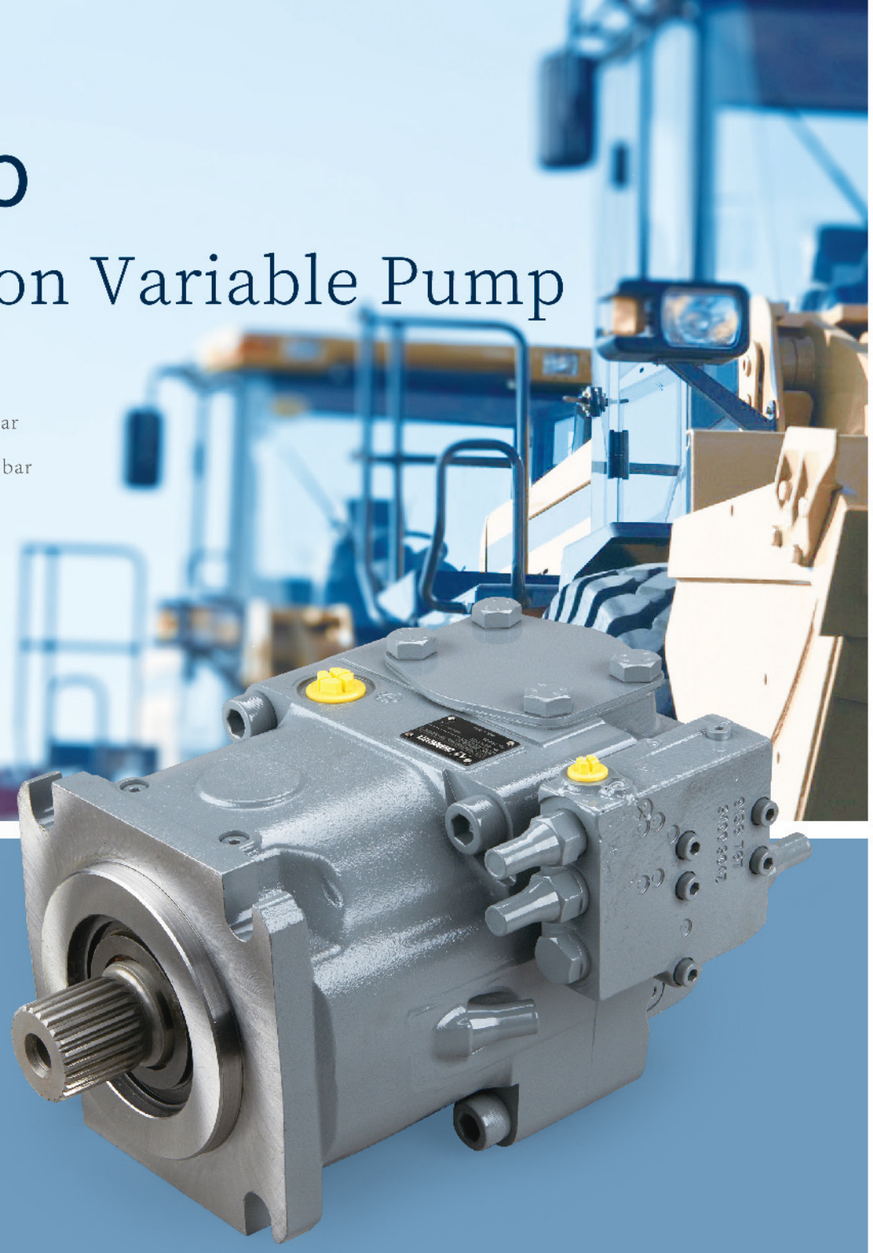
ZP11V(L)O

Axial Piston Variable Pump

- Size (ml/r): 28-260
- Nominal pressure (bar): 350 bar
- Maximum pressure (bar): 400 bar



Open circuit

- Variable axial piston pump of swashplate design for hydrostatic drives in open circuit hydraulic system.
- Designed primarily for use in mobile applications.
- The pump operates under self-priming conditions, with tank pressurization, or with an optional built-in charge pump (impeller).
- A comprehensive range of control options is available matching any application requirement.
- Power control option is externally adjustable, even when the pump is running
- The through drive is suitable for adding gear pumps and axial piston pumps up to the same, i.e. 100% through drive.
- The output flow is proportional to the drive speed and infinitely variable between qV_{max} and $qV_{min} = 0$.

ZHANPENG HYDRAULIC
HYDRAULIC COMPONENTS DEVELOPING AND MANUFACTURING

Ordering Code / Standard Program

ZP11V	L	0	145	LRDS	/	1	1	R	N	Z	D	12	N00
01	02	03	04	05		06	07	08	09	10	11	12	13

Axial piston unit

01	Swashplate design	ZP11V

Charge pump

02	without charge pump	●	●	●	●	●	●	●	●	●	●	●	●	
	with charge pump	–	–	–	–	–	–	–	●	●	●	●	●	L

Operation

03	Pump, open circuit	O

Size

04	Displa -cement	28	40	60	75	85	95	115	125	130	145	165	190	260

Control unit

05	Power control	LR
	Constant pressure control	DR
	Pressure control with load sensing	DRS
	Power control with load sensing and Constant pressure control	LRDS
	Hydraulic stroke limiter control (negative characteristic)	LRH1/5
	Hydraulic stroke limiter control (positive characteristic)	LRH2/6
	Electric stroke limiter control	LRU1/2
	Pressure control, remote controlled	DRG
	Electric control with proportional solenoid	

Series

06		1

Index

07	28-130	0
	145-260	1

Direction of rotation

08	Viewed from shaft end	clockwise	R
		counter-clockwise	L

Seals

09	NBR (nitrile caoutchouc)	N
	FKM (fluor-caoutchouc)	V

Shaft end

10	Splined shaft DIN 5480 for single and combination pump	Z
	Parallel keyed shaft DIN 6885	P
	Splined shaft ANSIB92.1a-1979	S
		T

Mounting flange

11	SAE J744-2 hole	C
	SAE J744-4 hole	D
	SAE J617 (SAE 3)	G

Service line ports

12	Pressure and suction port SAE, at side, opposite side (with metric fastening threads)	12

Through drive

	Flange SAE J744³)	Coupler for splined shaft		28	40	60	75	85	95	115/125	130	145/165	190	260	
13	–	–		●	●	●	●	●	●	●	●	●	●	●	N00
	82-2 (A)	5/8in	9T 16/32DP (A)	●	●	●	●	●	●	●	●	●	●	●	K01
		3/4in	11T 16/32DP (A-B)	▲	▲	▲	●	●	▲	▲	●	●	▲	▲	K52
	101-2 (B)	7/8in	13T 16/32DP (B)	●	●	●	●	●	●	●	●	●	●	●	K02
		1in	15T 16/32DP (B-B)	●	●	●	●	●	●	●	●	●	●	●	K04
		W35	2×30×16×9g	●	●	●	●	●	●	●	●	●	●	●	K79
		1 1/4in	14T 12/24DP (C)	–	–	●	●	●	●	●	●	●	●	●	K07
	127-2 (C)	1 1/2in	17T 12/24DP (C-C)	–	–	–	–	–	–	–	●	●	●	●	K24
		W30	2×30×14×9g	–	–	●	●	●	●	●	●	●	●	●	K80
		W35	2×30×16×9g	–	–	●	●	●	●	●	●	●	●	●	K61
		1 1/4in	14T 12/24DP (C)	–	–	–	●	●	●	●	●	●	●	●	K86
	152-4 (D)	1 3/4in	13T 8/16DP (D)	–	–	–	–	–	–	–	●	●	●	●	K17
		W40	2×30×18×9g	–	–	–	●	●	●	●	●	●	●	●	K81
		W45	2×30×21×9g	–	–	–	–	–	–	–	●	●	●	●	K82
		W50	2×30×24×9g	–	–	–	–	–	–	–	●	●	●	●	K83
	165-4 (E)	1 3/4in	13T 8/16DP (D)	–	–	–	–	–	–	–	–	–	●	●	K72
		W50	2×30×24×9g	–	–	–	–	–	–	–	–	–	●	●	K84
		W60	2×30×28×9g	–	–	–	–	–	–	–	–	–	–	●	K67

● available – not available ▲ on request

LR Power Control

The power control regulates the displacement of the pump depending on the operating pressure so that a given drive power is not exceeded at constant drive speed.

