (30)	O
T_1	Drain port	ISO 11926[6)]	1 5/16UNF-2B; 20 (0.79) deep	75 (5)	O[7)]
T_2	Drain port	ISO 11926[6)]	1 5/16UNF-2B; 20 (0.79) deep	75 (5)	X[7)]
T_3	Drain port	ISO 11926[6)]	1 5/16UNF-2B; 20 (0.79) deep	75 (5)	X[7)]
CR	Pilot signal (CR only)	ISO 11926	9/16-18 UNF-2B; 13 (0.51) deep	6100 (420)	O
PR	Pilot signal (PR only)	ISO 11926	9/16-18 UNF-2B; 13 (0.51) deep	6100 (420)	O
H3 to **H6**	Pilot signal (only on H3, H4, H5 and H6)	ISO 11926	9/16-18 UNF-2B; 13 (0.51) deep	1450 (100)	O
DP, DP_1	Measuring port pilot signal (DP)	ISO 11926[6)]	9/16-18 UNF-2B; 13 (0.51) deep	6100 (420)	X
X	Pilot signal	ISO 11926[6)]	9/16-18 UNF-2B; 13 (0.51) deep	6100 (420)	O
M	Measuring control pressure	ISO 11926[6)]	9/16-18 UNF-2B; 13 (0.51) deep	6100 (420)	X
M_A	Measuring pressure **A**	ISO 11926[6)]	9/16-18 UNF-2B; 13 (0.51) deep	6100 (420)	X
M_S	Measuring suction pressure	ISO 11926[6)]	9/16-18 UNF-2B; 13 (0.51) deep	435 (30)	X
P	External control pressure (type code position 8 version B or C = with external control pressure supply)	ISO 11926[6)]	9/16-18 UNF-2B; 13 (0.51) deep	725 (50)	O
	Port **P** is without function (Type code position 8 version A = without external control pressure supply)	ISO 11926[6)]	3/4-16 UNF-2B; 12.6 (0.50) deep	6100 (420)	X

1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5.
2) Center bore according to ASME B1.1 (thread according to ASME B1.1)
3) Center bore according to DIN 332 (thread according to DIN 13)
4) Observe the instructions in the instruction manual concerning the maximum tightening torques.
5) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
6) The countersink can be deeper than as specified in the standard.
7) Depending on installation position, **T_1**, **T_2** or **T_3** must be connected (see also Installation instructions on pages 64 and 65).
8) O = Must be connected (plugged when delivered)
X = Plugged (in normal operation)

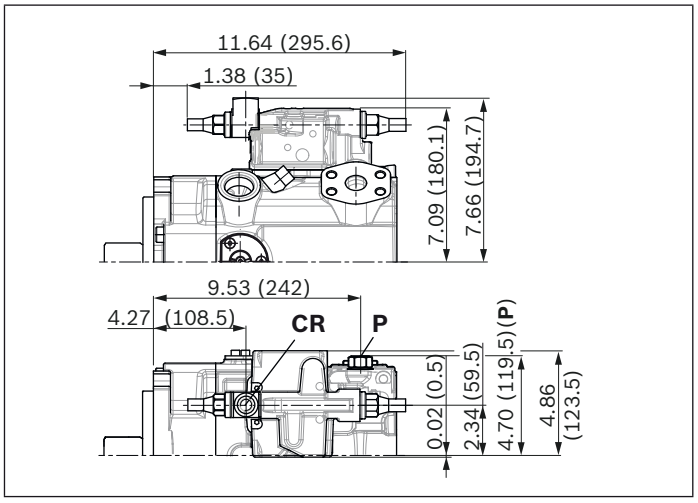
▼ **LR – Power controller, fixed setting**



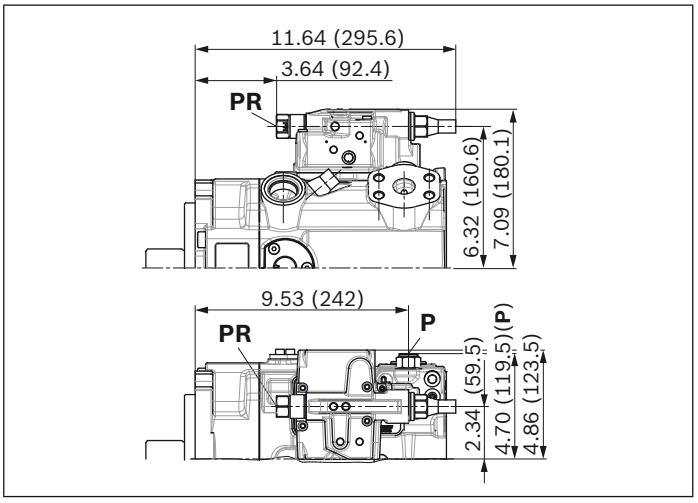
▼ **L4 – Power controller, electric-proportional override**



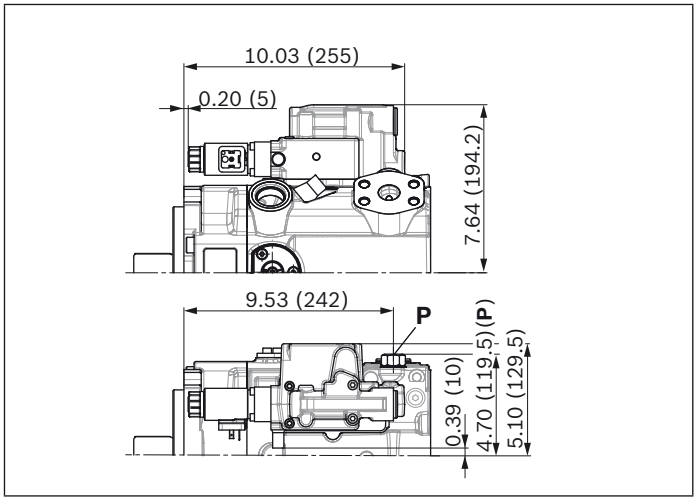
▼ **CR – Power controller, hydraulic-proportional override, high pressure, with stop**



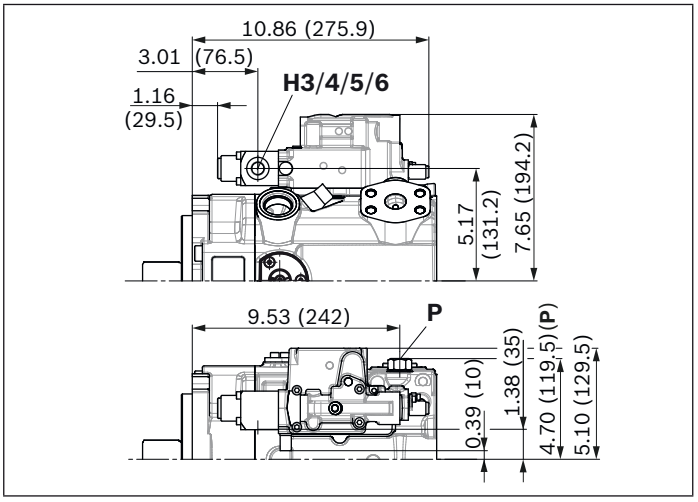
▼ **PR – Power controller, hydraulic-proportional override, high pressure, without stop**



▼ **E2/E6 – Stroke control electric-proportional**



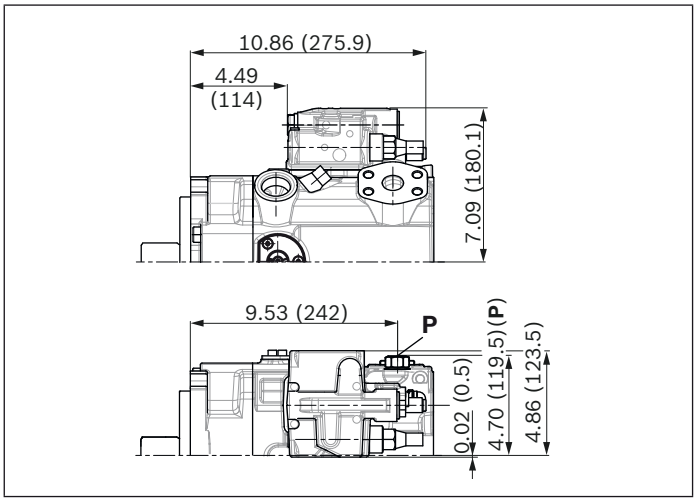
▼ **H3/4/5/6 – Stroke control, hydraulic prop., pilot pressure**



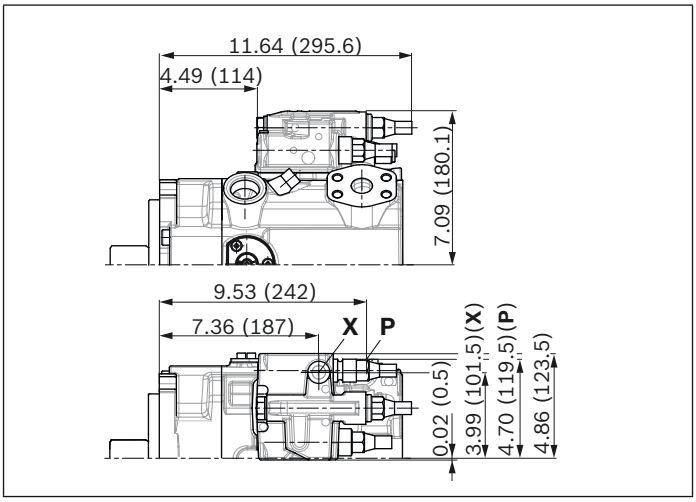
Notice

All controllers described with shuttle valve in **P**
(some contrary to standard as per type code digit 08)

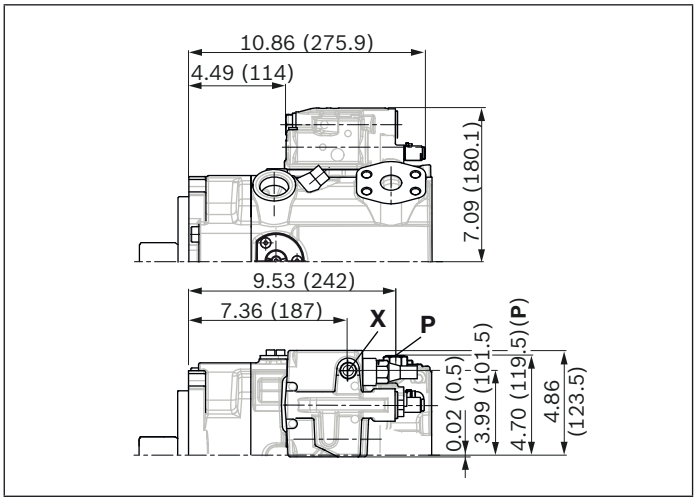
▼ **DR – Pressure controller, fixed setting**



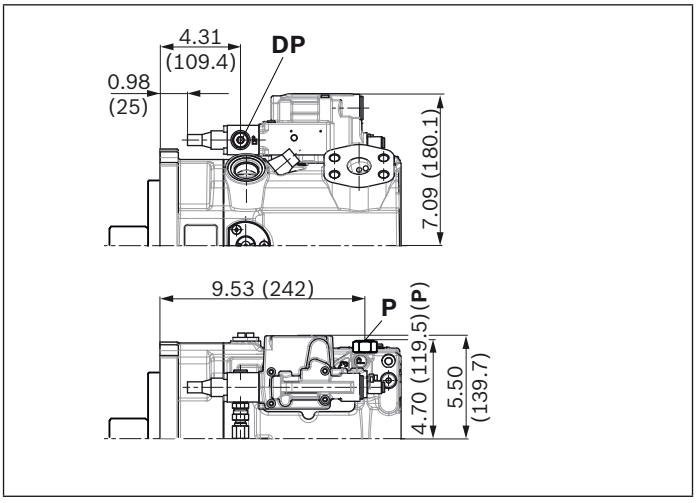
▼ **LRDRS0 – Power controller with pressure controller and load-sensing, fixed setting**



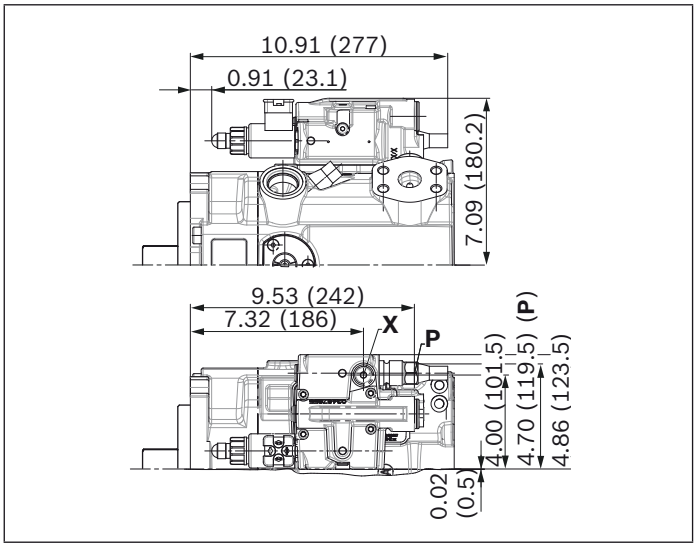
▼ **DG – Pressure controller, hydraulic, remote controlled**



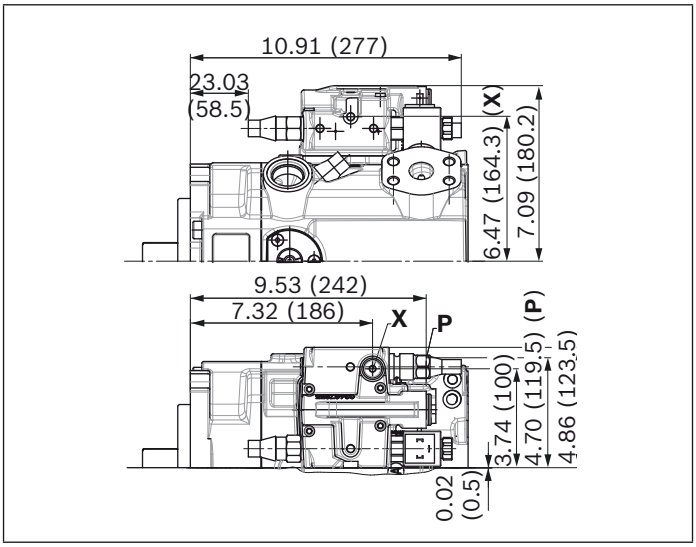
▼ **DP – Pressure controller, for parallel operation**



▼ **DGT6/DGT8 – With integrated pilot control valve, electric-proportional override**



▼ **DGV2 – Electric directional valve and pressure relief valve mounted (only in combination with DG)**



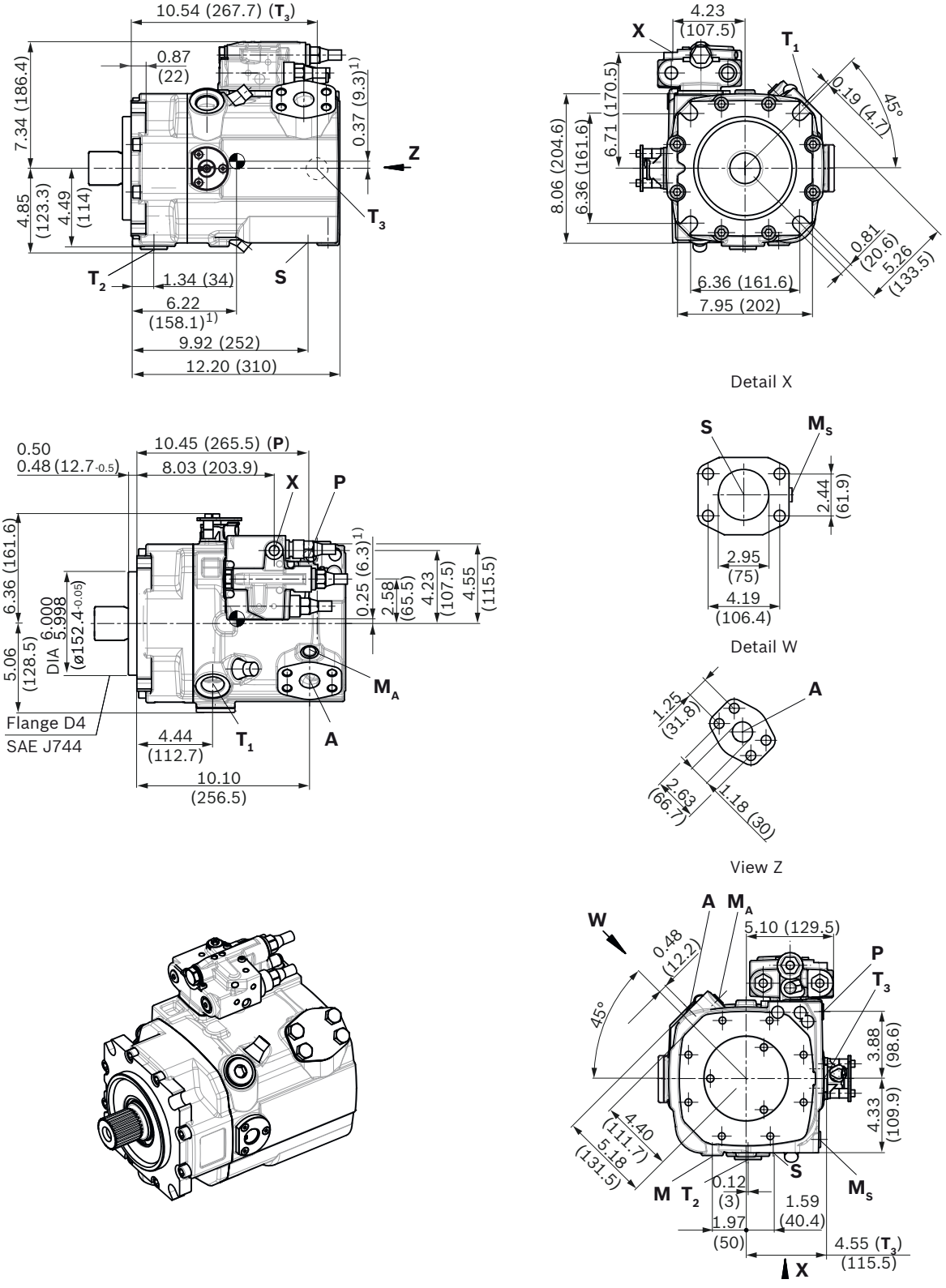
Notice

All controllers described with shuttle valve in **P**
(some contrary to standard as per type code digit 08)

Dimensions, size 145

LRDRS0 – Power controller with pressure controller, load-sensing and with electric swivel angle sensor