$P_B \cdot V_g$ = constant

P_B = operating pressure

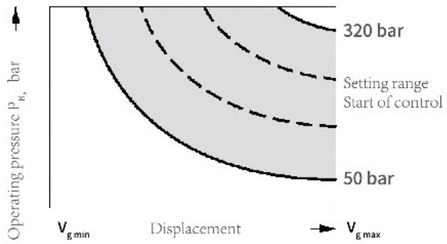
V_g = displacement

The precise control with a hyperbolic control characteristic, provides an optimum utilization of available power.

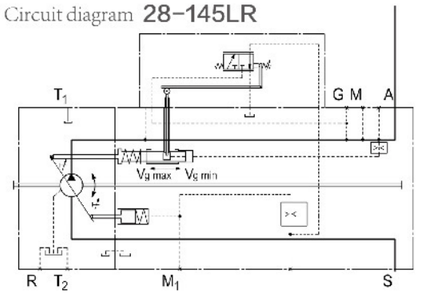
The operating pressure acts on a rocker via a measuring piston. An externally adjustable spring force counteracts this, it determines the power setting

If the operating pressure exceeds the set spring force, the control valve is actuated by the rocker, the pump swivels back (direction $V_{g\,min}$)。The lever length at the rocker is shortened, and the operating pressure can increase at the same rate as the displacement decreases without the drive powers being exceeded ($P_B \cdot V_g$ = constant).

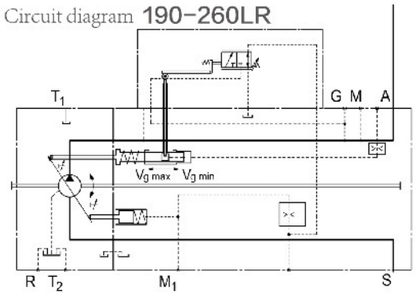
Characteristic **LR**



Circuit diagram **28–145LR**



Circuit diagram **190–260LR**

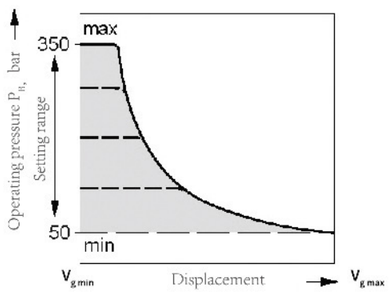


LRD Power control with pressure cut-off

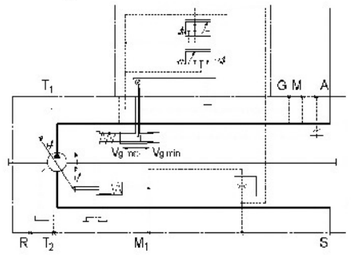
The pressure cut-off corresponds to a pressure control which adjusts the pump displacement back to Vg min, when the pressure setting is reached.

This function overrides the power control, i.e. below the preset pressure value, the power function is effective. The pressure cut-off function is integrated into the pump control module and is preset to a specified value at the factory from 50 to 350 bar.

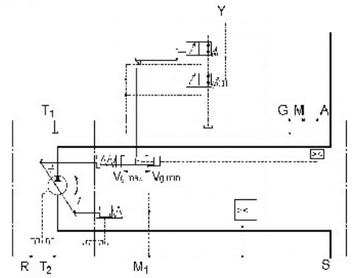
Characteristic **LRD**



Circuit diagram **28–145: LRD**



Circuit diagram **190–260: LRD**



DRS Pressure control with load sensing

The load sensing control is a flow control option that operates as a function of the load pressure to regulate the pump displacement to match the actuator flow requirement.

The flow depends here on the cross section of the external sensing orifice (1) fitted between the pump outlet and the actuator. The flow is independent of the load pressure below the pressure cut-off setting and within the control range of the pump.

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

If the differential pressure Δp increases at the sensing orifice, the pump is swivelled back (towards $V_{g\,min}$), and, if the differential pressure Δp decreases, the pump is swivelled out (towards$V_{g\,max}$) until the pressure drop across the sensing orifice in the valve is restored.

△p orifice= △p pump - △p actuator.

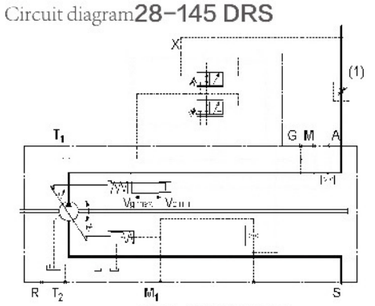
The setting range for Δp is between 14 bar and 25 bar.

The standard differential pressure setting is 18 bar. (Please state in clear text when ordering).

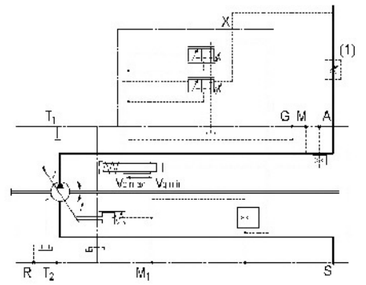
The stand-by pressure in zero stroke operation (sensing orifice plugged) is slightly above the Δp setting.

(1) The sensing orifice (control block) is not included in the pump supply.

Circuit diagram**28–145 DRS**



Circuit diagram**190–260 DRS**

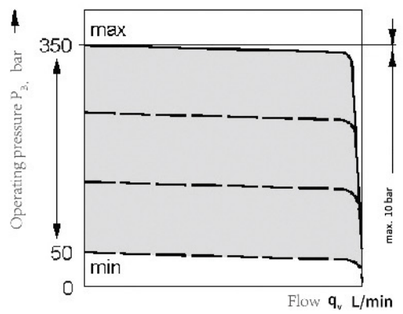


DRG Pressure control, remote controlled

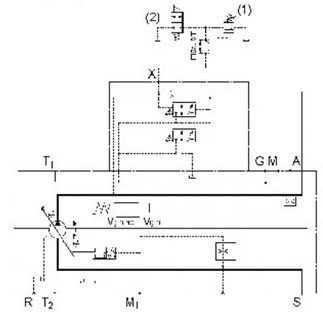
The remote control pressure cut-off regulator permits the adjustment of the pressure setting by a remotely installed pressure relief valve (1). Pilot flow for this valve is provide by a fixed orifice in the control module.

Setting range from 50 to 350 bar.

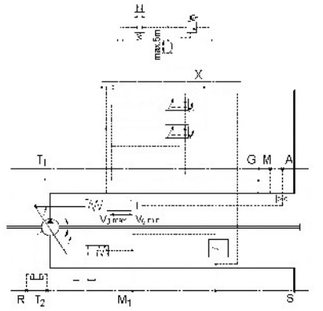
Characteristic **DRG**



Circuit diagram **28–145 DRG**



Circuit diagram **190–260 DRG**



LRDS Power control with pressure cut-off and load sensing

The load sensing control is a flow control option that operates as a function of the load pressure to regulate the pump displacement to match the actuator flow requirement.

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

The load sensing control compares pressure before and after the sensing orifice and maintains the pressure drop across the orifice (differential pressure Δp) and with it the pump flow constant.

If the differential pressure Δp increases at the sensing orifice, the pump is swivelled back (towards $V_{g\,min}$), and, if the differential pressure Δp decreases, the pump is swivelled out (towards$V_{g\,max}$) until the pressure drop across the sensing orifice in the valve is restored.

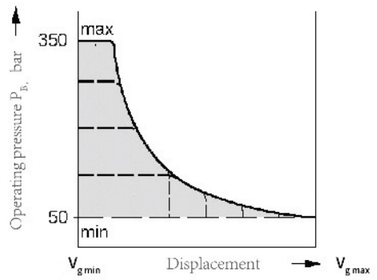
△p orifice= △p pump - △p actuator.

The setting range for Δp is between 14 bar and 25 bar.

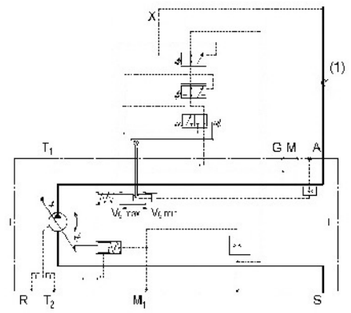
The standard differential pressure setting is 18 bar. (Please state in clear text when ordering).

The stand-by pressure in zero stroke operation (sensing orifice plugged) is slightly above the Δp setting.

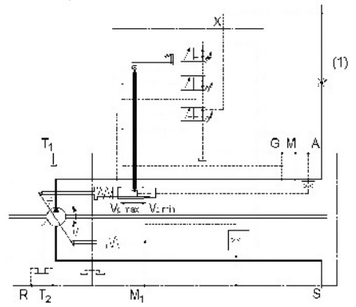
Characteristic LRDS



Circuit diagram 28–145: LRDS



Circuit diagram 190–260: LRDS

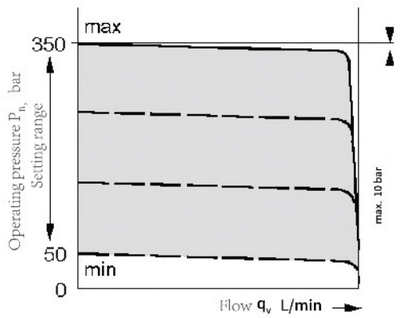


DR Pressure Control

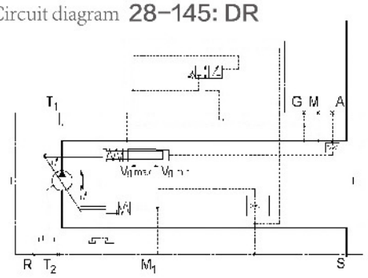
The pressure control keeps the pressure in a hydraulic system constant within its control range even under varying flow conditions. The variable pump only moves as much hydraulic fluid as is required by the actuators. If the operating pressure exceeds the setpoint set at the integral pressure control valve, the pump displacement is automatically swivelled back until the pressure deviation is corrected.

Starting position in depressurized state: $V_{g\,max}$ Setting range from： 50 to 350 bar.

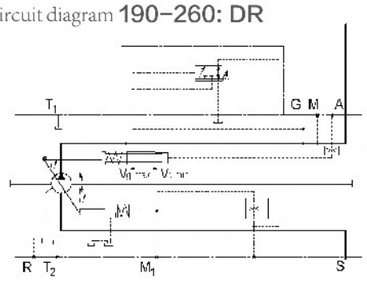
Characteristic DR



Circuit diagram 28–145: DR



Circuit diagram 190–260: DR



LRU1/2 Electric stroke limiter (positive characteristic)

With increasing control current the pump swivels to a higher displacement

Technical data - solenoids

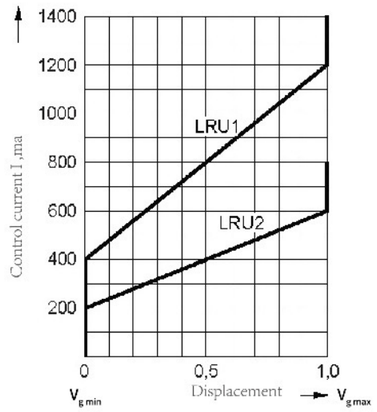
Voltage	LRU1 12VDC (±20%)	ED72 24VDC (±20%)
Control current		
Start of control at$V_{g\,max}$	400mA	200mA
End of control at$V_{g\,max}$	1200mA	600mA
Limiting current	1.54A	0.77A
Nominal resistance (at 20℃)	5.5Ω	22.7Ω
Dither frequency	100Hz	100Hz
Actuated time	100%	100%

Starting position without control signal (control current)

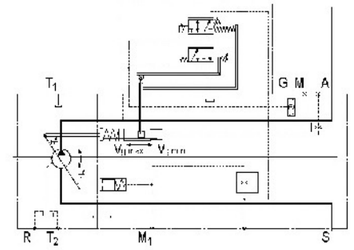
-at operating pressure and external control pressure< 30 bar.: $V_{g\,max}$

-at operating pressure or external control pressure> 30 bar.: $V_{g\,min}$

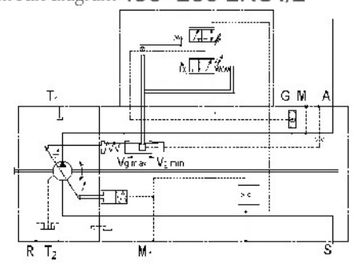
Characteristic LRU1/2



Circuit diagram 28–145 LRU1/2



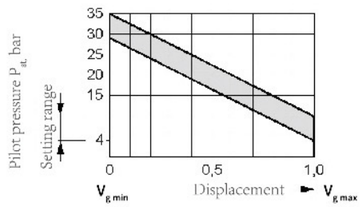
Circuit diagram 190–260 LRU1/2



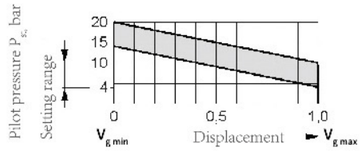
LRH1/5 Hydraulic stroke limiter (negative characteristic)

Control from $V_{g\,max}$ to $V_{g\,min}$ With increasing pilot pressure the pump swivels to a smaller displacement. Start of control (at $V_{g\,max}$) from 4 - 10 bar. State start of control in clear text in the order. Starting position without control signal (pilot pressure):$V_{g\,max}$ Increase in pilot pressure $\Delta p = 25$ bar

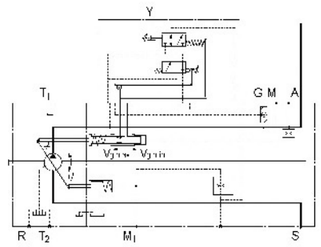
Characteristic **H1**



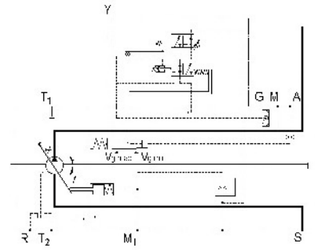
Characteristic **H5**



Circuit diagram **28–145: LRH1/5**



Circuit diagram **190–260: LRH1/5**



LRH2/6 Hydraulic stroke limiter (positive characteristic)

With increasing pilot pressure the pump swivels to a higher displacement. Start of control (at $V_{g\,min}$), can be set from 4 - 10 bar

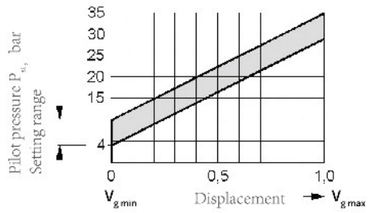
State start of control in clear text in the order.

-at operating pressure and external control pressure < 30 bar: $V_{g\,max}$

-at operating pressure or external control pressure > 30 bar:$V_{g\,min}$

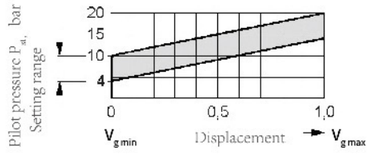
-Increase in pilot pressure $\Delta p = 25$ bar

Characteristic **H2**

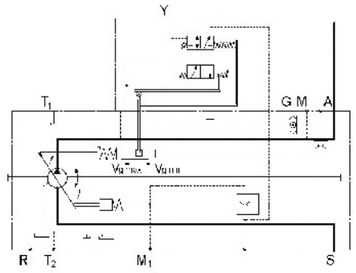


Characteristic **H6**

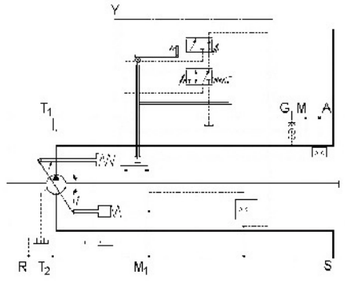
Increase in pilot pressure ($V_{g\,max}$-$V_{g\,min}$) —— Δp=10 bar



Circuit diagram **28–145: LRH2/6**



Circuit diagram **190–260: LRH2/6**

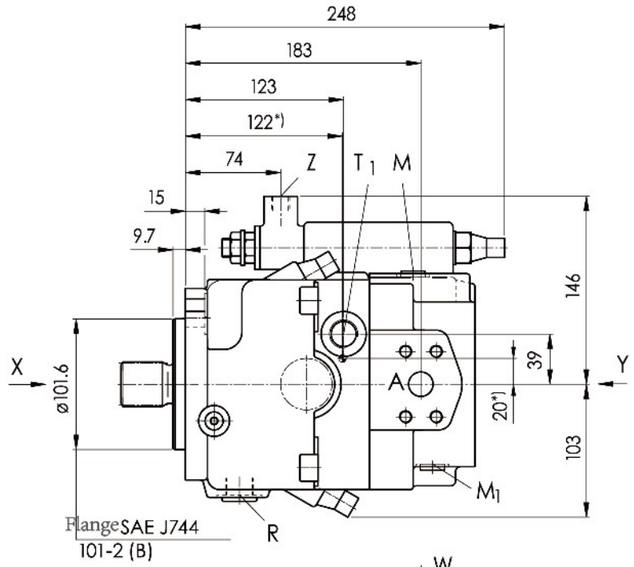


FAX | 0574-8824 0106

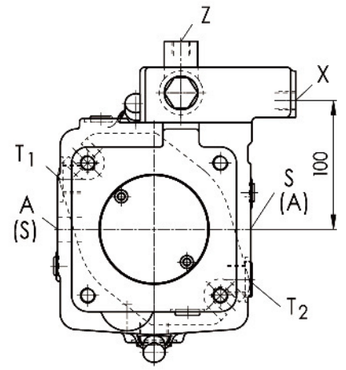
Dimensions, Size 28/40

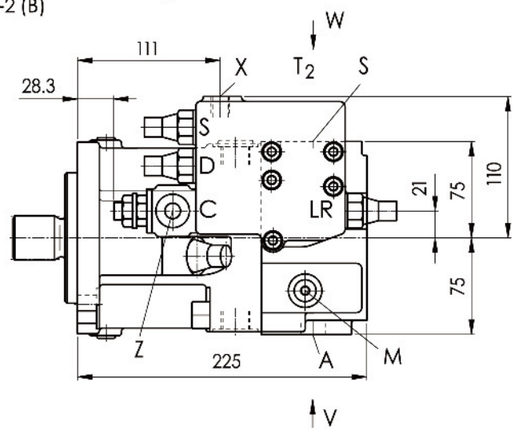
LRDCS

Power control LR with pressure cut-off D, cross sensing control C and load sensing controls.