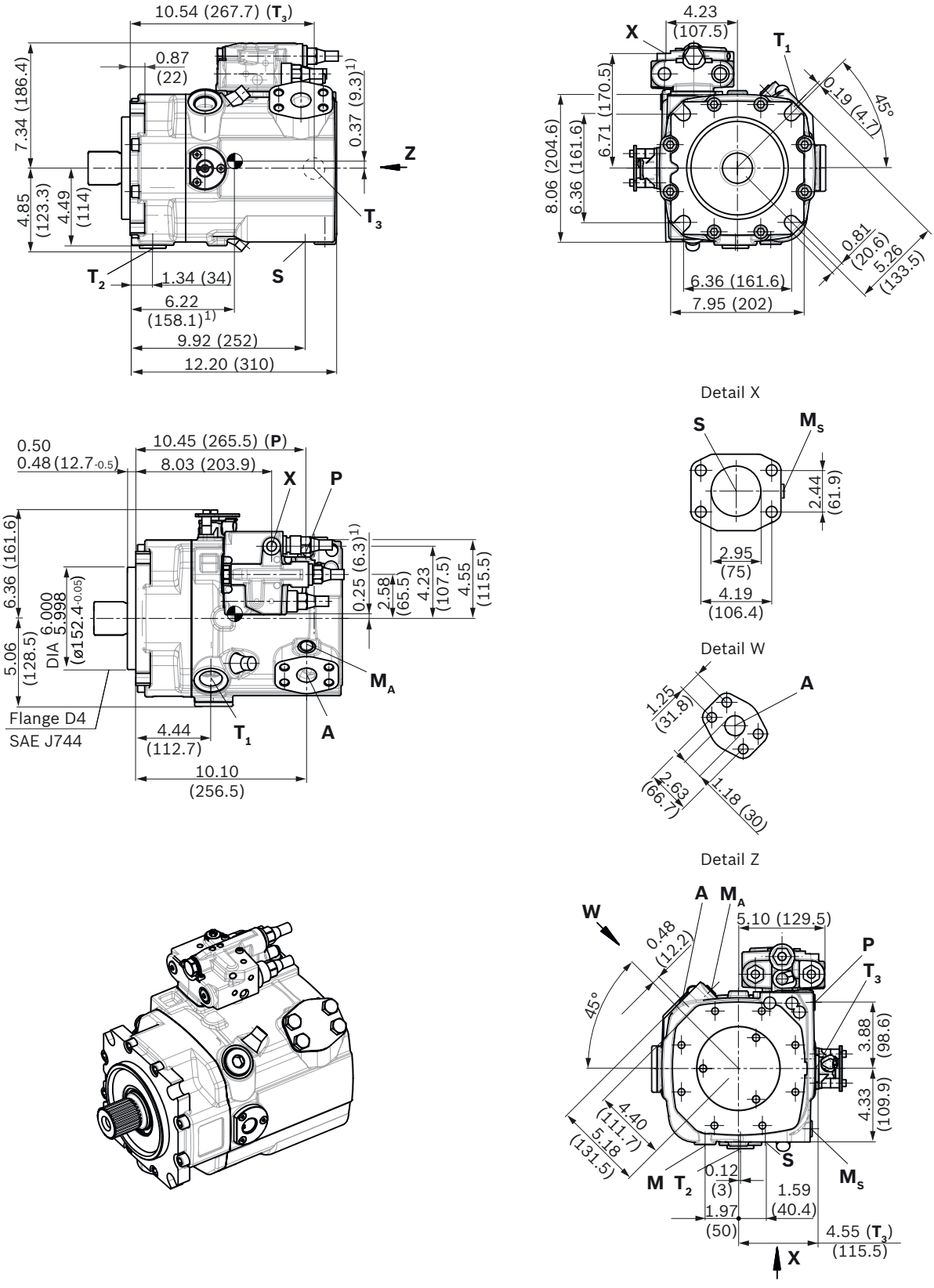
Without charge pump, clockwise rotation



1) Center of gravity

LRDRS0 – Power controller with pressure controller, load-sensing and with electric swivel angle sensor

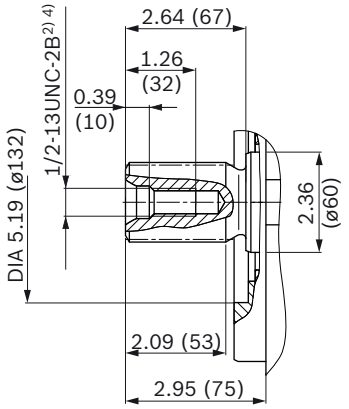
With charge pump, clockwise rotation



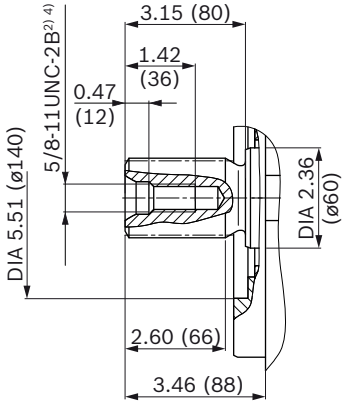
1) Center of gravity

▼ **Splined shaft SAE J744**

T1 – 3/4 in 13T 8/16DP[1)]

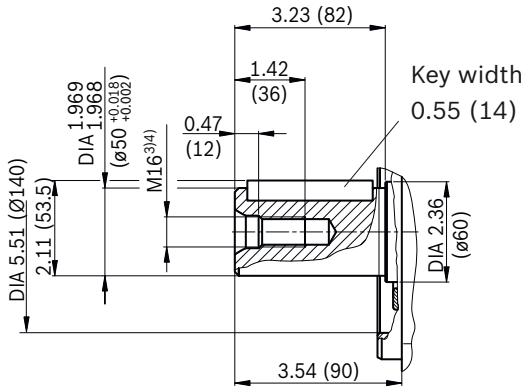


T2 – 2 in 15T 8/16DP[1)]



▼ **Parallel keyed shaft DIN 6885**

B2 – Ø50 A 14x9x80

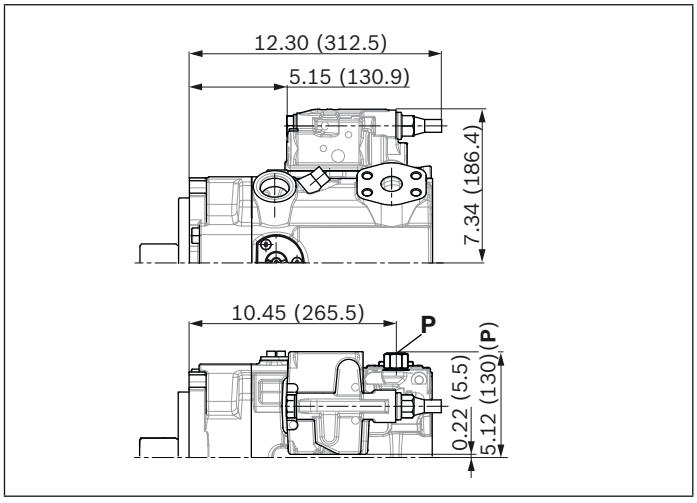


1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5.
2) Center bore according to ASME B1.1 (thread according to ASME B1.1)
3) Center bore according to DIN 332 (thread according to DIN 13)

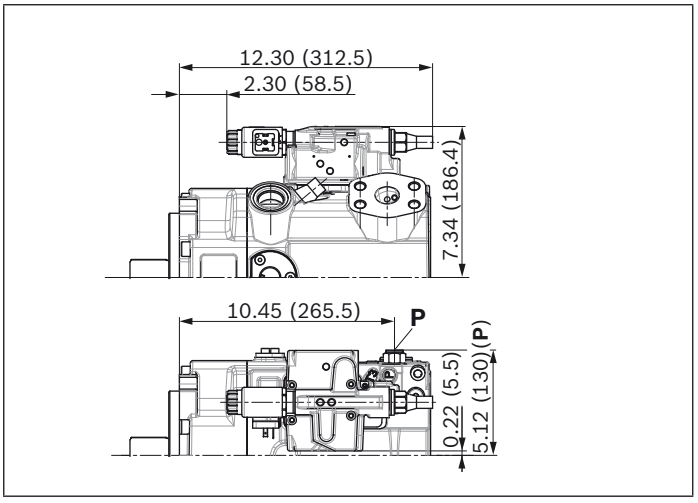
Ports		Standard	Size[4]	p_{max} [psi (bar)][5]	State[8]
A	Working port Fastening thread	SAE J518 ASME B1.1	1 1/4 in 1/2-13 UNC-2B; 0.75 (19) deep	6100 (420)	O
S	Suction port (without charge pump) Fastening thread	SAE J518 ASME B1.1	3 in 5/8-11 UNC-2B; 0.94 (24) deep	435 (30)	O
S	Suction port (with charge pump) Fastening threads	SAE J518[6] ASME B1.1	3 in 5/8-11 UNC-2B; 0.94 (24) deep	30 (2)	O
T_1	Drain port	ISO 11926[6]	1 5/16 UNF-2B; 0.79 (20) deep	75 (5)	O[7]
T_2	Drain port	ISO 11926[6]	1 5/16 UNF-2B; 0.79 (20) deep	75 (5)	X[7]
T_3	Drain port	ISO 11926[6]	1 5/16 UNF-2B; 0.79 (20) deep	75 (5)	X[7]
CR	Pilot signal (CR only)	ISO 11926	9/16-18 UNF-2B; 0.51 (13) deep	6100 (420)	O
PR	Pilot signal (PR only)	ISO 11926	9/16-18 UNF-2B; 0.51 (13) deep	6100 (420)	O
H3 to **H6**	Pilot signal (only on H3, H4, H5 and H6)	ISO 11926	9/16-18 UNF-2B; 0.51 (13) deep	6100 (420)	O
DP	Pilot pressure (only on DP)	ISO 11926	9/16-18 UNF-2B; 0.51 (13) deep	6100 (420)	O
DP_1	Measuring port pilot signal (DP)	ISO 11926	9/16-18 UNF-2B; 0.51 (13) deep	6100 (420)	X
X	Pilot signal	ISO 11926[6]	9/16-18 UNF-2B; 0.51 (13) deep	6100 (420)	O
M	Measuring control pressure	ISO 11926[6]	9/16-18 UNF-2B; 0.51 (13) deep	6100 (420)	X
M_A	Measuring pressure **A**	ISO 11926[6]	9/16-18 UNF-2B; 0.51 (13) deep	6100 (420)	X
M_S	Measuring suction pressure (only A15VSO)	ISO 6149[5]	9/16-18 UNF-2B; 0.51 (13) deep	435 (30)	X
P	External control pressure (type code position 8 version B or C = with external control pressure supply)	ISO 11926[6]	9/16-18 UNF-2B; 0.51 (13) deep	725 (50)	O
	Port **P** is without function (type code position 8 version A = without external control pressure supply)	ISO 11926[6]	3/4-16 UNF-2B; 0.50 (12.6) deep	6100 (420)	X

4) Observe the instructions in the instruction manual concerning the maximum tightening torques.
5) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
6) The countersink can be deeper than as specified in the standard.
7) Depending on installation position, **T_1**, **T_2** or **T_3** must be connected (see also Installation instructions on pages 64 and 65).
8) O = Must be connected (plugged when delivered)
X = Plugged (in normal operation)

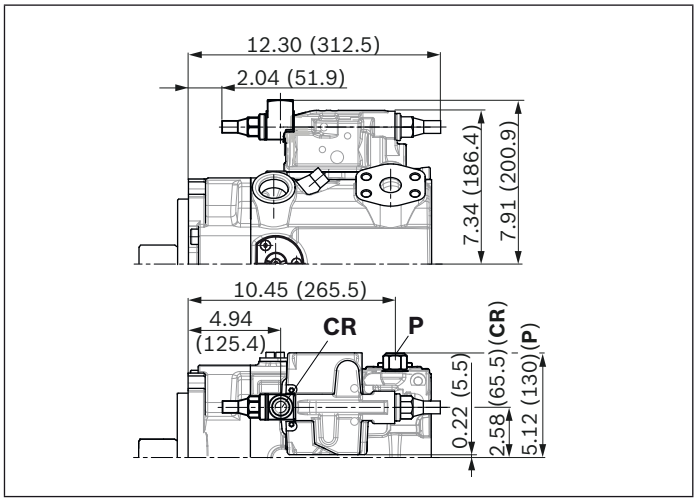
▼ **LR – Power controller, fixed setting**



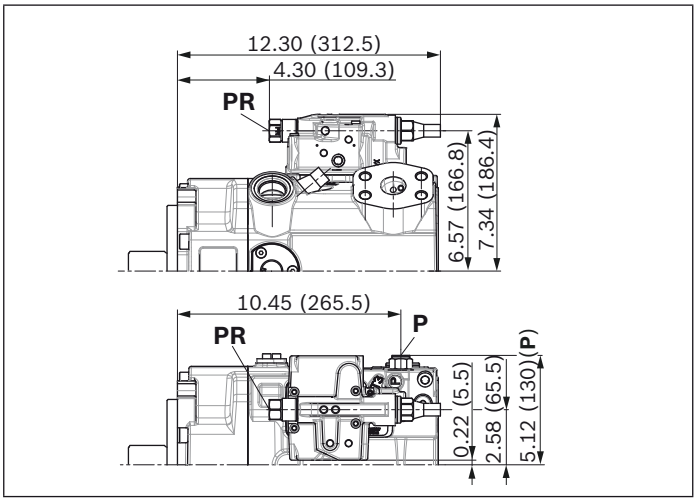
▼ **L4 – Power controller, electric-proportional override**



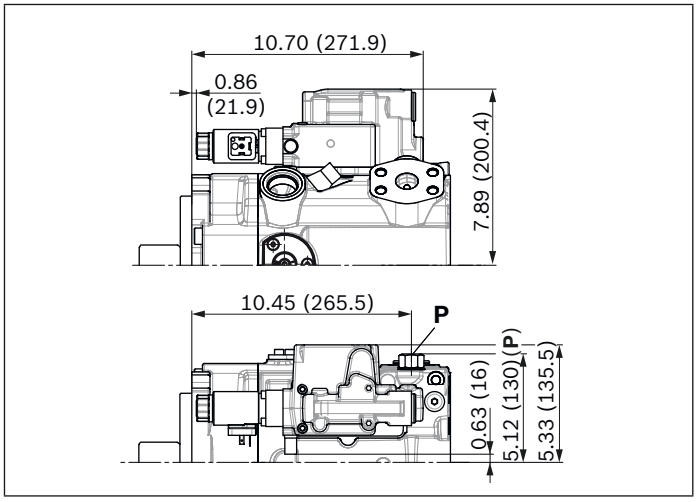
▼ **CR – Power controller, hydraulic-proportional override, high pressure, with stop**



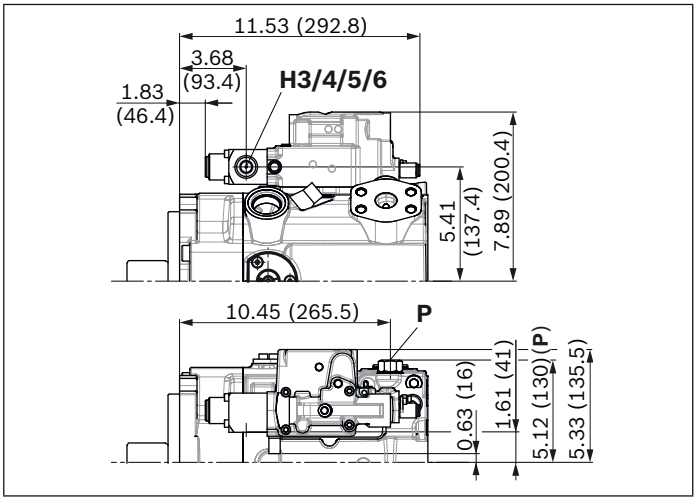
▼ **PR – Power controller, hydraulic-proportional override, high pressure, without stop**



▼ **E2/E6 – Stroke control electric-proportional**



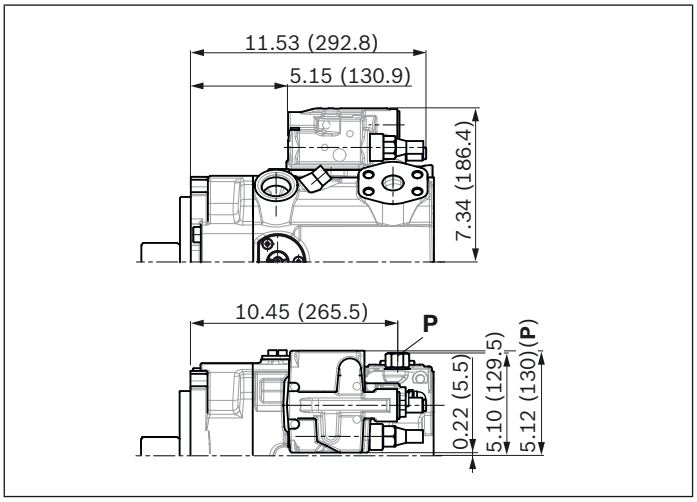
▼ **H3/4/5/6 – Stroke control, hydraulic prop., pilot pressure**



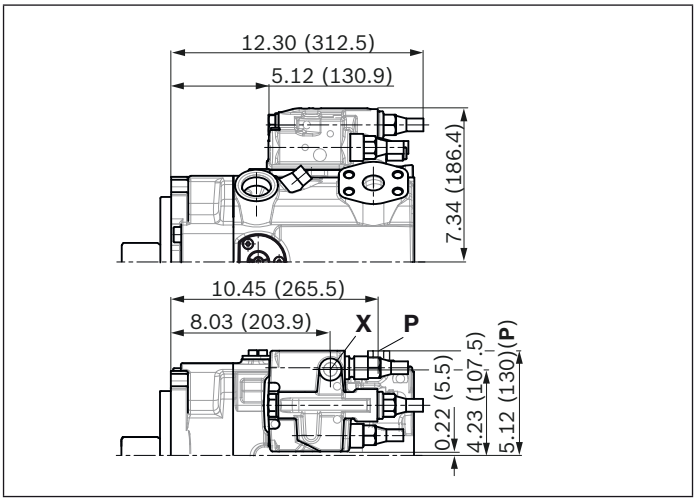
Notice

All controllers described with shuttle valve in **P**
(some contrary to standard as per type code digit 08)

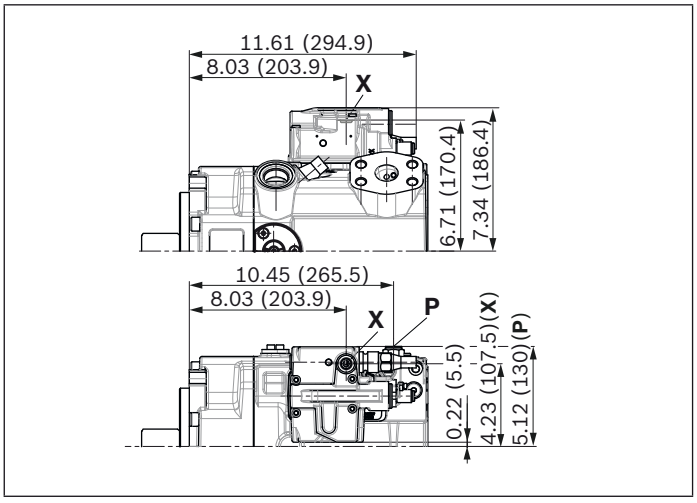
▼ **DR – Pressure controller, fixed setting**



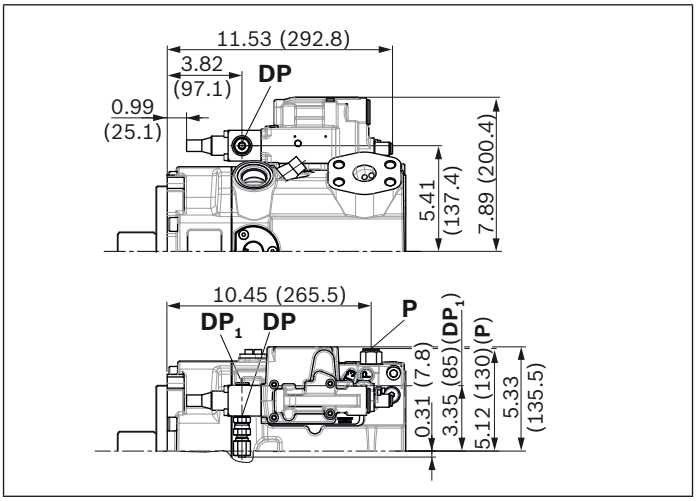
▼ **LRDRS0 – Power controller with pressure controller and load-sensing, fixed setting**