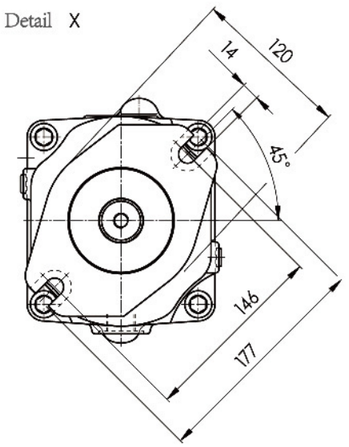


View
clockwise rotation
(counter-clockwise rotation)

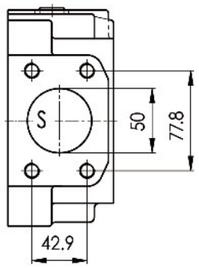




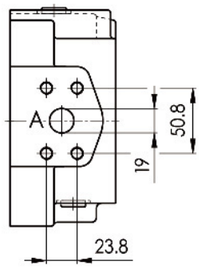
Detail X



View W



View V

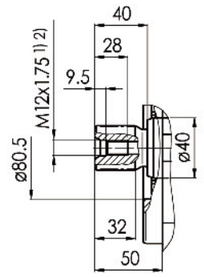


Dimensions, Size 28/40

Shaft ends

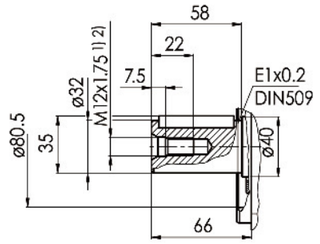
Z Splined shaft DIN 5480

W35x2x30x16x9g



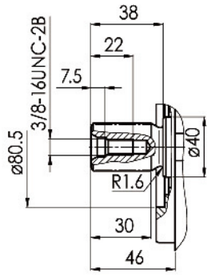
P Parallel keyed shaft

DIN 6885 AS10x8x56



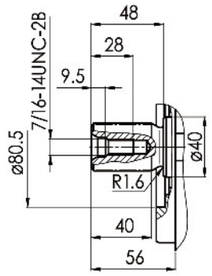
S Splined shaft SAE J744 1

in 15T 16/32[3])



T Splined shaft SAE J744 1

1/4 in 14T 12/24DP[3])



Ports

Designation	Function	Standard	Size[2)]	Deep	Max. pressure (bar)[4)]	State
A	Service line port Fixing thread	SAEJ518 DIN 13	3/4 in M10×1.5	16	400	O
S	Suction port Fixing thread	SAE J518 DIN 13	2 in M12×1.75	17	30	O
T1、T2	Tank port	DIN 3852	M22×1.5	14	10	5
R	Air bleed	DIN 3852	M22×1.5	14	10	X
M1	Measurement point, positioning chamber	DIN 3852	M12×1.5	12	400	X
M	Measurement point, service line port	DIN 3852	M12×1.5	12	400	X
X	Pilot pressure port in version with load sensing (S) and remote controlled pressure cut-off(G)	DIN 3852	M14×1.5	12	400	O
Y	Pilot pressure port in version with stroke limiter (H...),2-stage pressure cut-off (E) and HD	DIN 3852	M14×1.5	12	40	O
Z	Pilot pressure port in version with cross sensing (C) and power override (LR3) power override (LG1)	DIN 3852	M14×1.5	12	400 40	O
G	Port for control pressure (controller) in version with stroke limiter (H.., U2), HD and EP with screw union GE10 - PLM (otherwise closed)	DIN 3852	M14×1.5	12	40	O

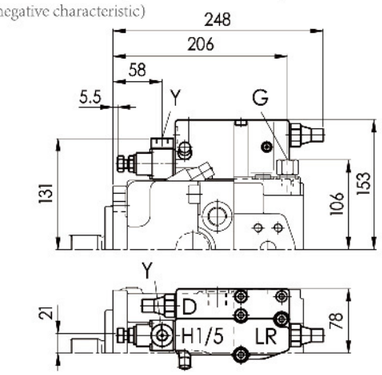
O = Open, must be connected (closed on delivery)

X = Closed (in normal operation)

Dimensions, Size 28/40

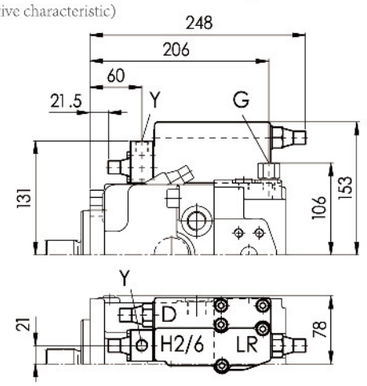
LRDH1/LRDH5

Power control with pressure cut-off and hydraulic stroke limiter (negative characteristic)



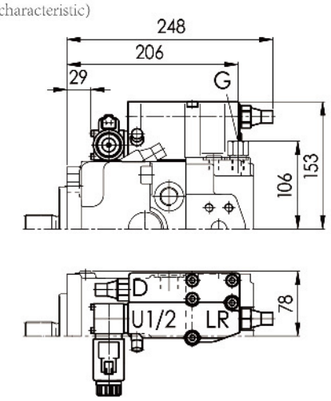
LRDH2/LRDH6

Power control with pressure cut-off and hydraulic stroke limiter (positive characteristic)



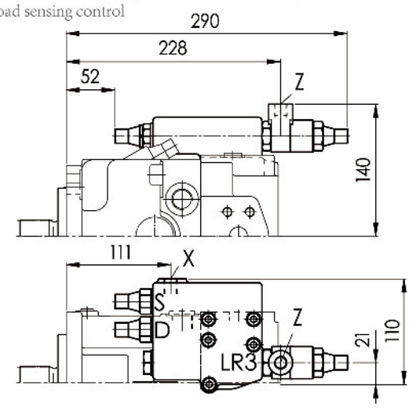
LRDU1/LRDU2

Power control with pressure cut-off and electric stroke limiter (positive characteristic)



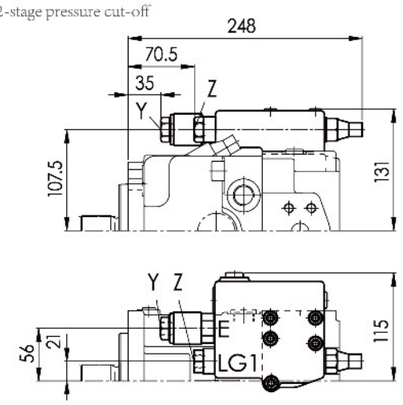
LR3DS

Power control with high-pressure related override, pressure cut-off and load sensing control



LG1E

Power control with pilot-pressure related override (negative) and 2-stage pressure cut-off