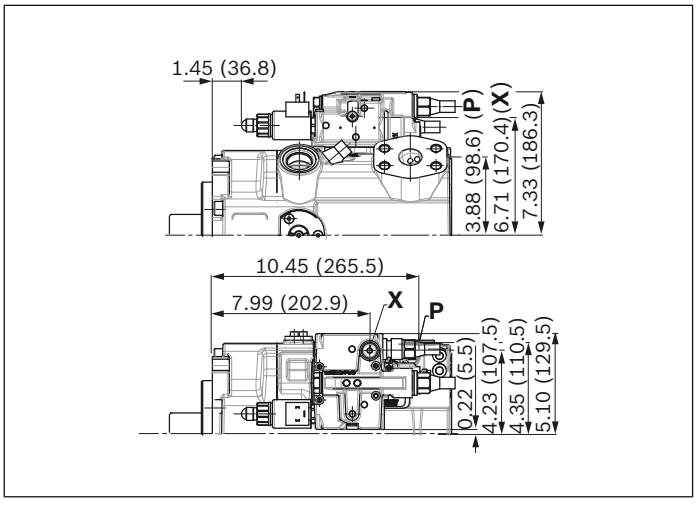
▼ **DG – Pressure controller, hydraulic, remote controlled**



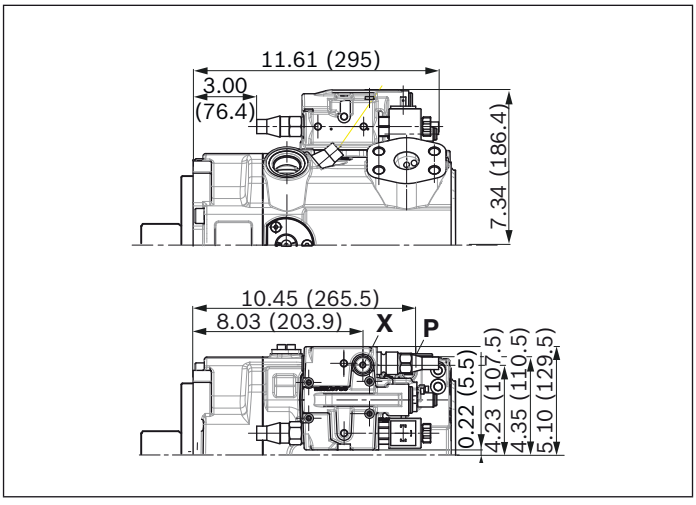
▼ **DP – Pressure controller, for parallel operation**



▼ **DGT6/DGT8 – With integrated pilot control valve, electric-proportional override**



▼ **DGV2 – Electric directional valve and pressure relief valve mounted (only in combination with DG)**



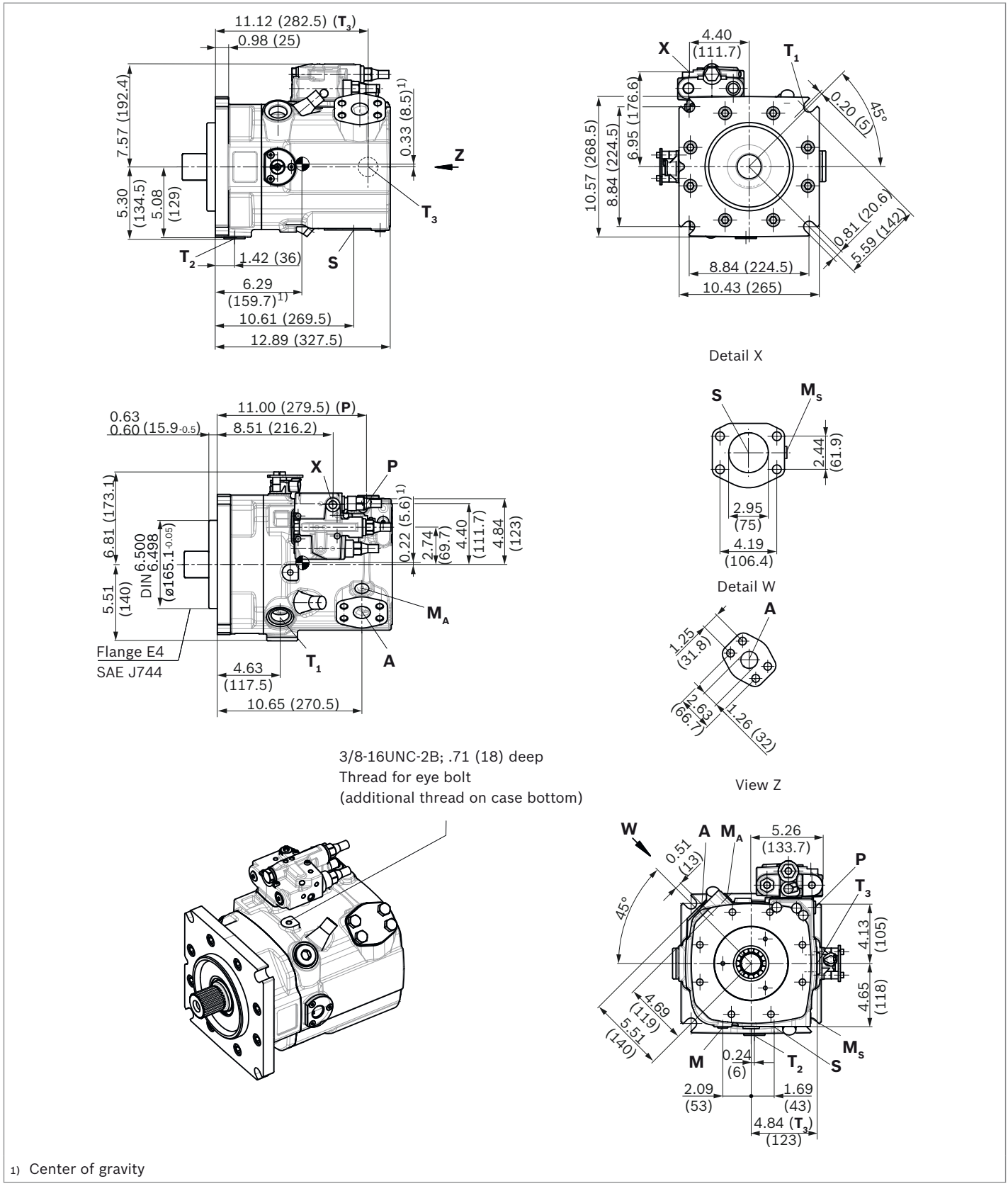
Notice

All controllers described with shuttle valve in **P**
(some contrary to standard as per type code digit 08)

Dimensions, size 175

LRDRS0 – Power controller with pressure controller, load-sensing and with electric swivel angle sensor

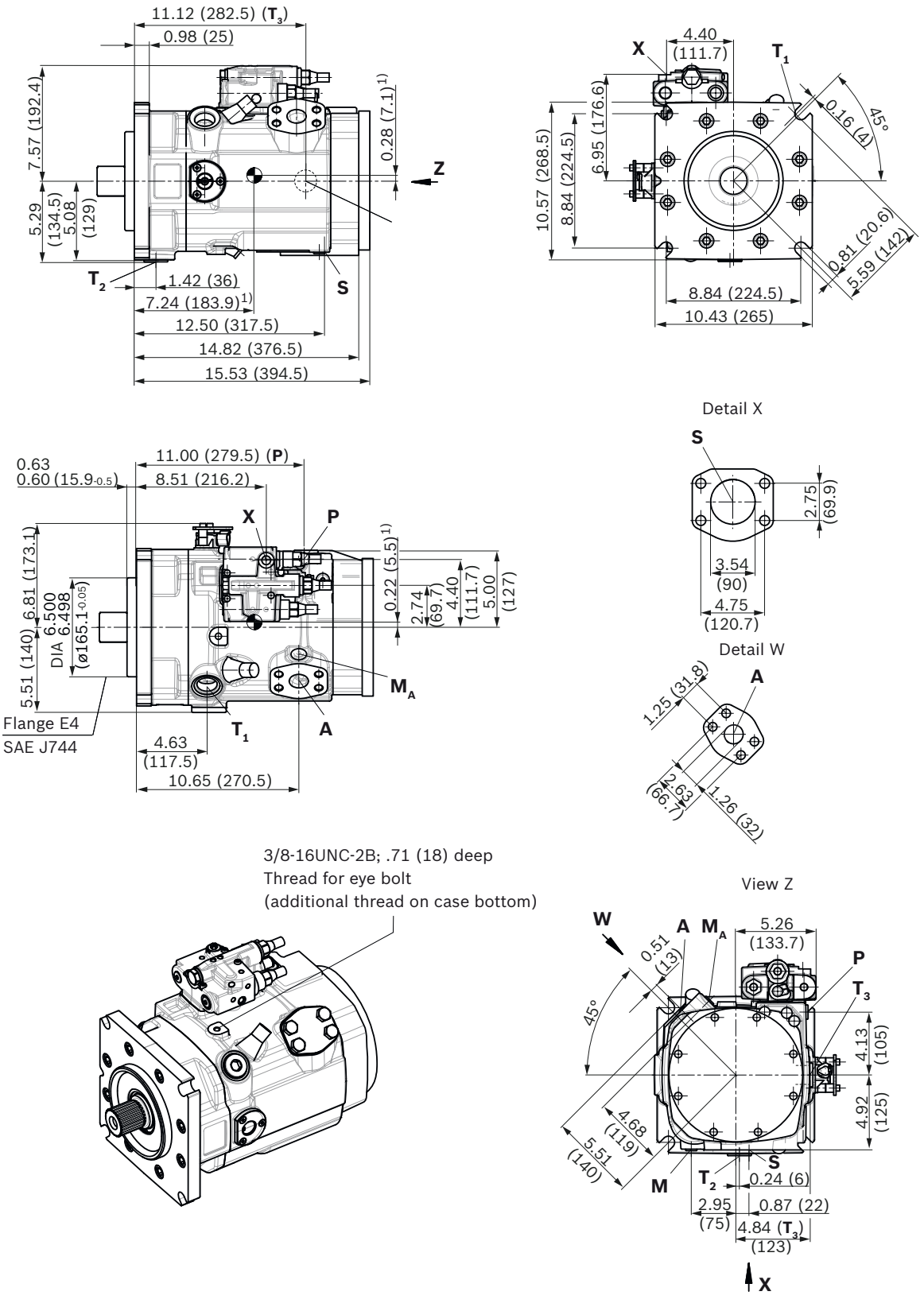
Without charge pump, clockwise rotation



1) Center of gravity

LRDRS0 – Power controller with pressure controller, load-sensing and with electric swivel angle sensor

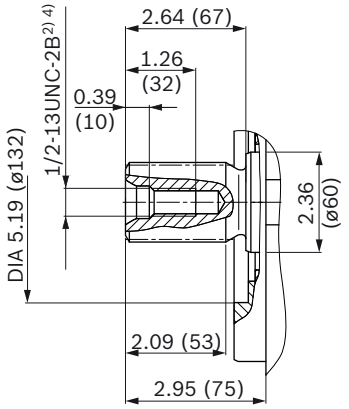
With charge pump, clockwise rotation



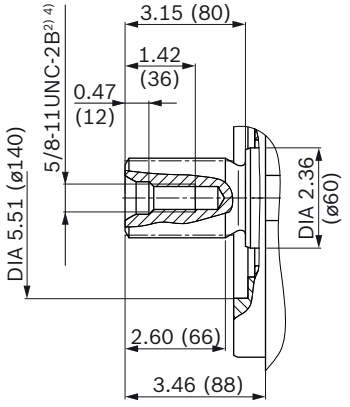
1) Center of gravity

▼ **Splined shaft SAE J744**

T1 – 3/4 in 13T 8/16DP[1)]

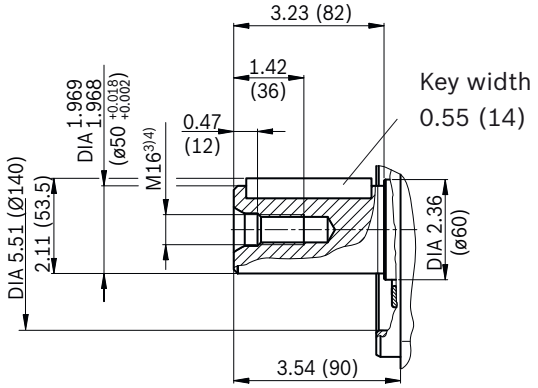


T2 – 2 in 15T 8/16DP[1)]



▼ **Parallel keyed shaft DIN 6885**

B2 – Ø50 A 14x9x80

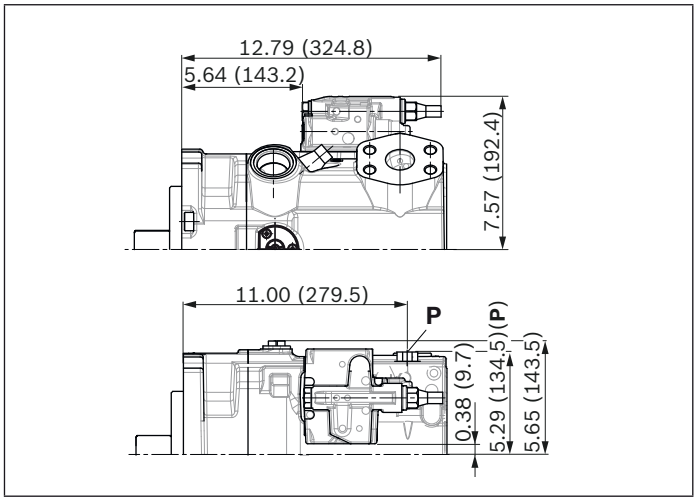


1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5.
2) Center bore according to ASME B1.1 (thread according to ASME B1.1)
3) Center bore according to DIN 332 (thread according to DIN 13)
4) Observe the instructions in the instruction manual concerning the maximum tightening torques.

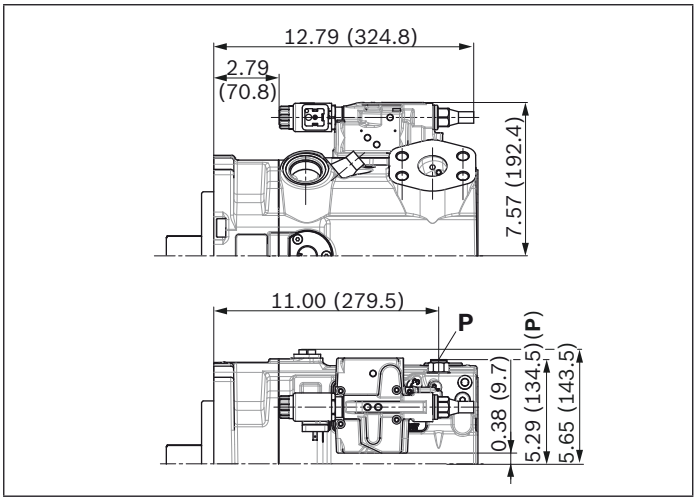
Ports		Standard	Size[4]	p_{max} [psi (bar)][5]	State[8]
A	Working port Fastening thread	SAE J518 ASME B1.1	1 1/4 in 1/2-13UNC-2B; 0.75 (19) deep	6100 (420)	O
S	Suction port (without charge pump) Fastening thread	SAE J518 ASME B1.1	3 in 5/8-11UNC-2B; 0.94 (24) deep	435 (30)	O
S	Suction port (with charge pump) Fastening threads	SAE J518 ASME B1.1	3 1/2 in 5/8-11UNC-2B; 0.94 (24) deep	30 (2)	O O
T_1	Drain port	ISO 11926[6]	1 5/16UNF-2B; 0.79 (20) deep	75 (5)	O[7]
T_2	Drain port	ISO 11926[6]	1 5/16UNF-2B; 0.79 (20) deep	75 (5)	X[7]
T_3	Drain port	ISO 11926[6]	1 5/16UNF-2B; 0.79 (20) deep	75 (5)	X[7]
CR	Pilot signal (CR only)	ISO 11926	9/16-18UNF-2B; 0.51 (13) deep	1450 (100)	O
PR	Pilot signal (PR only)	ISO 11926	9/16-18UNF-2B; 0.51 (13) deep	1450 (100)	O
H3 to **H6**	Pilot signal (only on H3, H4, H5 and H6)	ISO 11926	9/16-18UNF-2B; 0.51 (13) deep	1450 (100)	O
X	Pilot signal	ISO 11926[6]	9/16-18UNF-2B; 0.51 (13) deep	6100 (420)	O
DP	Pilot pressure (only on DP)	ISO 11926[6]	9/16-18UNF-2B; 0.51 (13) deep	6100 (420)	O
DP_1	Measuring port pilot signal (DP)	ISO 11926[6]	9/16-18UNF-2B; 0.51 (13) deep	6100 (420)	X
M	Measuring control pressure	ISO 11926[6]	9/16-18UNF-2B; 0.51 (13) deep	6100 (420)	X
M_A	Measuring pressure **A**	ISO 11926[6]	9/16-18UNF-2B; 0.51 (13) deep	6100 (420)	X
M_S	Measuring suction pressure (only A15VSO)	ISO 11926[6]	9/16-18UNF-2B; 0.51 (13) deep	435 (30)	X
P	External control pressure (type code position. 8 version B or C = with external control pressure supply)	ISO 11926[6]	9/16-18UNF-2B; 0.51 (13) deep	725 (50)	O
	Port **P** is without function (type code position 8 version A = without external control pressure supply)	ISO 11926[6]	3/4-16UNF-2B; 0.50 (12.6) deep	6100 (420)	X

5) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
6) The countersink can be deeper than as specified in the standard.
7) Depending on installation position, **T_1**, **T_2** or **T_3** must be connected (see also Installation instructions on pages 64 and 65).
8) O = Must be connected (plugged when delivered)
X = Plugged (in normal operation)

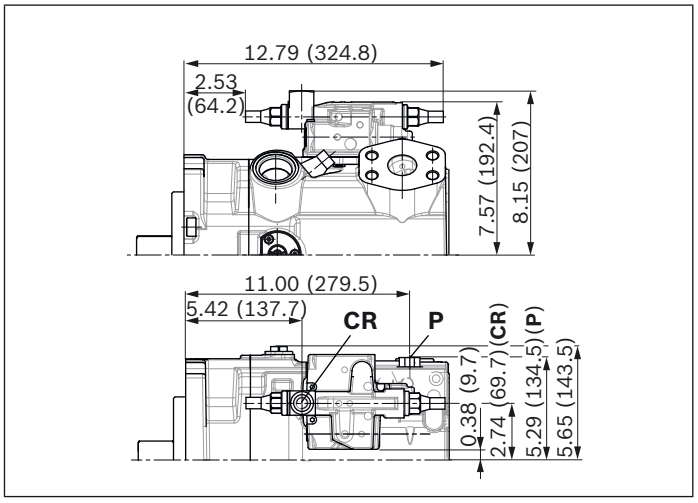
▼ **LR – Power controller, fixed setting**



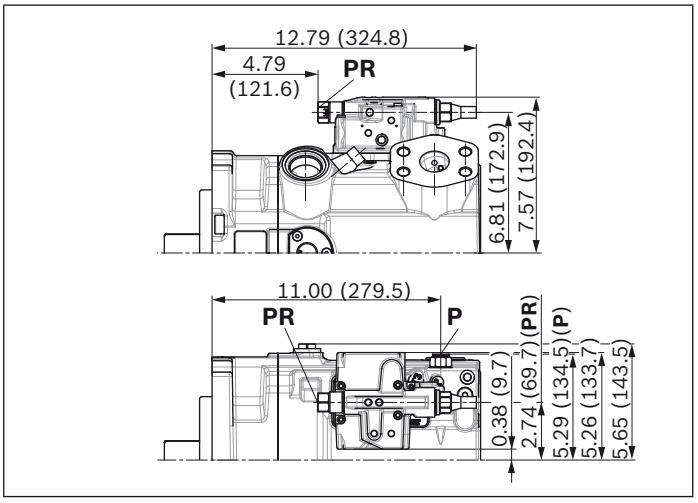
▼ **L4 – Power controller, electric-proportional override**



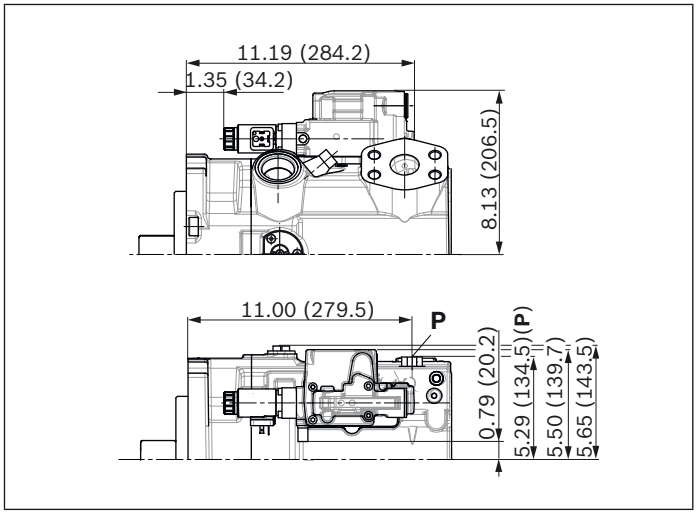
▼ **CR – Power controller, hydraulic-proportional override, high pressure, with stop**



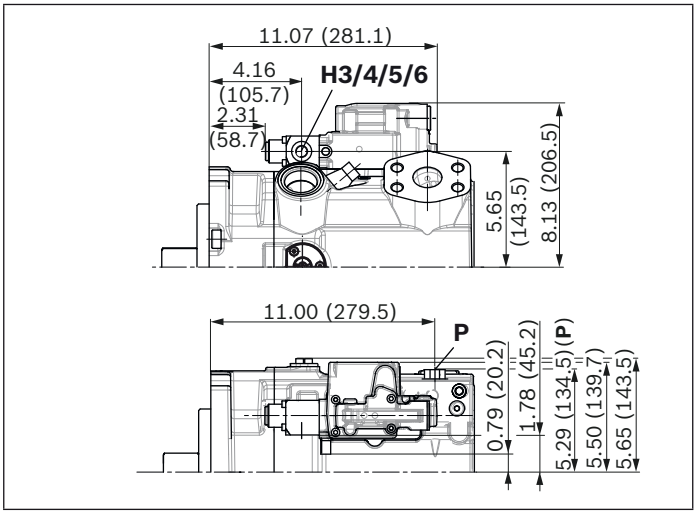
▼ **PR – Power controller, hydraulic-proportional override, high pressure, without stop**



▼ **E2/E6 – Stroke control electric-proportional**



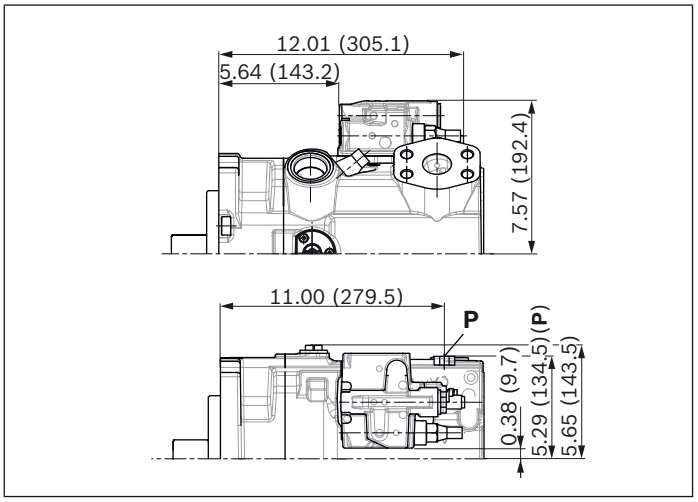
▼ **H3/4/5/6 – Stroke control, hydraulic prop., pilot pressure**



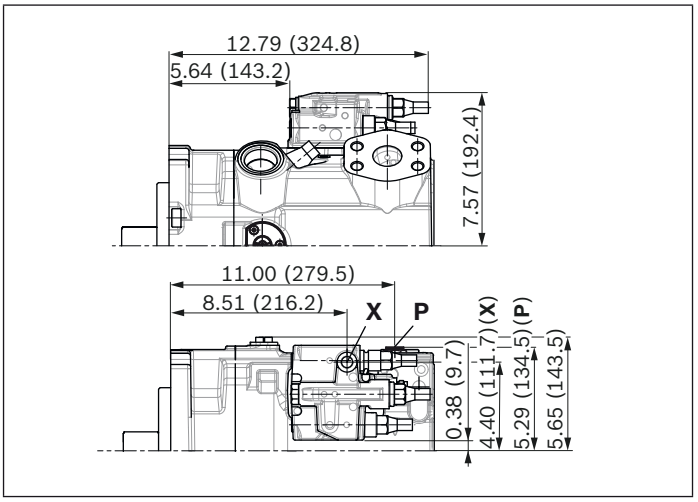
Notice

All controllers described with shuttle valve in **P**
(some contrary to standard as per type code digit 08)

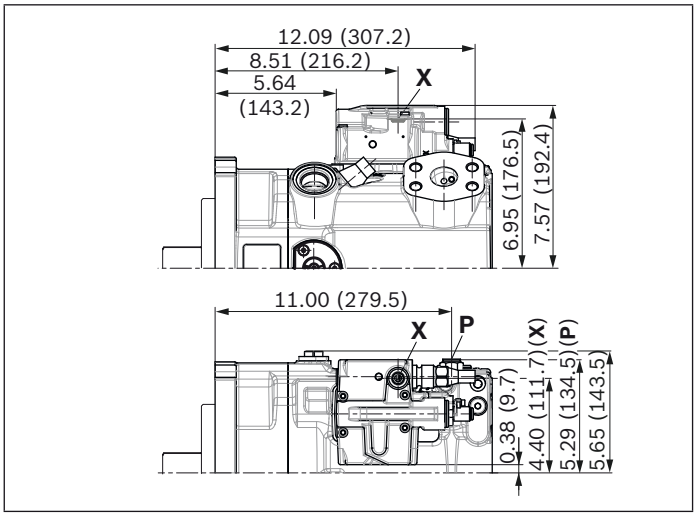
▼ **DR – Pressure controller, fixed setting**



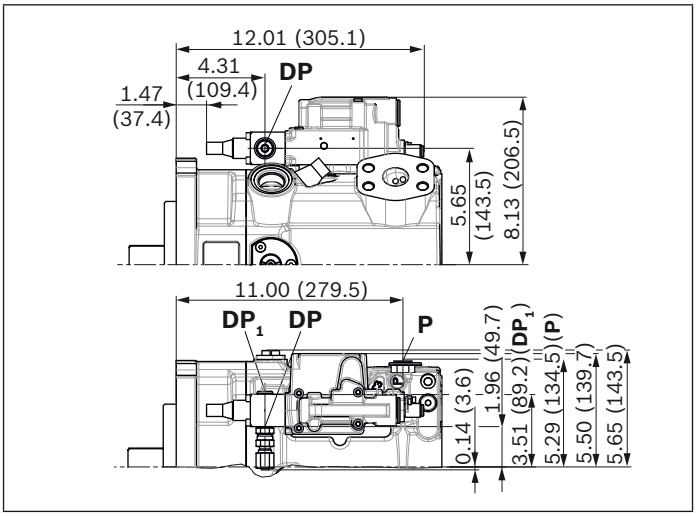
▼ **LRDRS0 – Power controller with pressure controller and load-sensing, fixed setting**



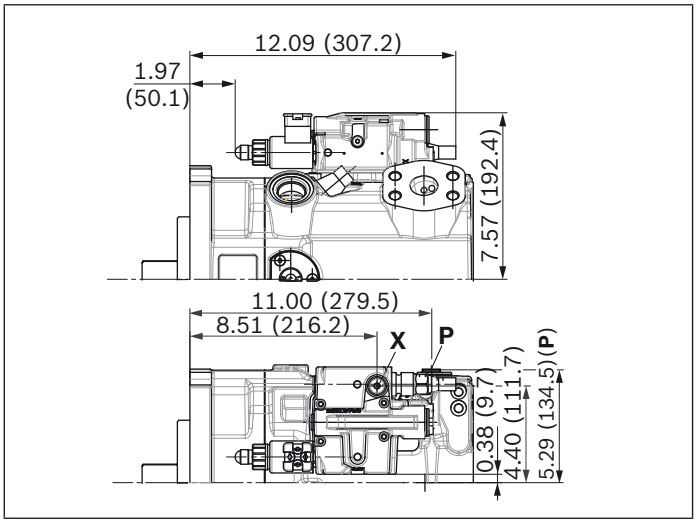
▼ **DG – Pressure controller, hydraulic, remote controlled**



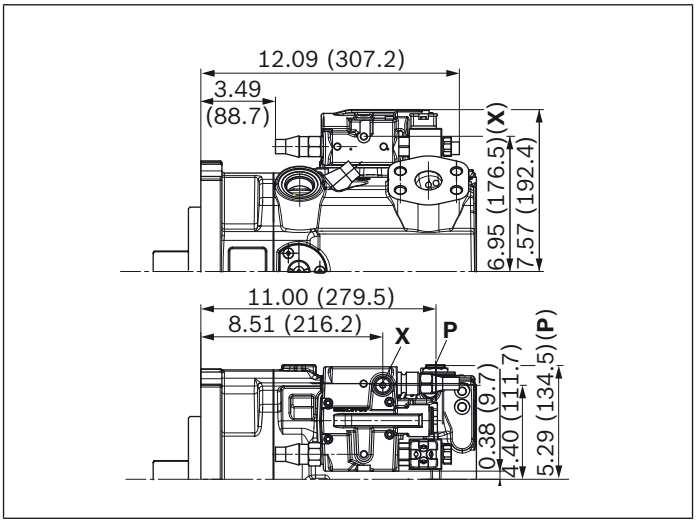
▼ **DP – Pressure controller, for parallel operation**



▼ **DGT6/DGT8 – With integrated pilot control valve, electric-proportional override**



▼ **DGV2 – Electric directional valve and pressure relief valve mounted (only in combination with DG)**



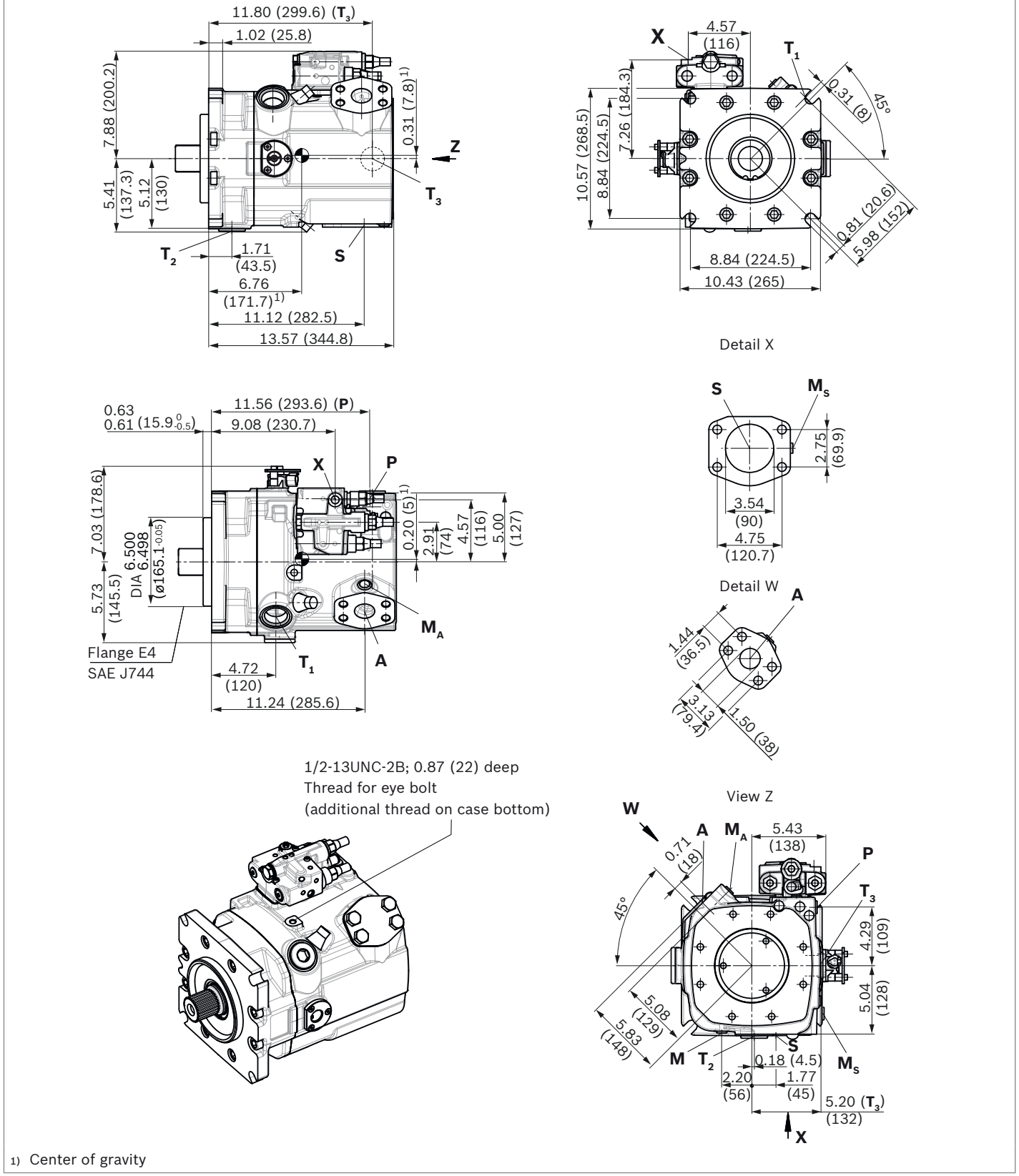
Notice

All controllers described with shuttle valve in **P**
(some contrary to standard as per type code digit 08)

Dimensions, size 210

LRDRS0 – Power controller with pressure controller, load-sensing and with electric swivel angle sensor

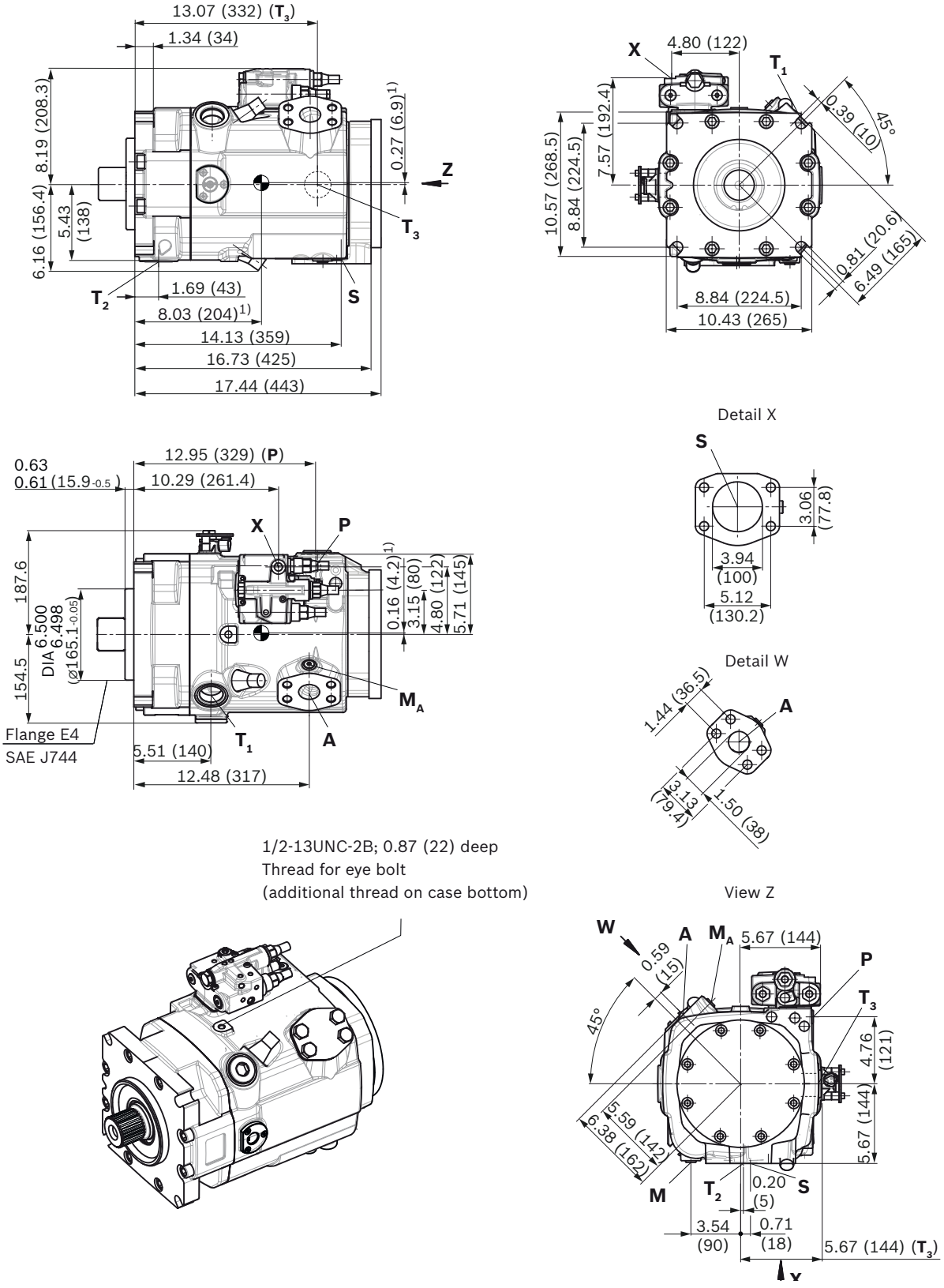
Without charge pump, clockwise rotation



1) Center of gravity

LRDRS0 – Power controller with pressure controller, load-sensing and with electric swivel angle sensor

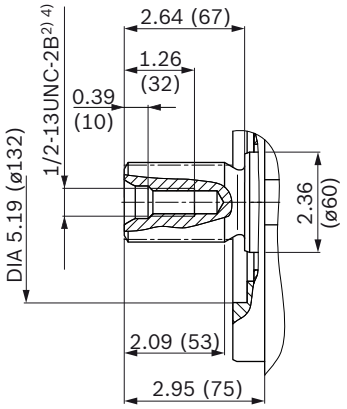
With charge pump, clockwise rotation



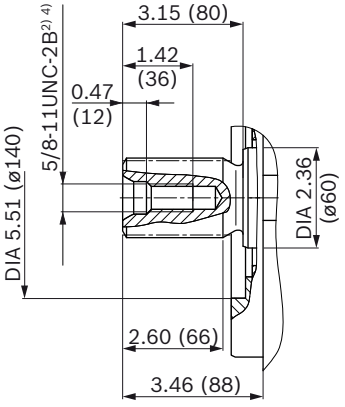
1) Center of gravity

▼ **Splined shaft SAE J744**

T1 – 3/4 in 13T 8/16DP[1)]

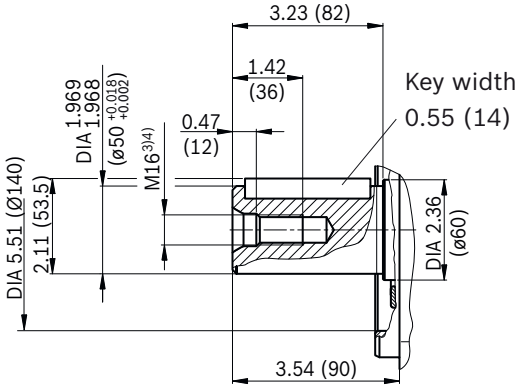


T2 – 2 in 15T 8/16DP[1)]



▼ **Parallel keyed shaft DIN 6885**

B2 – Ø50 A 14x9x80

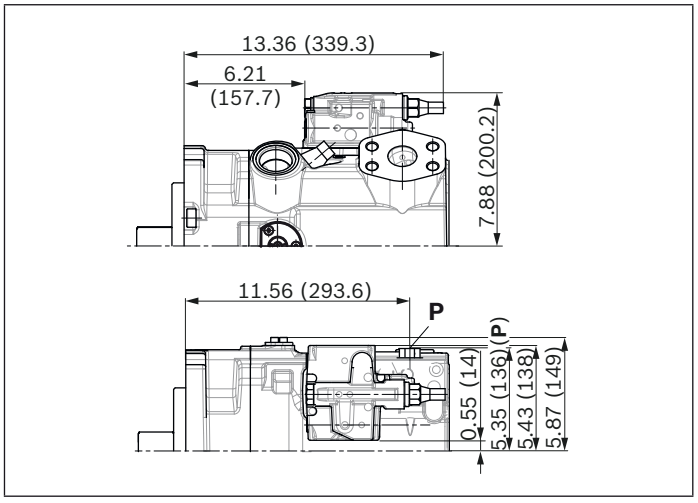


1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5.
2) Center bore according to ASME B1.1 (thread according to ASME B1.1)
3) Center bore according to DIN 332 (thread according to DIN 13)
4) Observe the instructions in the instruction manual concerning the maximum tightening torques.