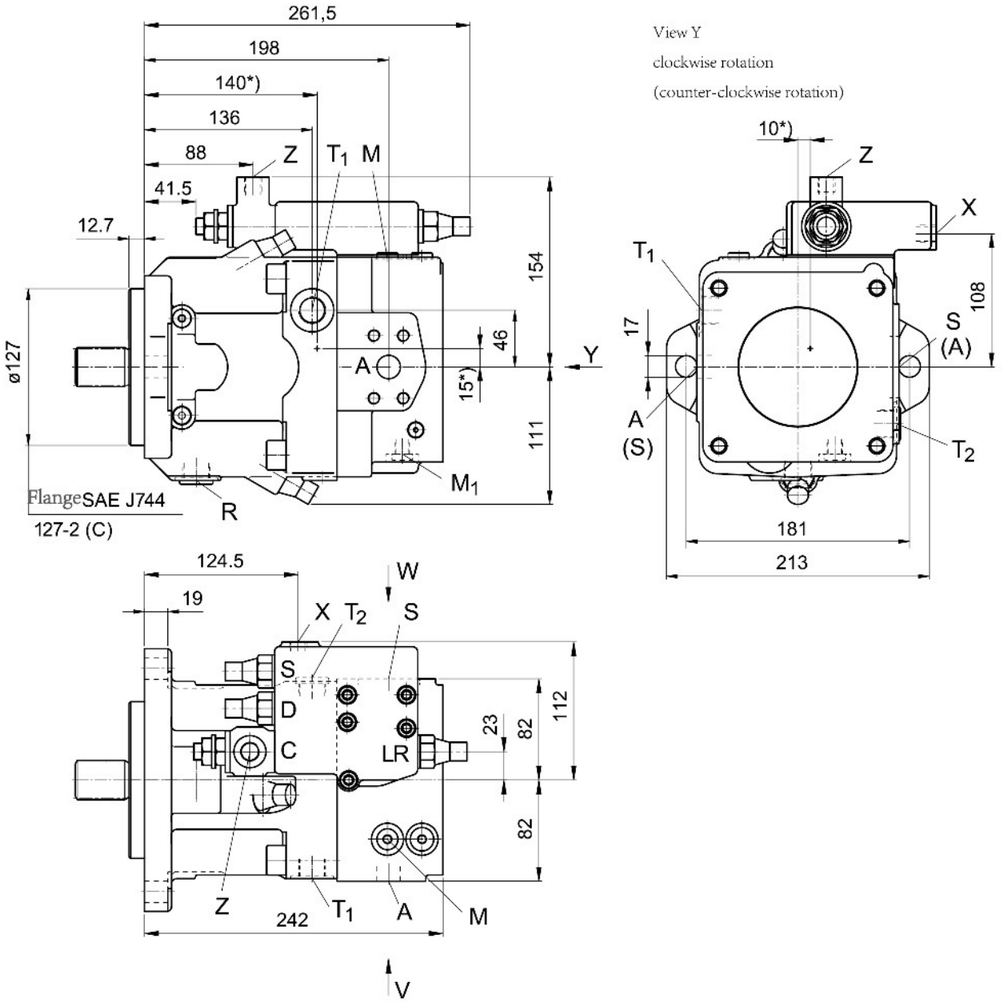


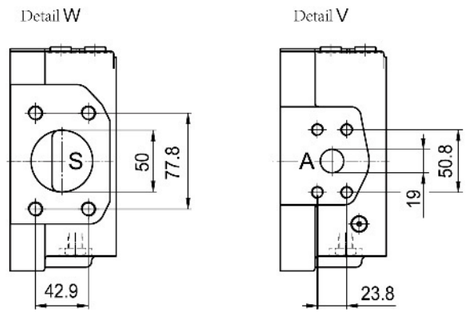
LG2E

Power control with pilot-pressure related override (positive) and 2-stage pressure cut-off

LRDCS

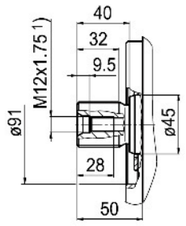
Power control LR with pressure cut-off D, cross sensing control C and load sensing control S



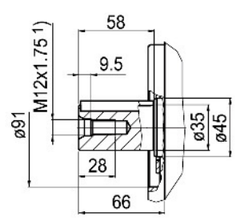


Shaft ends

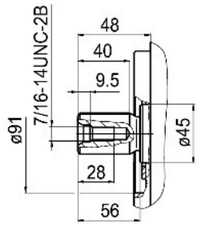
Z Splined shaft DIN 5480
W35x2x30x16x9g



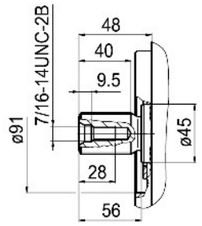
P Parallel keyed shaft
DIN 6885-AS10x8x56



S Splined shaft
1 1/4 in 14T 12/24DP[2]
(SAE J744-32-4(C))



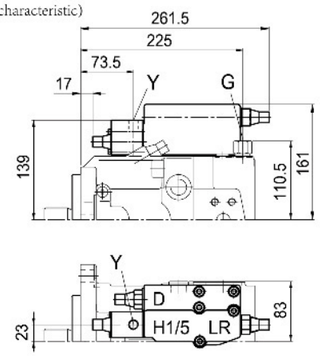
T Splined shaft
1 3/8 in 21T 16/32DP[2]



A,B	Service line port Fixing thread	SAEJ 518 DIN 13	3/4 in M10X1,5;Deep 17	– See safety instruction
S	Suction port Fixing thread	SAEJ 518 DIN 13	2 in M12X1.75;Deep 20	– See safety instruction
T_1,T_2	Tank port	DIN 3852	M22X1.5;Deep 14	210Nm
R	Air bleed	DIN 3852	M22X1.5;Deep 14	210Nm
M_1	Measurement point, positioning chamber	DIN 3852	M12X1.5;Deep 12	50Nm
M	Measurement point, service line port	DIN 3852	M12X1.5;Deep 12	50Nm
X,Y,Z	Pilot pressure port	DIN 3852	M14X1.5;Deep 12	80Nm
G	Port for control pressure (controller)	DIN 3852	M14X1.5;Deep 12	80Nm

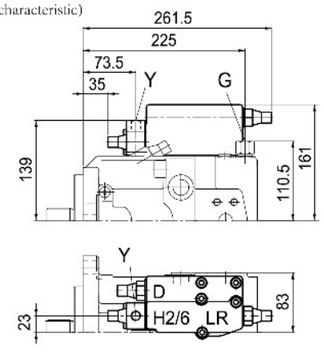
LRDH1/LRDH5

Power control with pressure cut-off and hydraulic stroke limiter (negative characteristic)



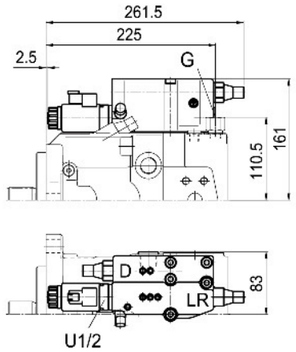
LRDH2/LRDH6

Power control with pressure cut-off and hydraulic stroke limiter (positive characteristic)



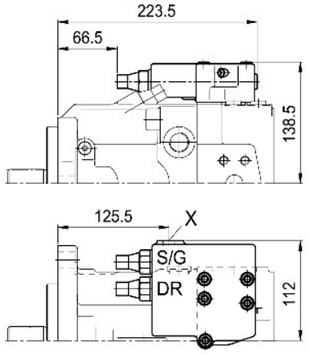
LRDU1/LRDU2

Power control with pressure cut-off and electric stroke limiter (positive characteristic)



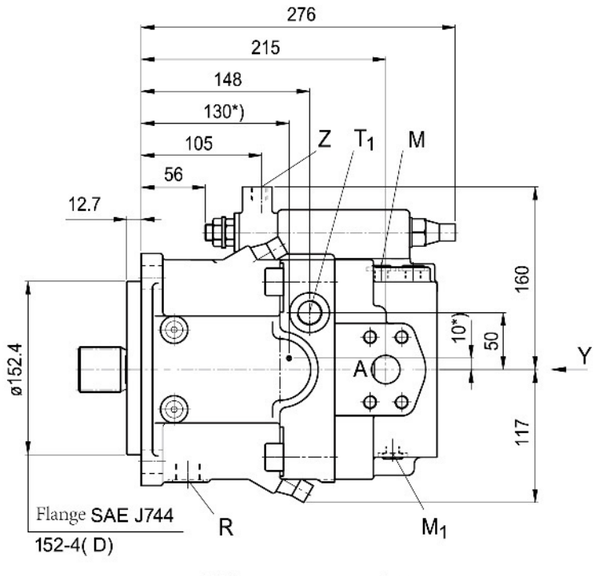
DRS/DRG

Power control with high-pressure related override, pressure cut-off and load sensing control

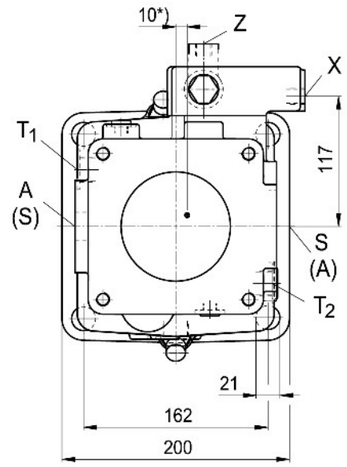


LRDCS

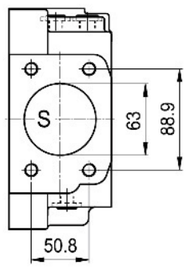
Power control LR with pressure cut-off D, cross sensing control C and load sensing control S