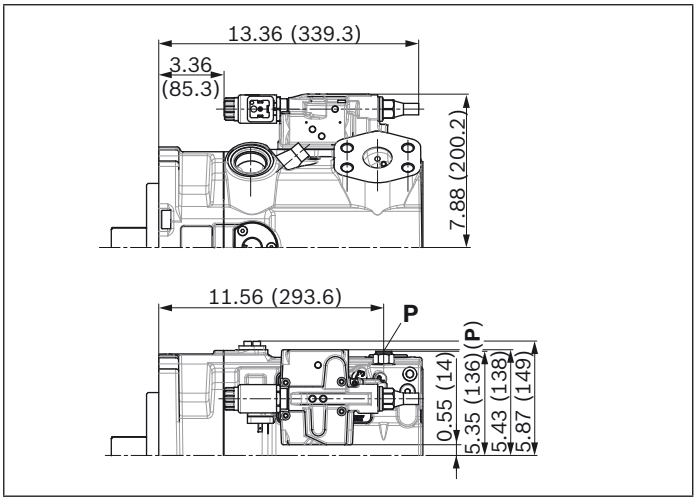
Ports		Standard	Size[4)]	p_{max} [psi (bar)][5)]	State[8)]
A	Working port fastening thread	SAE J518 ASME B1.1	1 1/2 in 5/8-11UNC-2B; 1.18 (30) deep	6100 (420)	O
S	Suction port (without charge pump) fastening thread	SAE J518 ASME B1.1	3 1/2 in 5/8-11UNC-2B; 1.18 (30) deep	435 (30)	O
S	Suction port (with charge pump) fastening threads	SAE J518 ASME B1.1	3 1/2 in 5/8-11UNC-2B; 1.18 (30) deep	30 (2)	O
T_1	Drain port	ISO 11926[6)]	1 5/8-12UNF-2B; 0.79 (20) deep	75 (5)	O[7)]
T_2	Drain port	ISO 11926[6)]	1 5/8-12UNF-2B; 0.79 (20) deep	75 (5)	X[7)]
T_3	Drain port	ISO 11926[6)]	1 5/8-12UNF-2B; 0.79 (20) deep	75 (5)	X[7)]
CR	Pilot signal (CR only)	ISO 11926	9/16-18UNF-2B; 0.51 (13) deep	6100 (420)	O
PR	Pilot signal (PR only)	ISO 11926	9/16-18UNF-2B; 0.51 (13) deep	6100 (420)	O
H3 to **H6**	Pilot signal (only on H3, H4, H5 and H6)	ISO 11926	9/16-18UNF-2B; 0.51 (13) deep	1450 (100)	O
X	Pilot signal	ISO 11926[6)]	9/16-18UNF-2B; 0.51 (13) deep	6100 (420)	O
DP	Pilot pressure (only on DP)	ISO 11926[6)]	9/16-18UNF-2B; 0.51 (13) deep	6100 (420)	O
DP_1	Measuring port pilot signal (DP)	ISO 11926[6)]	9/16-18UNF-2B; 0.51 (13) deep	6100 (420)	X
M	Measuring control pressure	ISO 11926[6)]	9/16-18UNF-2B; 0.51 (13) deep	6100 (420)	X
M_A	Measuring pressure **A**	ISO 11926[6)]	9/16-18UNF-2B; 0.51 (13) deep	6100 (420)	X
M_S	Measuring suction pressure (only A15VSO)	ISO 11926[6)]	9/16-18UNF-2B; 0.51 (13) deep	435 (30)	X
P	External control pressure (type code position 8 version B or C = with external control pressure supply)	ISO 11926[6)]	9/16-18UNF-2B; 0.51 (13) deep	725 (50)	O
	Port **P** is without function (Type code position 8 version A = without external control pressure supply)	ISO 11926[6)]	3/4-16UNF-2B; 0.50 (12.6) deep	6100 (420)	X

5) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
6) The countersink can be deeper than as specified in the standard.
7) Depending on installation position, **T_1**, **T_2** or **T_3** must be connected (see also Installation instructions on pages 64 and 65).
8) O = Must be connected (plugged when delivered)
X = Plugged (in normal operation)

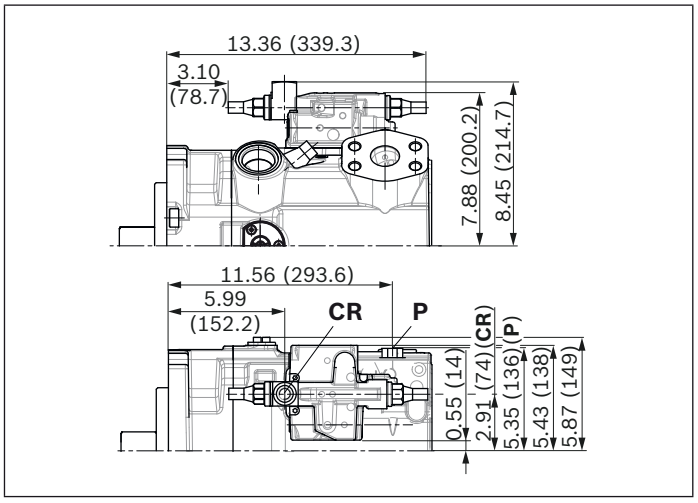
▼ **LR – Power controller, fixed setting**



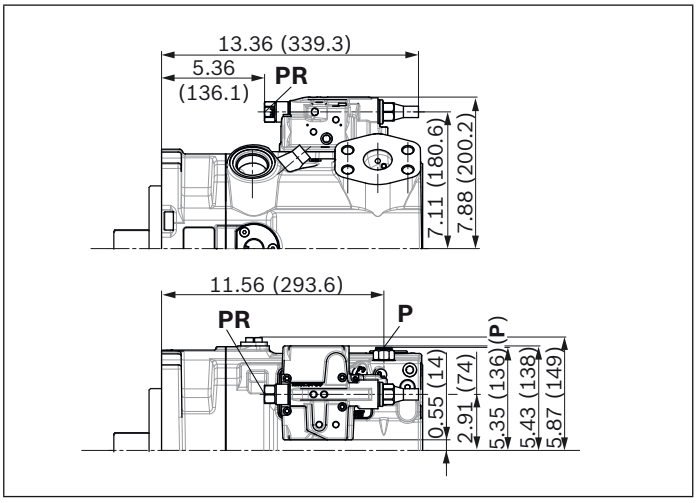
▼ **L4 – Power controller, electric-proportional override**



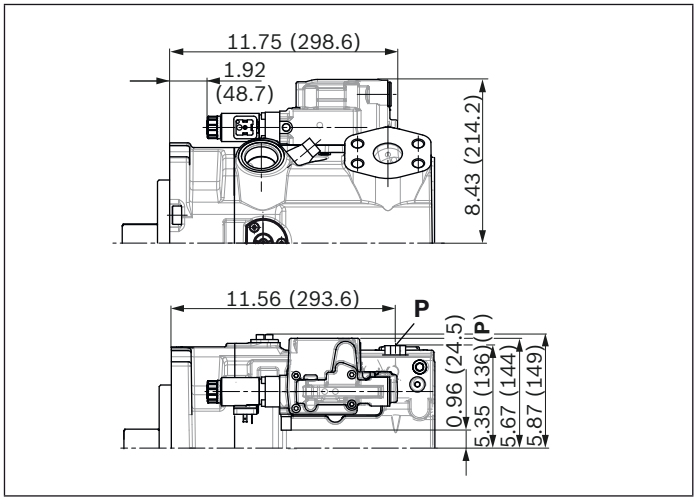
▼ **CR – Power controller, hydraulic-proportional override, high pressure, with stop**



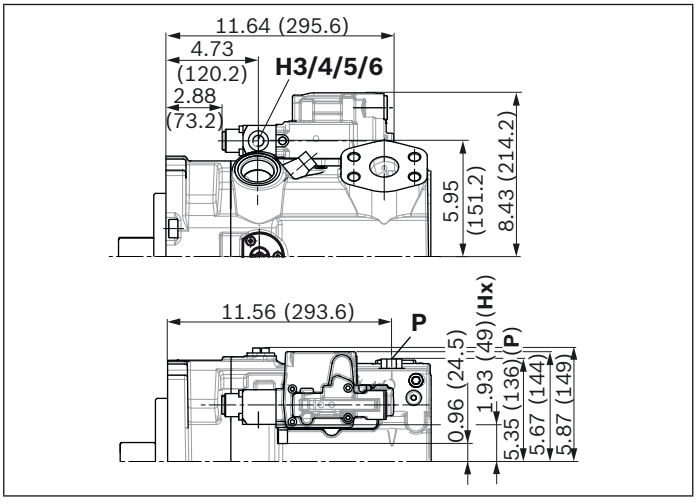
▼ **PR – Power controller, hydraulic-proportional override, high pressure, without stop**



▼ **E2/E6 – Stroke control electric-proportional**



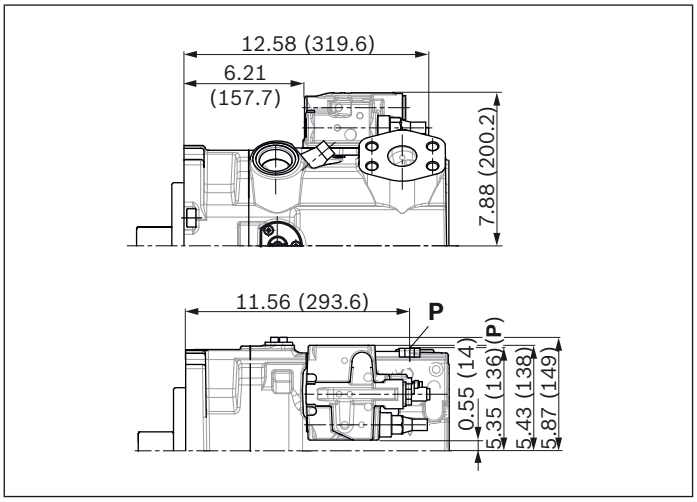
▼ **H3/4/5/6 – Stroke control, hydraulic prop., pilot pressure**



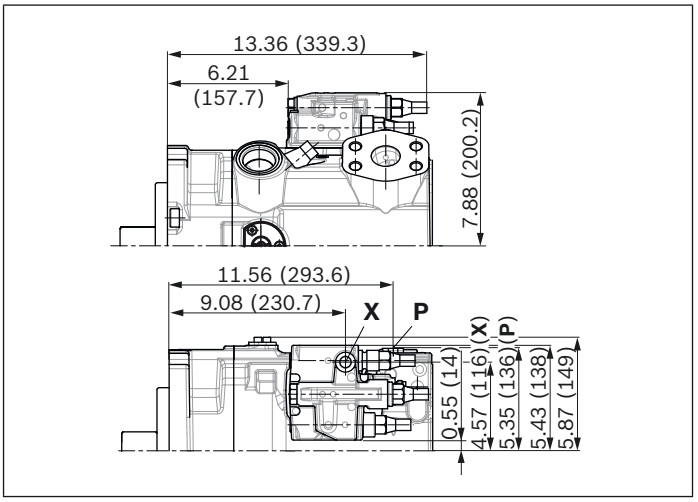
Notice

All controllers described with shuttle valve in **P**
(some contrary to standard as per type code digit 08)

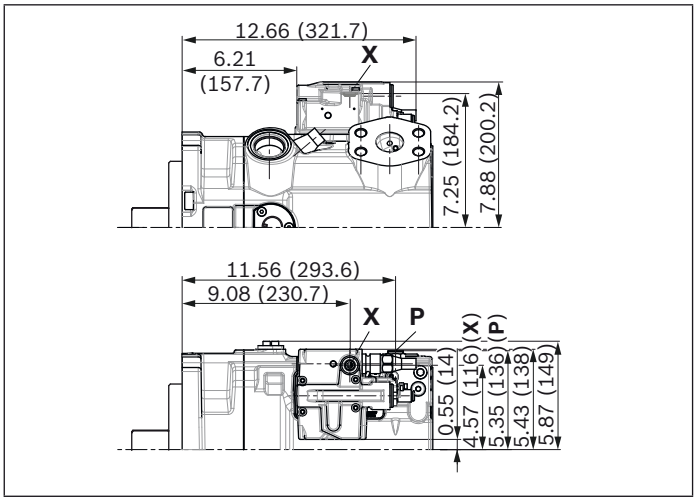
▼ **DR – Pressure controller, fixed setting**



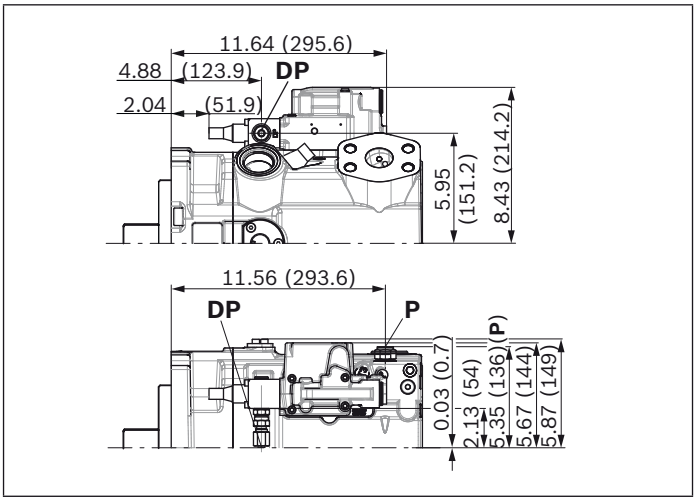
▼ **LRDRS0 – Power controller with pressure controller and load-sensing, fixed setting**



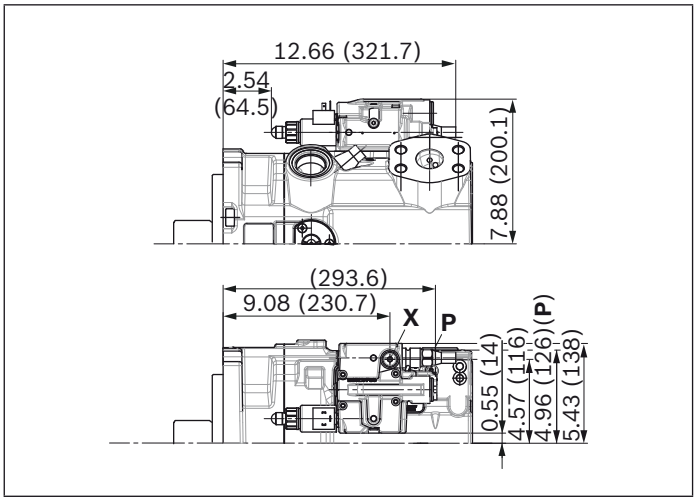
▼ **DG – Pressure controller, hydraulic, remote controlled**



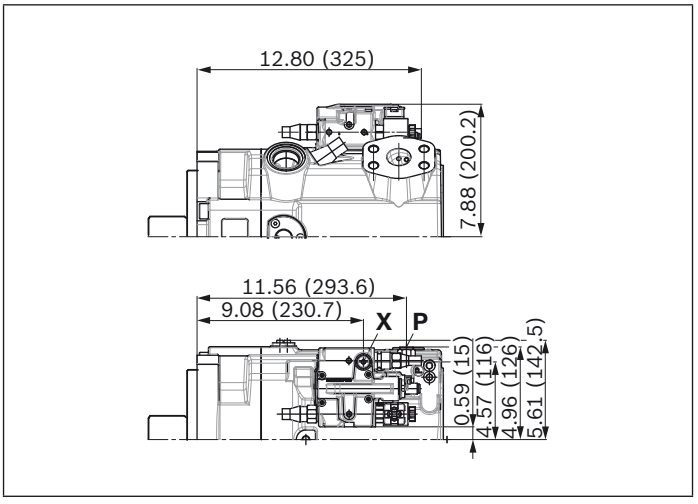
▼ **DP – Pressure controller, for parallel operation**



▼ **DGT6/DGT8 – With integrated pilot control valve, electric-proportional override**



▼ **DGV2 – Electric directional valve and pressure relief valve mounted (only in combination with DG)**

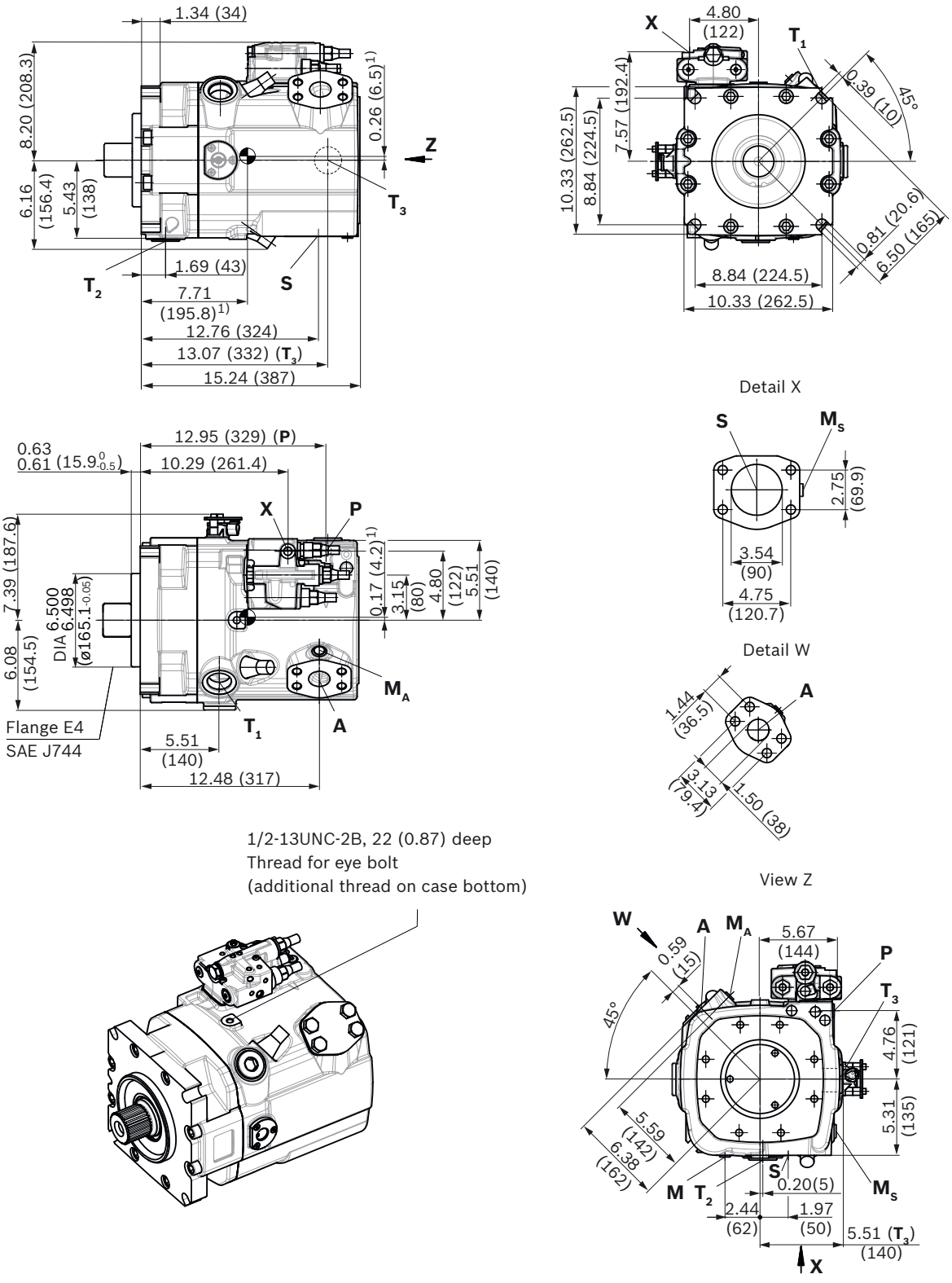


Notice
All controllers described with shuttle valve in **P**
(some contrary to standard as per type code digit 08)

Dimensions, size 280

LRDRS0 – Power controller with pressure controller, load-sensing and with electric swivel angle sensor

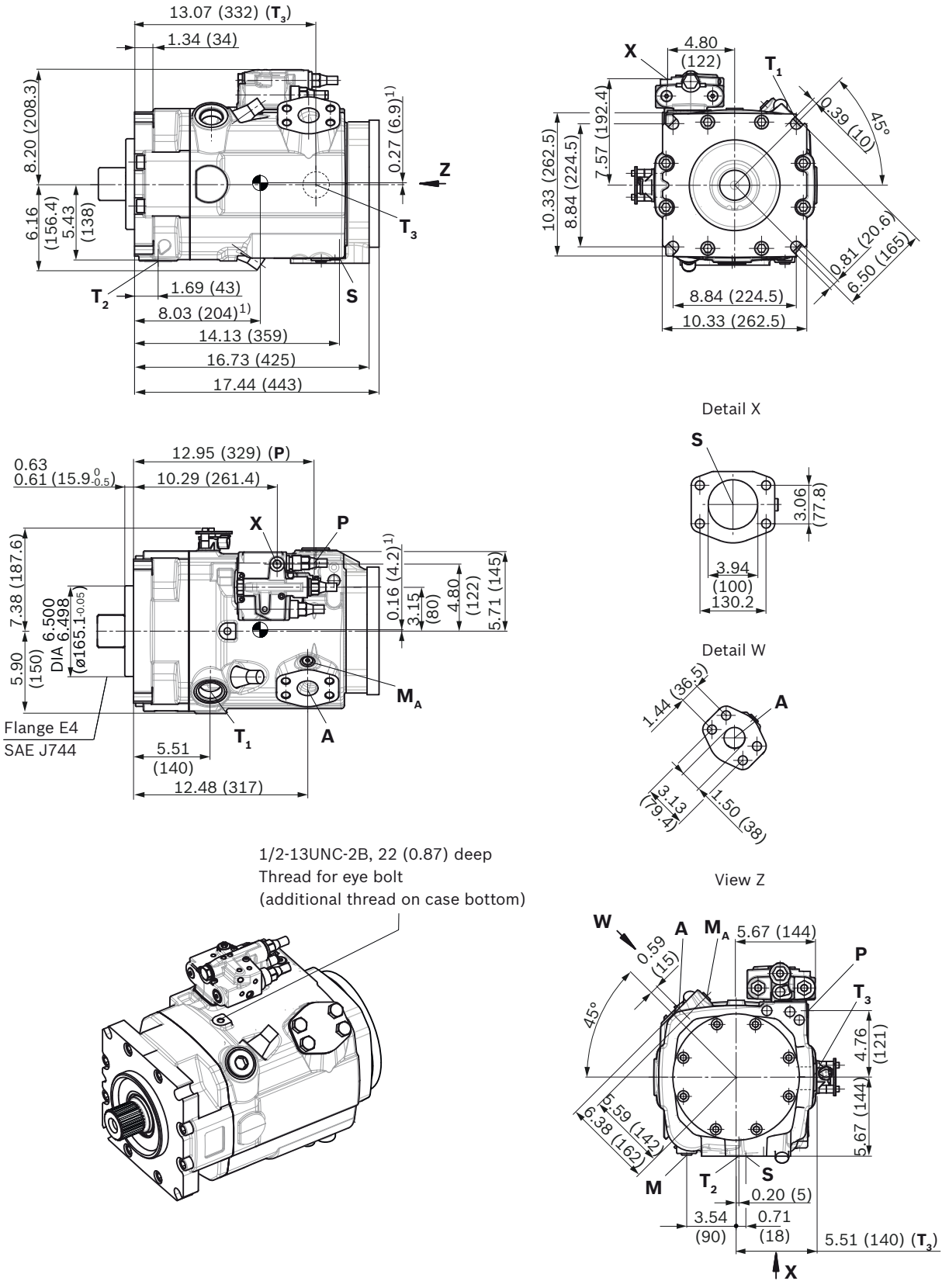
Without charge pump, clockwise rotation



1) Center of gravity

LRDRS0 – Power controller with pressure controller, load-sensing and with electric swivel angle sensor

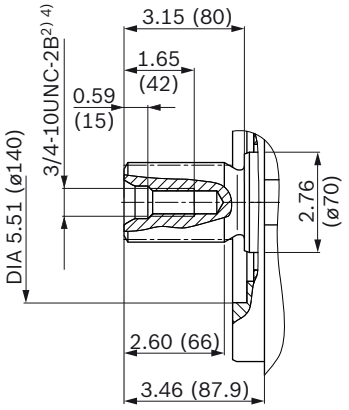
With charge pump, clockwise rotation



1) Center of gravity

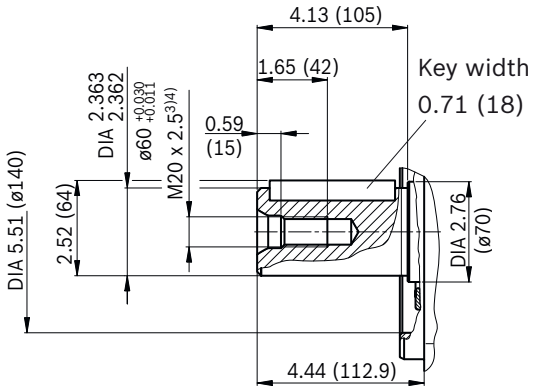
▼ **Splined shaft SAE J744**

T3 – 2 1/4 in 17T 8/16DP[1)]



▼ **Parallel keyed shaft DIN 6885**

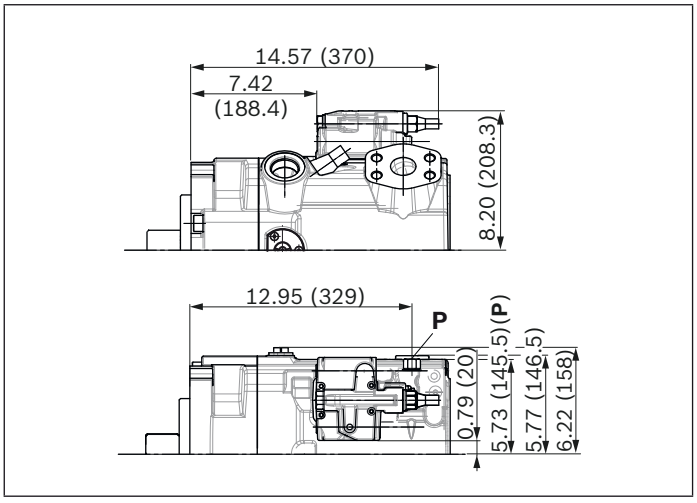
B4 – Ø60 A 18x11x100



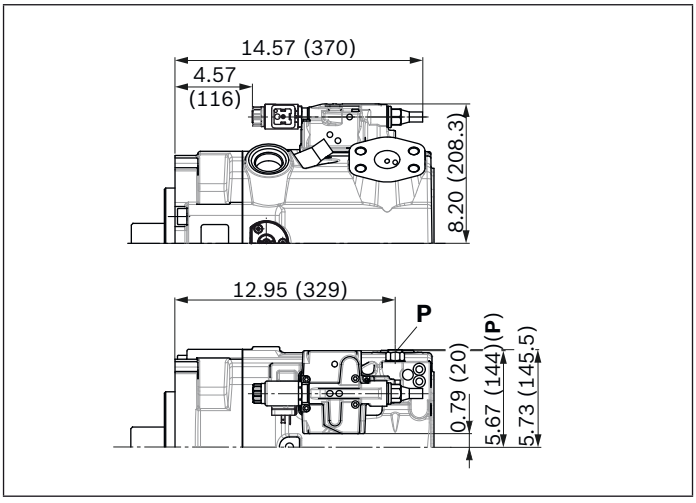
Ports		**Standard**	**Size**[4)]	p_{max} **[psi (bar)]**[5)]	**State**[8)]
A	Working port fastening thread	SAE J518 ASME B1.1	1 1/2 in 5/8-11UNC-2B; 35[9)] (1.38) deep	6100 (420)	O
S	Suction port (without charge pump) fastening thread	SAE J518 ASME B1.1	3 1/2 in 5/8-11UNC-2B; 35[9)] (1.38) deep	435 (30)	O
S	Suction port (with charge pump) fastening threads	SAE J518 ASME B1.1	4 in 5/8-11UNC-2B; 35[9)] (1.38) deep	30 (2)	O
$\mathbf{T_1}$	Drain port	ISO 11926[6)]	1 5/8UN-2B; 20 (0.79) deep	75 (5)	O[7)]
$\mathbf{T_2}$	Drain port	ISO 11926[6)]	1 5/8UN-2B; 20 (0.79) deep	75 (5)	X[7)]
$\mathbf{T_3}$	Drain port	ISO 11926[6)]	1 5/8UN-2B; 20 (0.79) deep	75 (5)	X[7)]
CR	Pilot signal (CR only)	ISO 11926	9/16-18UNF-2B; 13 (0.51) deep	6100 (420)	O
PR	Pilot signal (PR only)	ISO 11926	9/16-18UNF-2B; 13 (0.51) deep	6100 (420)	O
H3 to **H6**	Pilot signal (only on H3, H4, H5 and H6)	ISO 11926	9/16-18UNF-2B; 13 (0.51) deep	1450 (100)	O
X	Pilot signal	ISO 11926[6)]	9/16-18UNF-2B; 13 (0.51) deep	6100 (420)	O
DP	Pilot pressure (only on DP)	ISO 11926[6)]	9/16-18UNF-2B; 0.51 (13) deep	6100 (420)	O
$\mathbf{DP_1}$	Measuring port pilot signal (DP)	ISO 11926[6)]	9/16-18UNF-2B; 0.51 (13) deep	6100 (420)	X
M	Measuring control pressure	ISO 11926[6)]	9/16-18UNF-2B; 13 (0.51) deep	6100 (420)	X
$\mathbf{M_A}$	Measuring pressure **A**	ISO 11926[6)]	9/16-18UNF-2B; 13 (0.51) deep	6100 (420)	X
$\mathbf{M_S}$	Measuring suction pressure (only A15VSO)	ISO 11926[6)]	9/16-18UNF-2B; 0.51 (13) deep	435 (30)	X
P	External control pressure (type code position 8 version B or C = with external control pressure supply)	ISO 11926[6)]	9/16-18UNF-2B; 13 (0.51) deep	725 (50)	O
	Port **P** is without function (Type code position 8 version A = without external control pressure supply)	ISO 11926[6)]	3/4-16UNF-2B; 12.6 (0.50) deep	6100 (420)	X

1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5.
2) Center bore according to ASME B1.1 (thread according to ASME B1.1)
3) Center bore according to DIN 332 (thread according to DIN 13)
4) Observe the instructions in the instruction manual concerning the maximum tightening torques.
5) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
6) The countersink can be deeper than as specified in the standard.
7) Depending on installation position, $\mathbf{T_1}$, $\mathbf{T_2}$ or $\mathbf{T_3}$ must be connected (see also Installation instructions on pages 64 and 65).
8) O = Must be connected (plugged when delivered)
X = Plugged (in normal operation)

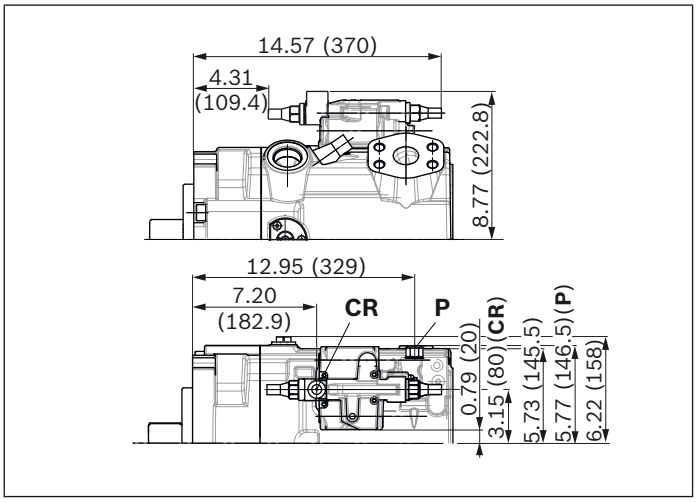
▼ **LR – Power controller, fixed setting**



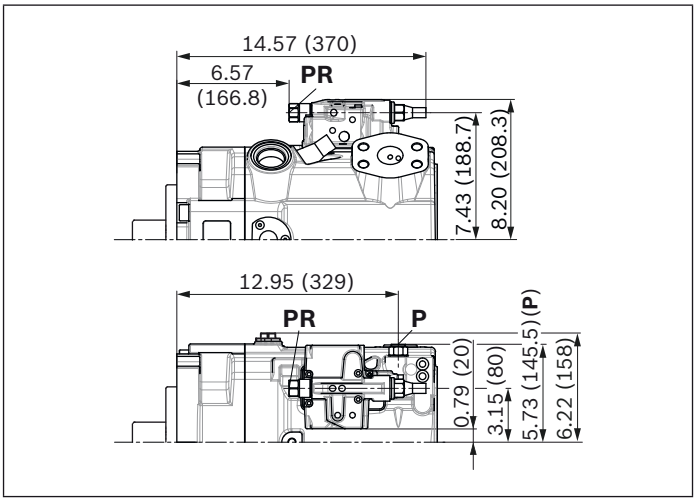
▼ **L4 – Power controller, electric-proportional override**



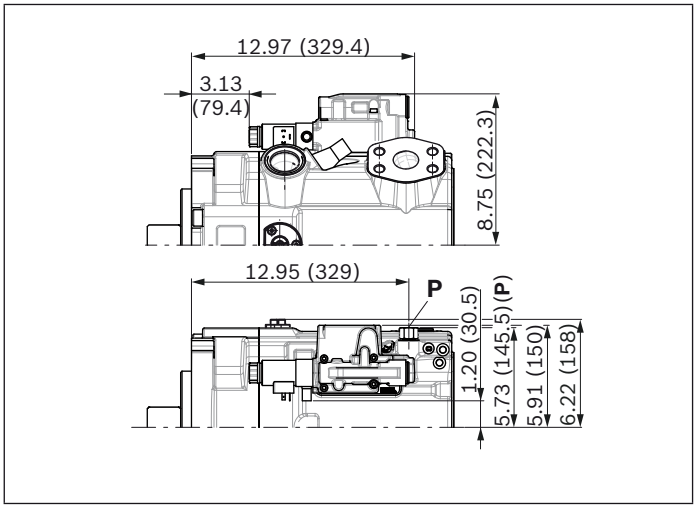
▼ **CR – Power controller, hydraulic-proportional override, high pressure, with stop**



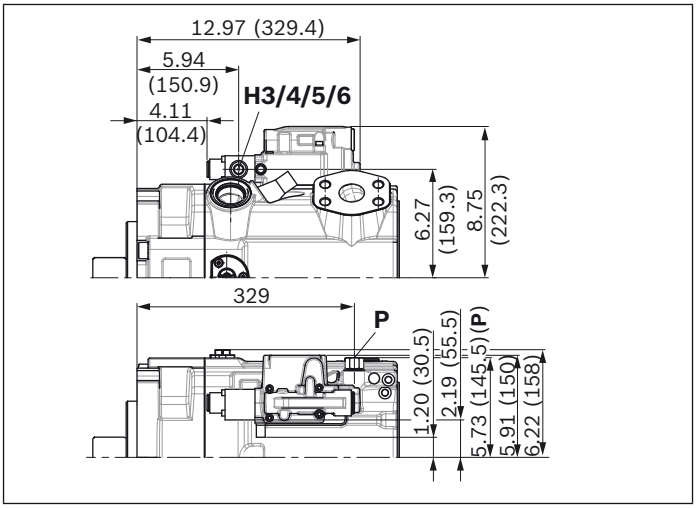
▼ **PR – Power controller, hydraulic-proportional override, high pressure, without stop**