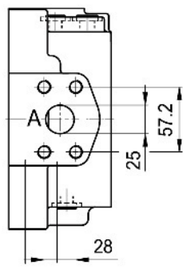
View Y
clockwise rotation
(counter-clockwise rotation)



Detail W



Detail V



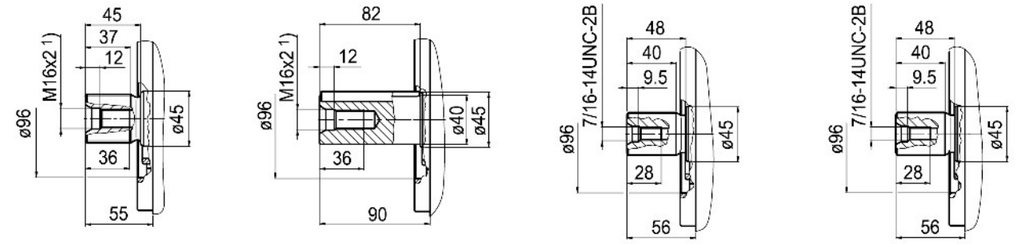
Shaft ends

Z Splined shaft DIN 5480
W40x2x30x18x9g

P Parallel keyed shaft
DIN 6885-AS12x8x80

S Splined shaft
1 1/4 in 14T 12/24DP[2]
(SAE J744-32-4(C))

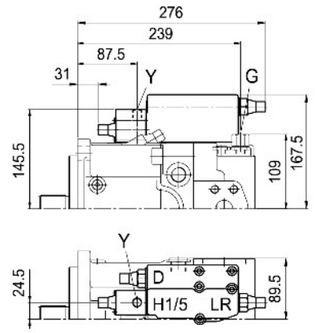
T Splined shaft
1 3/8 in 21T 16/32DP[2]



A,B	Service line port	SAEJ 518	3/4 in	–
	Fixing thread	DIN 13	M10X1,5;Deep 17	See safety instruction
S	Suction port	SAEJ 518	2 in	–
	Fixing thread	DIN 13	M12X1.75;Deep 20	See safety instruction
T_1,T_2	Tank port	DIN 3852	M22X1.5;Deep 14	210Nm
R	Air bleed	DIN 3852	M22X1.5;Deep 14	210Nm
M_1	Measurement point, positioning chamber	DIN 3852	M12X1.5;Deep 12	50Nm
M	Measurement point, service line port	DIN 3852	M12X1.5;Deep 12	50Nm
X,Y,Z	Pilot pressure port	DIN 3852	M14X1.5;Deep 12	80Nm
G	Port for control pressure (controller)	DIN 3852	M14X1.5;Deep 12	80Nm

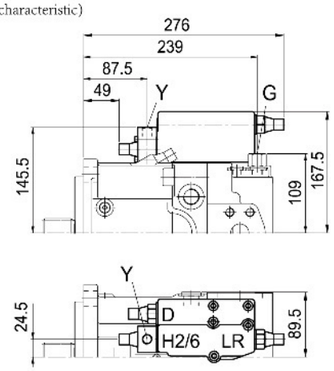
LRDH1/LRDH5

Power control with pressure cut-off and hydraulic stroke limiter
(negative characteristic)



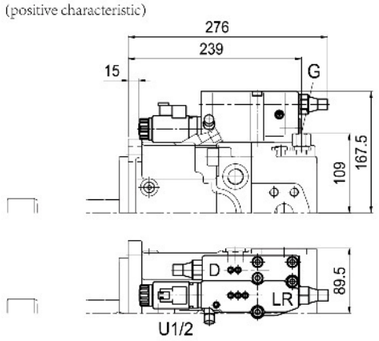
LRDH2/LRDH6

Power control with pressure cut-off and hydraulic stroke limiter
(positive characteristic)



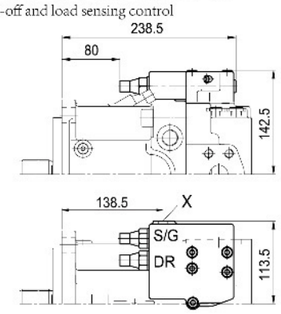
LRDU1/LRDU2

Power control with pressure cut-off and electric stroke limiter
(positive characteristic)



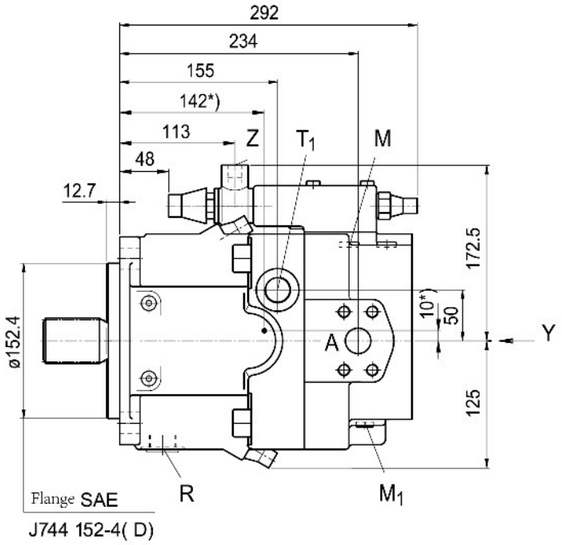
DRS/DRG

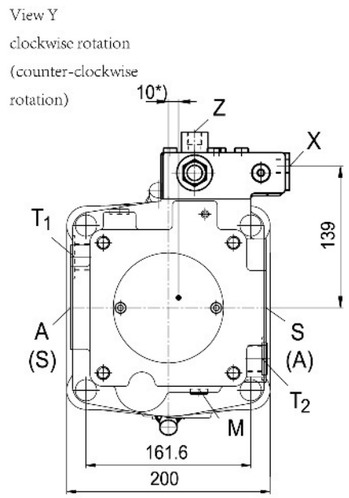
Power control with high-pressure related override,
pressure cut-off and load sensing control

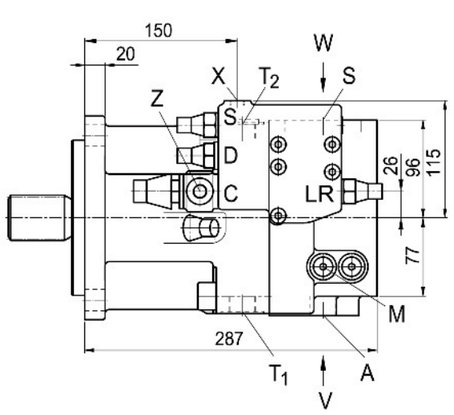


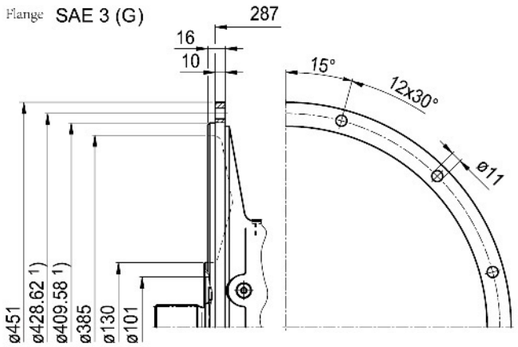
LRDCS

Power control LR with pressure cut-off D, cross sensing control C and load sensing control S

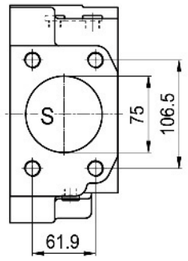




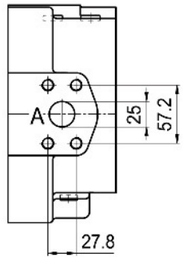




Detail W



Detail V



1)Dimensions according to SAE J617-No. 3, for connection to the flywheel case of the combustion engine.