▼ **E2/E6 – Stroke control electric-proportional**

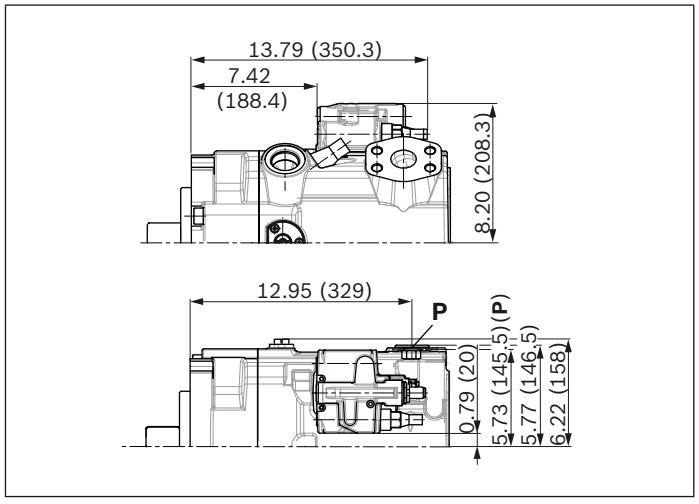


▼ **H3/4/5/6 – Stroke control, hydraulic prop., pilot pressure**

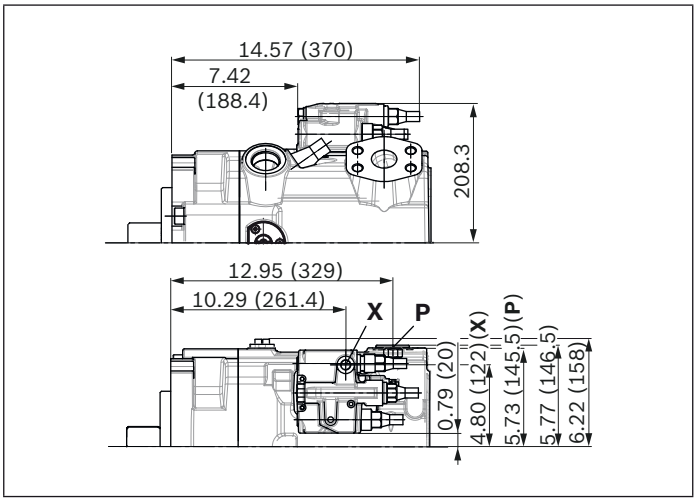


Notice
All controllers described with shuttle valve in **P**
(some contrary to standard as per type code digit 08)

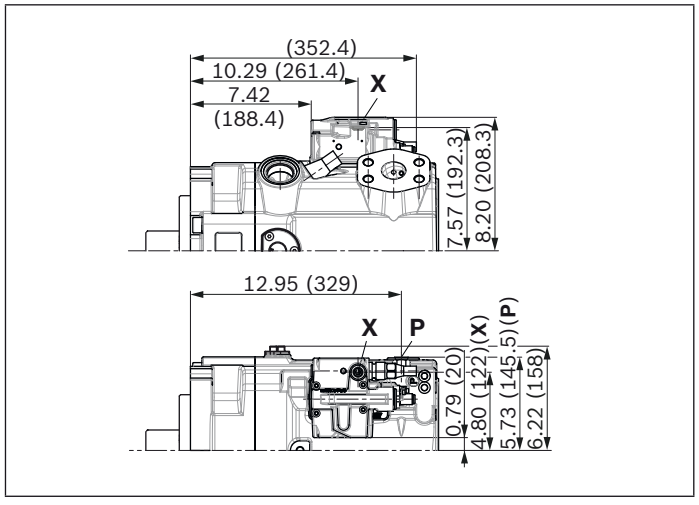
▼ **DR – Pressure controller, fixed setting**



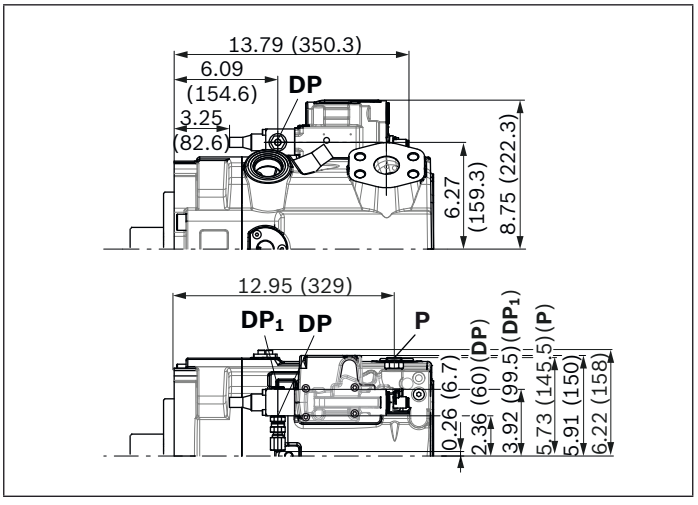
▼ **LRDRS0 – Power controller with pressure controller and load-sensing, fixed setting**



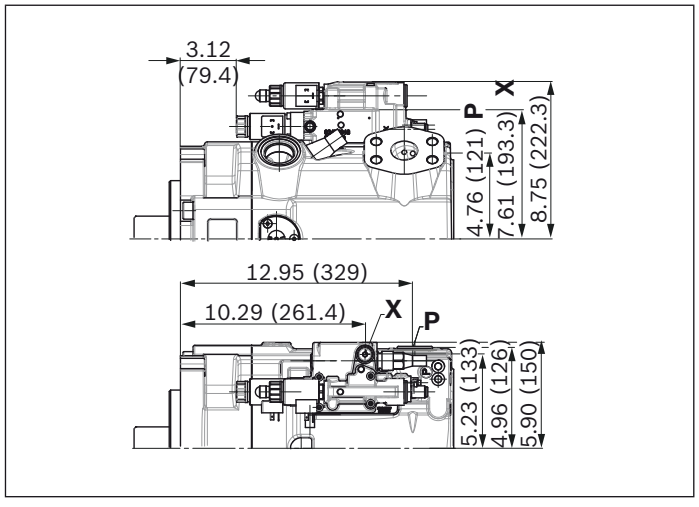
▼ **DG – Pressure controller, hydraulic, remote controlled**



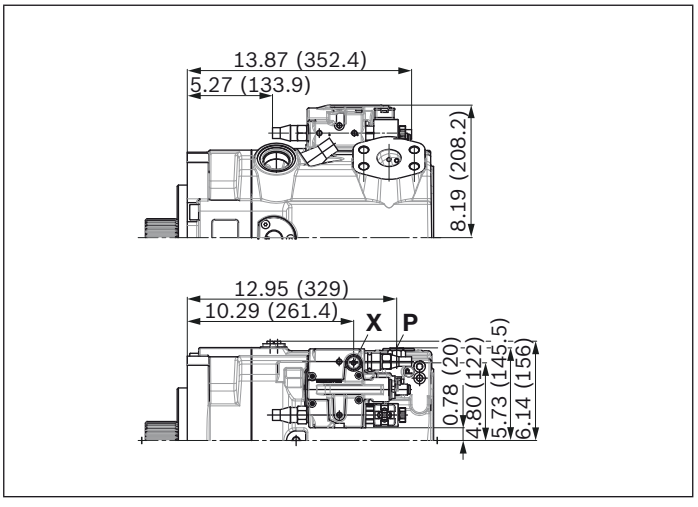
▼ **DP – Pressure controller, for parallel operation**



▼ **DGT6/DGT8 – With integrated pilot control valve, electric-proportional override**



▼ **DGV2 – Electric directional valve and pressure relief valve mounted (only in combination with DG)**



Notice

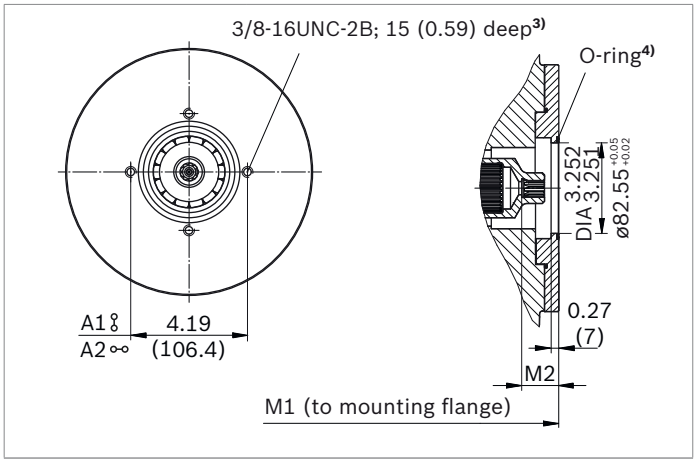
All controllers described with shuttle valve in **P**
(some contrary to standard as per type code digit 08)

Dimensions, through drive

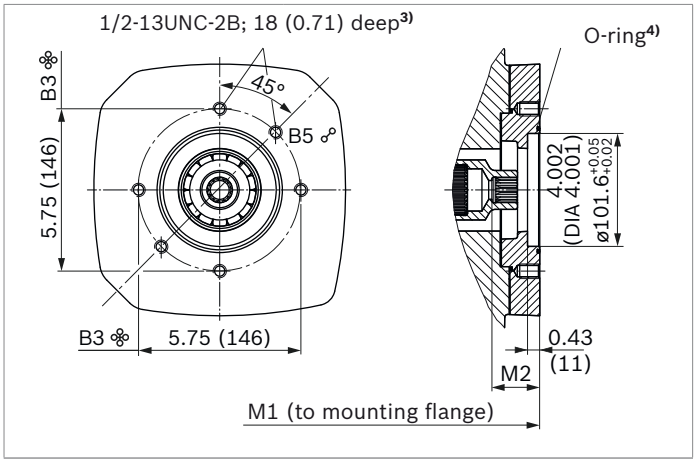
Flange SAE J744			Hub for splined shaft[2]			Availability over sizes					Code
Diameter	Attachment[1]	Designation	Diameter		Designation	110	145	175	210	280	
82-2 (A)	⁂	A3	5/8 in	9T 16/32DP	S2	●	●	●	●	●	A3S2
101-2 (B)	⁂	B3	7/8 in	13T 16/32DP	S4	●	●	●	●	●	B3S4
			1 in	15T 16/32DP	S5	●	●	●	●	●	B3S5
	⚯	B5	7/8 in	13T 16/32DP	S4	●	●	●	●	●	B5S4
			1 in	15T 16/32DP	S5	●	●	●	●	●	B5S5

● = Available ○ = On request

▼ **82-2 (A)**



▼ **101-2 (B)**



A3S2	NG	M1	M2
without charge pump	110	11.85 (301)	1.39 (34)
	145	12.83 (326)	1.57 (40)
	175	13.41 (340.5)	1.33 (33.8)
	210	14.09 (357.8)	1.33 (33.8)
	280	15.75 (400)	1.33 (33.8)
with charge pump	145	14.75 (374.7)	1.57 (40)
	175	15.33 (389.5)	1.33 (33.8)
	210	16.02 (406.8)	1.33 (33.8)
	280	17.24 (438)	1.33 (33.8)

B3S4, B5S4	NG	M1	M2
without charge pump	110	12.28 (312)	1.69 (43)
	145	13.27 (337)	1.69 (43)
	175	13.97 (355)	1.69 (43)
	210	14.65 (372.3)	1.69 (43)
	280	16.31 (414.5)	1.69 (43)
with charge pump	145	15.19 (385.7)	1.69 (43)
	175	15.90 (404)	1.69 (43)
	210	16.58 (421.3)	1.69 (43)
	280	17.81 (452.5)	1.69 (43)

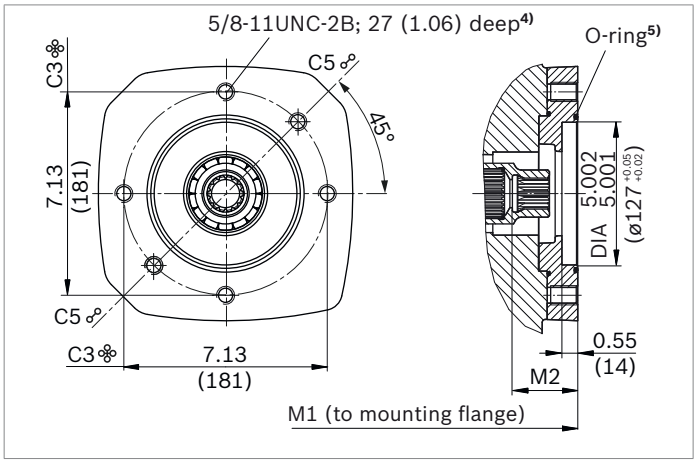
B3S5, B5S5	NG	M1	M2
without charge pump	110	12.28 (312)	1.89 (48)
	145	13.27 (337)	1.89 (48)
	175	13.97 (355)	1.89 (48)
	210	14.65 (372.3)	1.89 (48)
	280	16.31 (414.5)	1.89 (48)
with charge pump	145	15.18 (385.7)	1.89 (48)
	175	15.90 (404)	1.89 (48)
	210	16.58 (421.3)	1.89 (48)
	280	17.81 (452.5)	1.89 (48)

1) Mounting holes pattern viewed on through drive with control at top
2) According to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
3) Thread according to ASME B1.1, observe the instructions in the instruction manual concerning the maximum tightening torques.
4) O-ring included in the scope of delivery

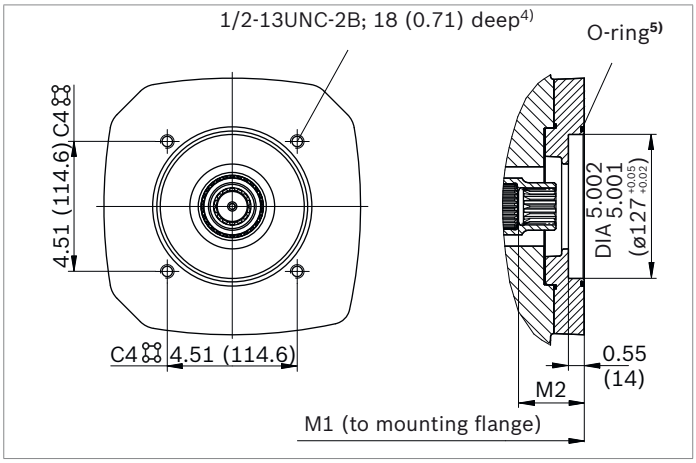
Flange SAE J744			Hub for splined shaft			Availability over sizes					Code
Diameter	Attachment[1]	Designation	Diameter		Designation	110	145	175	210	280	
127-2 (C)	❀	C3	1 1/4 in	14T 12/24DP[2]	S7	●	●	●	●	●	C3S7
			1 1/2 in	17T 12/24DP[2]	S9	●	●	●	●	●	C3S9
	☍	C5	1 1/4 in	14 12/24DP	S7	○	○	●	●	●	C5S7
127-4 (C)	⁘	C4	1 1/4 in	14T 12/24DP	S7	●	●	●	●	○	C4S7

● = Available ○ = On request

▼ **127-2 (C)**



▼ **127-4 (C)**



C3S7	NG	M1	M2
without charge pump	110	12.72 (323)	2.28 (58)
	145	13.70 (348)	2.28 (58)
	175	13.96 (354.5)	2.29 (58.1)
	210	14.64 (371.8)	2.29 (58.1)
	280	16.30 (414)	2.29 (58.1)
with charge pump	145	15.62 (396.7)	2.28 (58)
	175	15.89 (403.5)	2.29 (58.1)
	210	16.57 (420.8)	2.29 (58.1)
	280	17.80 (452)	2.29 (58.1)
C3S9	**NG**	**M1**	**M2**
without charge pump	175	14.15 (359.5)	2.52 (64)
	210	14.83 (376.8)	2.52 (64)
	280	16.30 (414)	2.51 (63.8)
with charge pump	175	16.08 (408.5)	2.52 (64)
	210	16.76 (425.8)	2.52 (64)
	280	17.80 (452)	2.51 (63.8)

C5S7	NG	M1	M2
without charge pump	175	13.96 (354.5)	2.28 (58)
	210	14.64 (371.8)	2.28 (58)
	280	16.30 (414)	2.28 (58)
with charge pump	175	15.89 (403.5)	2.28 (58)
	210	16.57 (420.8)	2.28 (58)
	280	17.80 (452)	2.28 (58)

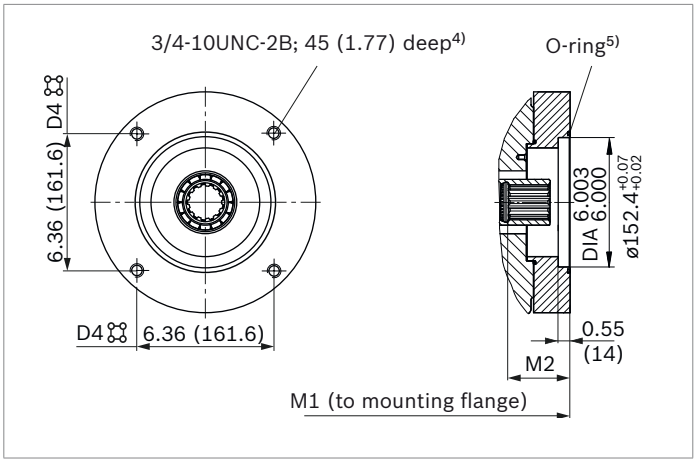
C4S7	NG	M1	M2
without charge pump	110	12.72 (323)	2.28 (58)
	145	13.70 (348)	2.28 (58))
	175	13.96 (354.5)	2.28 (58)
	210	14.64 (371.8)	2.28 (58)
with charge pump	145	15.62 (396.7)	2.28 (58)
	175	15.89 (403.5)	2.28 (58)
	210	16.57 (420.8)	2.28 (58)

1) Mounting holes pattern viewed on through drive with control at top.
2) Hub for splined shaft according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
3) Hub for splined shaft according to DIN 5480
4) Thread according to ASME B1.1, observe the instructions in the instruction manual concerning the maximum tightening torques.
5) O-ring included in the scope of delivery

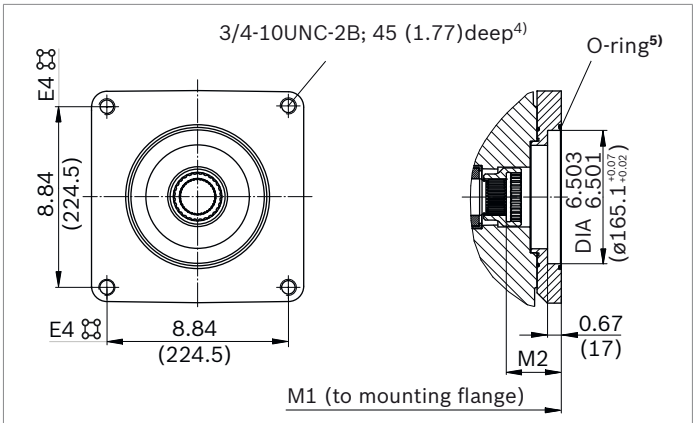
Flange SAE J744			Hub for splined shaft			Availability over sizes					Code
Diameter	Attachment[1]	Designation	Diameter		Designation	110	145	175	210	280	
152-4 (D)	⌘	D4	1 3/4 in	13T 8/16DP	T1	●	●	●	●	●	D4T1
			2 in	15T 8/16DP	T2	–	○	○	○	○	D4T2
165-4 (E)	⌘	E4	2 in	15T 8/16DP	T2	–	–	●	●	●	E4T2
			2 1/4 in	17T 8/16DP	T3	–	–	–	–	●	E4T3

● = Available ○ = On request

▼ **152-4 (D)**



▼ **165-4 (E)**



D4T1	NG	M1	M2
without charge pump	110	13.23 (336)	3.03 (77)
	145	14.21 (361)	3.02 (76.8)
	175	14.67 (372.5)	3.02 (76.8)
	210	15.35 (389.8)	3.02 (76.8)
	280	17.01 (432)	3.03 (77)
with charge pump	145	16.13 (409.7)	3.02 (76.8)
	175	16.59 (421.5)	3.02 (76.8)
	210	17.28 (438.8)	3.02 (76.8)
	280	18.50 (470)	3.03 (77)

E4T2	NG	M1	M2
without charge pump	175	15.18 (385.5)	3.54 (90)
	210	15.86 (402.8)	3.54 (90)
	280	17.52 (445)	3.54 (90)
with charge pump	175	17.11 (434.5)	3.54 (90)
	210	17.79 (451.8)	3.54 (90)
	280	19.02 (483)	3.54 (90)
E4T3	**NG**	**M1**	**M2**
without charge pump	280	17.52 (445)	3.54 (90)
with charge pump	280	19.02 (483)	3.54 (90)