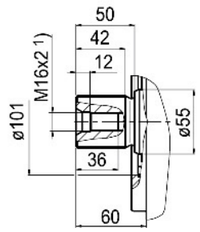
Dimensions, Size 95/115/125

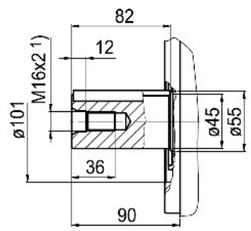
Shaft ends

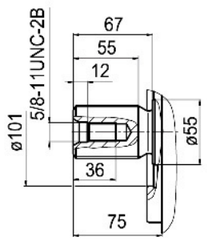
Z Splined shaft DIN 5480
W45x2x30x21x9g

P Parallel keyed shaft
DIN 6885-AS14x9x80

S Splined shaft
1 3/4 in 13T 8/16DP
(SAE J744-44-4(D))



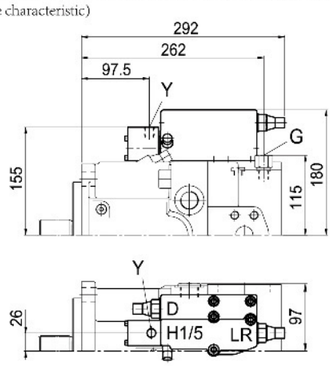




A,B	Service line port	SAEJ 518	3/4 in	–
	Fixing thread	DIN 13	M10X1,5;Deep 17	See safety instruction
S	Suction port	SAEJ 518	2 in	–
	Fixing thread	DIN 13	M12X1.75;Deep 20	See safety instruction
T_1,T_2	Tank port	DIN 3852	M22X1.5;Deep 14	210Nm
R	Air bleed	DIN 3852	M22X1.5;Deep 14	210Nm
M_1	Measurement point, positioning chamber	DIN 3852	M12X1.5;Deep 12	50Nm
M	Measurement point, service line port	DIN 3852	M12X1.5;Deep 12	50Nm
X,Y,Z	Pilot pressure port	DIN 3852	M14X1.5;Deep 12	80Nm
G	Port for control pressure (controller)	DIN 3852	M14X1.5;Deep 12	80Nm

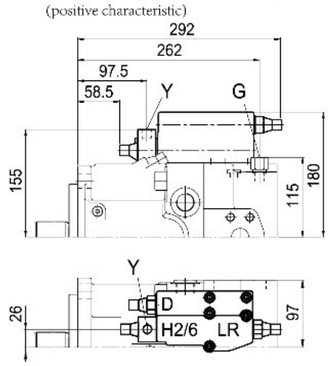
LRDH1/LRDH5

Power control with pressure cut-off and hydraulic stroke limiter (negative characteristic)



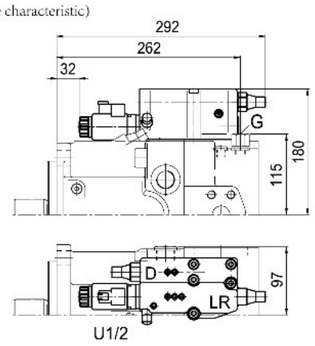
LRDH2/LRDH6

Power control with pressure cut-off and hydraulic stroke limiter (positive characteristic)



LRDU1/LRDU2

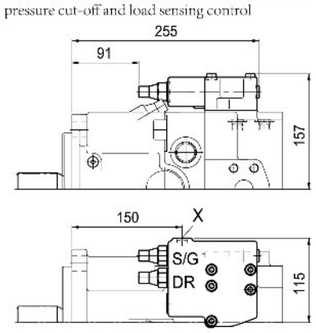
Power control with pressure cut-off and electric stroke limiter (positive characteristic)



U1/2

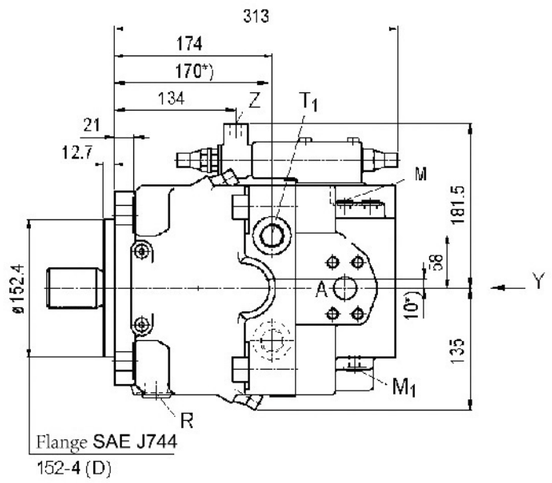
DRS/DRG

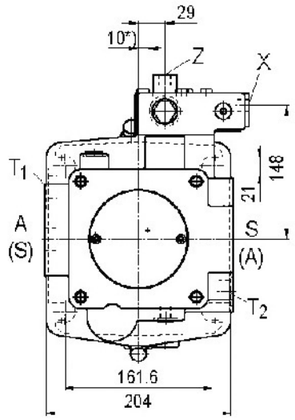
Power control with high-pressure related override, pressure cut-off and load sensing control

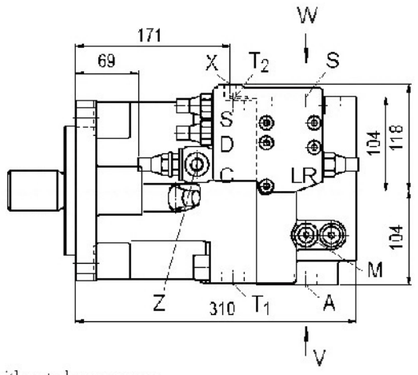


LRDCS

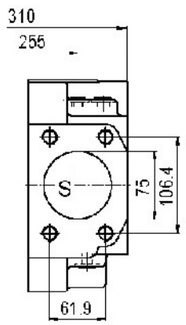
Power control LR with pressure cut-off D, cross sensing control C and load sensing control S



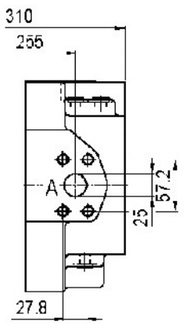




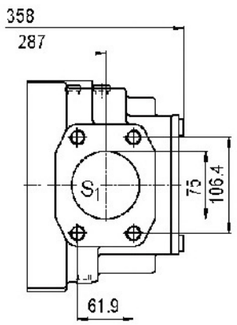
without charge pump
Detail W



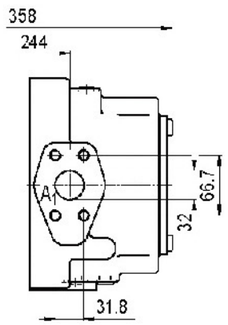
Detail V



with charge pump
Detail W



Detail V

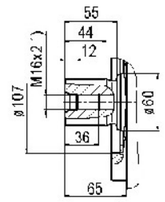


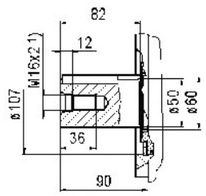
Shaft ends

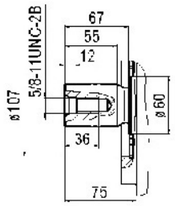
Z Splined shaft DIN 5480
W50x2x30x24x9g

P Parallel keyed shaft
6885-as14x9x80

S Splined shaft
1 3/4 in 13T 8/16DP[2]
(SAE J744-44-4(D))



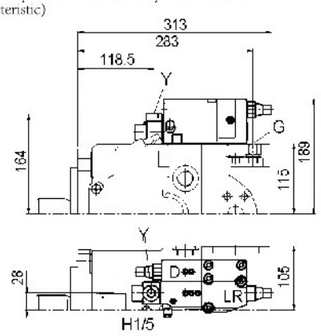




A,B	Service line port	1 in
	Fixing thread	M12×1.75;Deep 17
S	Suction port	M16×2;Deep 24
T_1,T_2	Tank port	M26×1.5;Deep 16
R	Air bleed	M26×1.5;Deep 16
M_1	Measurement point, positioning chamber	M12×1.5;Deep 12
M	Measurement point, service line port	M12×1.5;Deep 12
X,Y,Z	Pilot pressure port	M14×1.5;Deep 12
G	Port for control pressure (controller)	M14×1.5;Deep 12

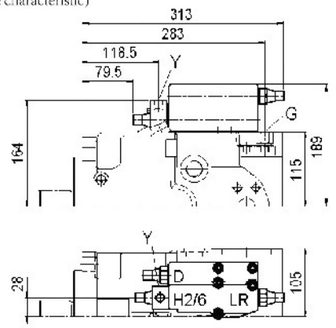
LRDH1/LRDH5

Power control with pressure cut-off and hydraulic stroke limiter (negative characteristic)



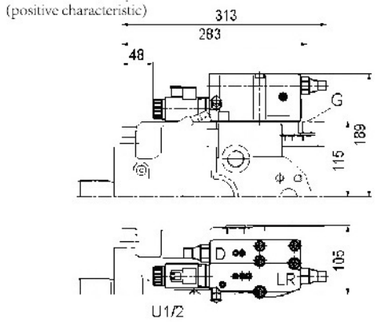
LRDH2/LRDH6

Power control with pressure cut-off and hydraulic stroke limiter (positive characteristic)