1) Mounting holes pattern viewed on through drive with control at top.
2) Hub for splined shaft according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
3) Hub for splined shaft according to DIN 5480
4) Thread according to ASME B1.1, observe the instructions in the instruction manual concerning the maximum tightening torques.
5) O-ring included in the scope of delivery

Overview of mounting options

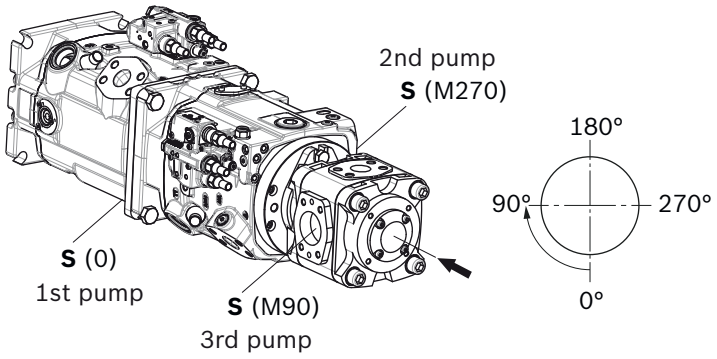
Through drive[1]			**Mounting options – 2nd pump**				
Flange SAE J744	**Hub for splined shaft**	**Code**	**A15VSO/10 A15VLO/10 Size (shaft)**	**A10VSO/31 NG (shaft)**	**A10VSO/32 NG (shaft)**	**A10VO/52 and 53 NG (shaft)**	**External gear pump**
82-2 (A)	5/8 in	A3S2	–	–	–	10, 18 (U)	Series F NG4 to 22[2]
101-2 (B)	7/8 in	B3S4	–	–	–	28 (R, S); 45 (U, W)	Series N NG20 to 36[2]
	1 in	B3S5	–	–	–	45 (R, S); 60, 63 (U, W)	PGH4
	7/8 in	B5S4	–	28 (S, R)		28 (R, S); 45 (U, W)	
	1 in	B5S5	–	45 (S, R)		45 (R, S); 60, 63 (U, W)	
127-2 (C)	1 1/4 in	C3S7	–	–	–	85, 100 (U, W)	–
	1 1/2 in	C3S9	–	–	–	85, 100 (S)	PGH5
	1 1/4 in	C5S7	–	71 (R) (S) 88 (R) (S) 100 (U, W)	–	85, 100 (U, W)	
	1 1/4 in	C4S7	–	71 (R) (S) 88 (R) (S)	–	60, 63 (S, R) 72 (S, R) 85 (U, W)	
152-4 (D)	1 3/4 in	D4T1	110 (T1)	140 (S)	140, 180 (S)	–	–
	2 in	D4T2	145 (T2)	–	–	–	–
165-4 (E)	2 in	E4T2	175; 210 (T2)	–	–	–	–
	2 1/4 in	E4T3	280 (T3)	–	–	–	–

Mounting situation combination pumps in relation to each other

Mounting situation combination pumps in relation to each other. The **S** port of the first pump is the baseline locating point. The **S** ports of the second and third pumps are oriented in relation to the **S** port of the first pump.

Below you will find an example of a triple pump combination:

1st pump **S** port baseline location	**2nd pump** **S** port angel in relation to 1st pump	**3rd pump** **S** port angel in relation to 1st pump
Example: **without code**	**-M270**	**-M90**



Details of the mounting orientation are provided after the order codes for each of the units in the combination. Alignment clockwise viewed on through drive.

Order example

A15VSO 280....+A15VSO....145....-**M270**

A15VSO 280....+A15VSO....145....-**M270**+PGH....-**M90**

Notice

Each through drive is plugged with a **non-pressure-resistant** cover. If the A15 is to be operated without through drive unit, the unit has to be rebuilt to U000 and closed by means of a pressure-resistant cover before the commissioning (see also instruction manual).

1) Additional through drives are available on request

2) Bosch Rexroth recommends special versions of the external gear pumps. Please contact us.

Combination pumps A15V... + A15V...

Total length A

A15VSO (1st pump)	A15VSO (2nd pump)					A15VLO (2nd pump)			
	NG110	NG 145	NG175	NG210	NG280	NG145	NG175	NG210	NG280
	D4T1	D4T1	E4T2	E4T2	E4T3	D4T1	E4T2	E4T2	E4T3
NG110	24.45 (621)	–	–	–	–	–	–	–	–
NG145	25.43 (646)	26.42 (671)	–	–	–	28.98 (736.2)	–	–	–
NG175	25.88 (657.5)	26.87 (682.5)	28.07 (713)	–	–	29.44 (747.7)	30.71 (780)	–	–
NG210	26.57 (674.8)	27.55 (699.8)	28.75 (730.3)	29.43 (747.6)	–	30.12 (765)	31.39 (797.3)	32.07 (814.6)	–
NG280	28.23 (717)	29.21 (742)	30.41 (772.5)	31.09 (789.8)	32.76 (832)	31.78 (807.2)	33.05 (839.5)	33.73 (856.8)	34.90 (886.5)

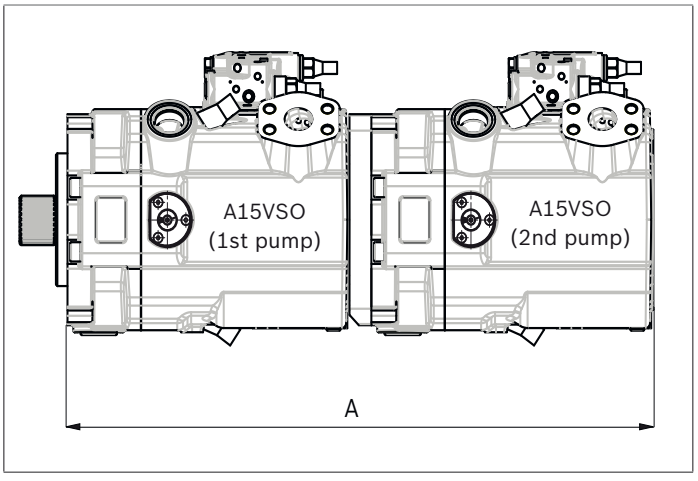
A15VLO (1st pump)	A15VSO (2nd pump)					A15VLO (2nd pump)			
	NG110	NG 145	NG175	NG210	NG280	NG145	NG175	NG210	NG280
	D4T1	D4T1	E4T2	E4T2	E4T3	D4T1	E4T2	E4T2	E4T3
NG145	27.35 (694.7)	28.33 (719.7)	–	–	–	30.90 (784.9)	–	–	–
NG175	27.81 (706.5)	28.80 (731.5)	30.00 (762)	–	–	31.37 (796.7)	32.64 (829)	–	–
NG210	28.50 (723.8)	29.48 (748.8)	30.68 (779.3)	31.36 (796.6)	–	32.05 (814)	33.32 (846.3)	34.00 (863.6)	–
NG280	29.72 (755)	30.71 (780)	31.91 (810.5)	32.59 (827.8)	34.25 (870)	33.28 (845.2)	34.55 (877.5)	35.23 (894.8)	36.40 (924.5)

By using combination pumps, it is possible to have independent circuits without the need for splitter gearboxes.
When ordering combination pumps, the type designations of the 1st and 2nd Pump must be connected with a "**+**" and the mounting situation must be added as described on page 61.

Order example:
A15VSO280LRDRA00/11MRVE4A41SE4A40-0+
A15VSO280LRDRA00/11MRVE4A41SU0000-0

A tandem pump, with two pumps of equal size, is permissible without additional supports, assuming that the dynamic mass acceleration does not exceed maximum 10 *g* (= 98.1 m/s^2).
For combination pumps consisting of more than two pumps, the mounting flange must be calculated for the permissible mass torque.

Notice
The combination pump type code is shown in shortened form in the order confirmation.



Connector for solenoids

HIRSCHMANN DIN EN 175 301-803-A /ISO 4400

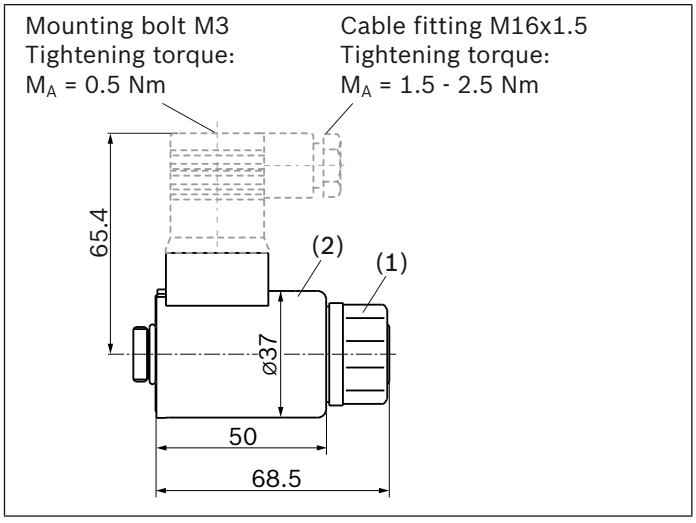
Without bidirectional suppressor diode _____H

Type of protection according to DIN/EN 60529 _____ IP65

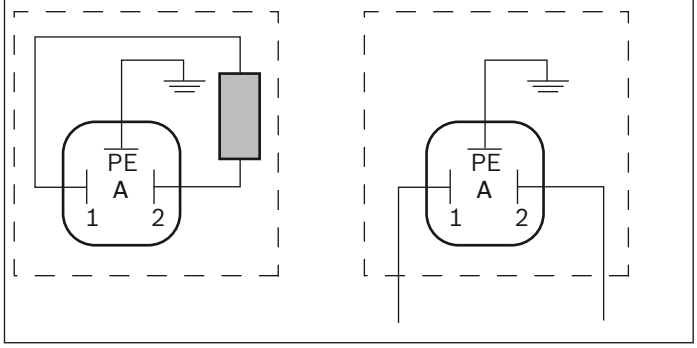
The seal ring in the cable fitting is suitable for lines of diameter 0.18 inch to 0.39 inch (4.5 mm to 10 mm).
The plug-in connector is not included in the scope of delivery.
This can be supplied by Bosch Rexroth on request (material number: R902602623).

Notice

If necessary, you can change the position of the connector by turning the solenoid body.
The procedure is described in the instruction manual.



Device plug on solenoid according to DIN 43650	Plug-in connector DIN EN 175301-803-A Line screw fitting M16x1.5



Installation instructions

General

The axial piston unit must be filled with hydraulic fluid and air bled during commissioning and operation. This must also be observed following a longer standstill as the axial piston unit may empty via the hydraulic lines.
Particularly in the installation position "drive shaft upwards", filling and air bleeding must be carried out completely as there is, for example, a danger of dry running.
The case drain leakage in the housing area must be directed to the reservoir via the highest available drain port (**T_1**, **T_2**, **T_3**).
For combination pumps, the leakage must be drained off at each single pump.
If a shared drain line is used for several units, make sure that the respective case pressure in each unit is not exceeded. The shared drain line must be dimensioned to ensure that the maximum permissible case pressure of all connected units is not exceeded in any operating conditions, particularly at cold start. If this is not possible, separate drain line must be laid, if necessary.
To achieve favorable noise values, decouple all connecting lines using elastic elements and avoid above-reservoir installation.
In all operating conditions, the suction and drain lines must flow into the reservoir below the minimum fluid level.
The permissible suction height h_S results from the total pressure loss. However, it must not be higher than $h_{S\ max}$ = 31.50 ich (800 mm). The minimum suction pressure at port **S** must also not fall below 12 psi (0.8 bar abs.) (without charge pump) or 10 psi (0.7 bar abs.) (with charge pump) during operation and during a cold start.
Make sure to provide adequate distance between suction line and drain line for the reservoir design. This prevents the heated return flow from being drawn directly back into the suction line.

Notice

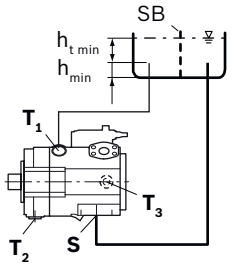
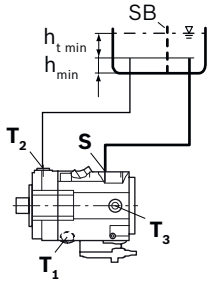
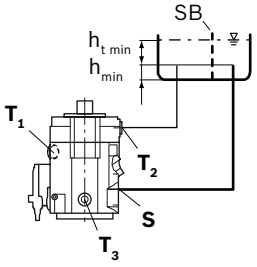
In certain installation positions, an influence on the adjustment or control can be expected. Gravity, dead weight and case pressure can cause minor characteristic shifts and changes in actuating time.

Installation position

See the following examples **1** to **9**.
Further installation positions are available upon request.
Recommended installation position: **1** and **2**

Below-reservoir installation (standard)

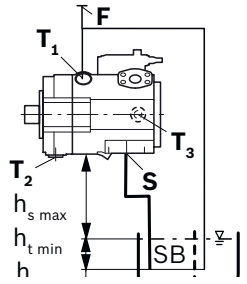
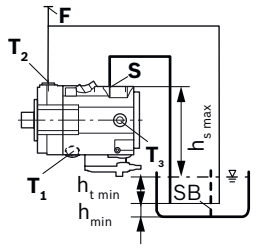
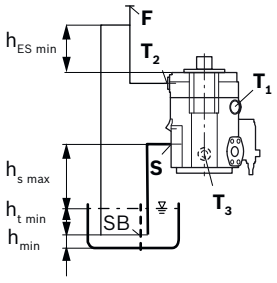
Below-reservoir installation means that the axial piston unit is installed outside of the reservoir below the minimum fluid level.

Installation position	Air bleed	Filling
1 	T_1	**S** + T_1
2 	T_2	**S** + T_2
3 	T_2	**S** + T_2

Key see page 62

Above-reservoir installation

Above-reservoir installation means that the axial piston unit is installed above the minimum fluid level of the reservoir. To prevent the axial piston unit from draining, a height difference $h_{ES\ min}$ of at least 0.98 inch (25 mm) at port $\mathbf{T_2}$ is required in position 6. Observe the max. permissible suction height $h_{S\ max}$ = 31.50 ich (800 mm).

Installation position	Air bleed	Filling
4 	**F**	$\mathbf{T_1}$ (**F**)
5 	**F**	$\mathbf{T_2}$ (**F**)
6 	**F**	$\mathbf{T_2}$ (**F**)

Key	
F	Filling / Air bleeding
S	Suction port
T	Drain port
SB	Baffle (baffle plate)
$h_{t\ min}$	Minimum required immersion depth (7.87 inch (200 mm))
h_{min}	Minimum required distance to reservoir bottom (3.94 inch (100 mm))
$h_{ES\ min}$	Minimum height required to prevent axial piston unit from draining (0.98 inch (25 mm))
$h_{S\ max}$	Maximum permissible suction height (31.50 inch (800 mm))

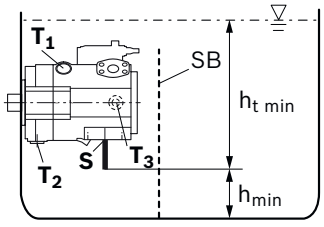
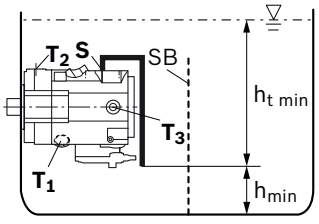
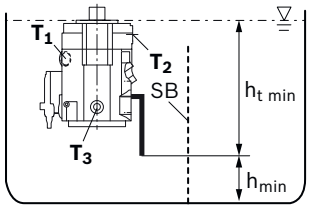
Inside-reservoir installation

Inside-reservoir installation is when the axial piston unit is installed in the reservoir below the minimum fluid level. The axial piston unit is completely below the hydraulic fluid. If the minimum fluid level is equal to or below the upper edge of the pump, see chapter "**Above-reservoir installation**".

Axial piston units with electric components (e.g. electric controls, sensors) must not be installed in a reservoir below the fluid level.

Exception

Installing the pump at an adequate E2/E6 control only with HIRSCHMANN connector and if mineral hydraulic fluids are used and the fluid temperature in the reservoir does not exceed 176 °F (80 °C).

Installation position	Air bleed	Filling
7 	Via the highest available port $\mathbf{T_1}$	Automatically via the open port $\mathbf{T_1}$ due to the position under the hydraulic fluid level
8 	Via the highest available port $\mathbf{T_2}$	Automatically via the open port $\mathbf{T_2}$ due to the position under the hydraulic fluid level
9 	Via the highest available port $\mathbf{T_2}$	Automatically via the open port $\mathbf{T_2}$ due to the position under the hydraulic fluid level

Notice

Port **F** is part of the external piping and must be provided on the customer side to make filling and air bleeding easier.

Project planning notes

- The A15VS(L)O axial piston variable pump is intended to be used in open circuit.
- The project planning, assembly and commissioning of the axial piston unit require the involvement of qualified skilled persons.
- Before using the axial piston unit, please read the corresponding instruction manual completely and thoroughly. If necessary, this can be requested from Bosch Rexroth.
- Before finalizing your design, please request a binding installation drawing.
- The specified data and notes contained herein must be observed.
- Depending on the operating conditions of the axial piston unit (working pressure, fluid temperature), the characteristic curve may shift.
- The characteristic curve may also shift due to the dither frequency or control electronics.
- Preservation: Our axial piston units are supplied as standard with preservative protection for a maximum of 12 months. If longer preservation is required (maximum 24 months), please specify this in plain text when placing your order. The preservation periods apply under optimal storage conditions, which can be found in data sheet 90312 or in the instruction manual.
- Not all versions of the product are approved for use in a safety function according to ISO 13849. Please consult the proper contact at Bosch Rexroth if you require reliability parameters (e.g. $MTTF_d$) for functional safety.
- Depending on the type of control used, electromagnetic effects can be produced when using solenoids. Use of the recommended direct current (DC) on the electromagnet does not produce any electromagnetic interference (EMI) nor is the electromagnet influenced by EMI. Potential electromagnetic interference (EMI) exists if the solenoid is energized with a modulated direct current (e.g. PWM signal). The machine manufacturer should conduct appropriate tests and take appropriate measures to ensure that other components or operators (e.g. with a pacemaker) are not affected by this potentiality.
- Pressure controllers are not safeguards against pressure overload. Be sure to add a pressure relief valve to the hydraulic system.
- For drives that are operated for a long period with constant rotational speed, the natural frequency of the hydraulic system can be stimulated by the excitation frequency of the pump (rotational speed frequency ×9). This can be prevented with suitably designed hydraulic lines.
- Please note the details regarding the tightening torques of port threads and other threaded joints in the instruction manual.
- Working ports:
  - The ports and fastening threads are designed for the specified maximum pressure. The machine or system manufacturer must ensure that the connecting elements and lines correspond to the specified application conditions (pressure, flow, hydraulic fluid, temperature) with the necessary safety factors.
  - The working ports and function ports are only intended to accommodate hydraulic lines.

Safety instructions

- During and shortly after operation, there is a risk of burning on the axial piston unit and especially on the solenoids. Take the appropriate safety measures (e.g. by wearing protective clothing).
- Moving parts in control equipment (e.g. valve spools) can, under certain circumstances, get stuck in position as a result of contamination (e.g. contaminated hydraulic fluid, abrasion, or residual dirt from components). As a result, the hydraulic fluid flow and the build-up of torque in the axial piston unit can no longer respond correctly to the operator's specifications. Even the use of various filter elements (external or internal flow filtration) will not rule out a fault but merely reduce the risk. The machine/system manufacturer must test whether remedial measures are needed on the machine for the application concerned in order to bring the driven consumer into a safe position (e.g. safe stop) and ensure any measures are appropriately implemented.

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