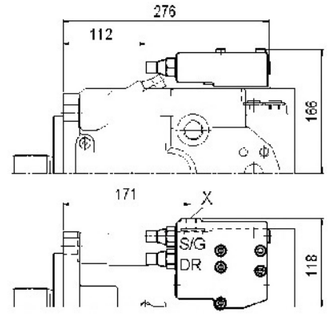
LRDU1/LRDU2

Power control with pressure cut-off and electric stroke limiter (positive characteristic)



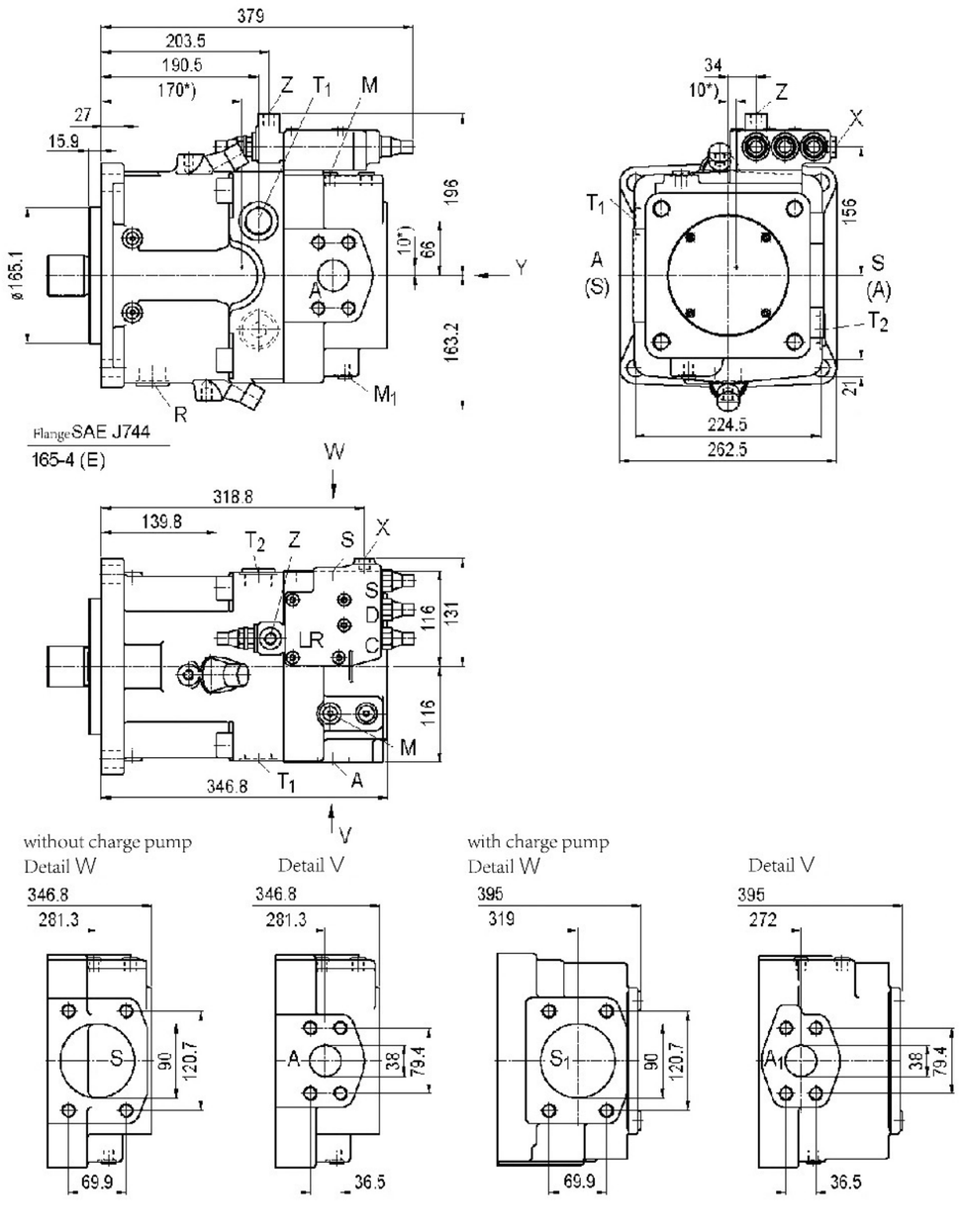
DRS/DRG

Pressure control with load sensing control
Pressure control remote controlled



LRDCS

Power control LR with pressure cut-off D, cross sensing control C and load sensing control S



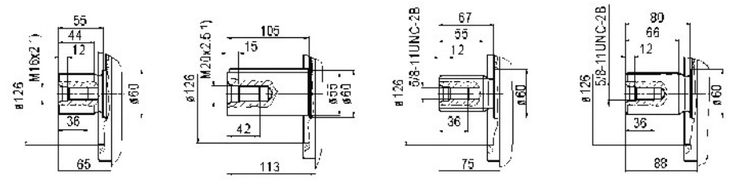
Shaft ends

Z Splined shaft DIN 5480 W50x2x30x24x9g

P Parallel keyed shaft 6885-as16x10x100

S Splined shaft 1 3/4 in 13T 8/16DP (SAE J744-44-4(D))

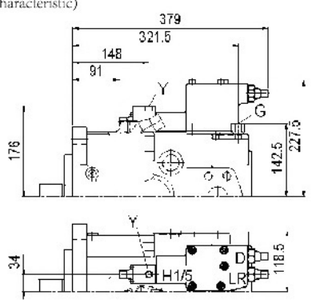
T Splined shaft 2 in 15T 8/16DP (SAE J744-50-4(F))



A, A_1	Service line port	1 1/2 in
	Fixing thread	M16×2;Deep 21
S	Suction port	3 1/2 in
	Fixing thread	M16×2;Deep 21
S1	Oil suction port (standard series)	4in
	Fixed thread	M16×1;Deep 21
T_1, T_2	Tank port	M33×2;Deep 16
R	Air bleed	M33×2;Deep 16
M_1	Measurement point, positioning chamber	M12×1.5;Deep 12
M	Measurement point, service line port	M12×1.5;Deep 21
X,Y,Z	Pilot pressure port	M14×1.5;Deep 21
G	Port for control pressure (controller)	M14×1.5;Deep 21

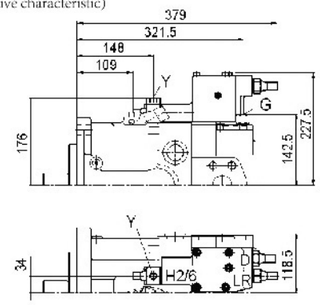
LRDH1/LRDH5

Power control with pressure cut-off and hydraulic stroke limiter (negative characteristic)



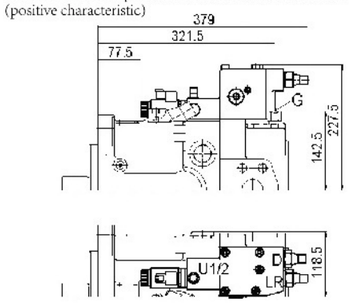
LRDH2/LRDH6

Power control with pressure cut-off and hydraulic stroke limiter (positive characteristic)



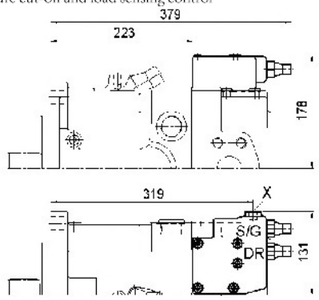
LRDU1/LRDU2

Power control with pressure cut-off and electric stroke limiter (positive characteristic)



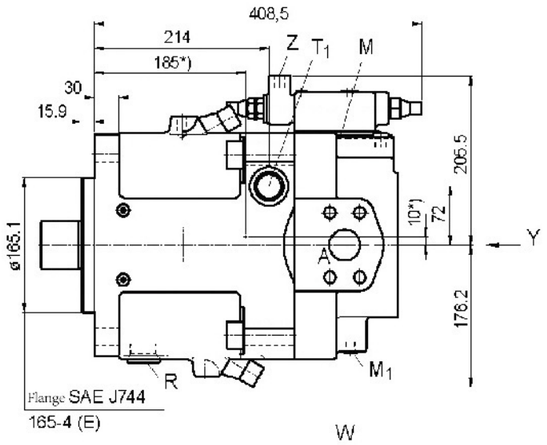
DRS/DRG

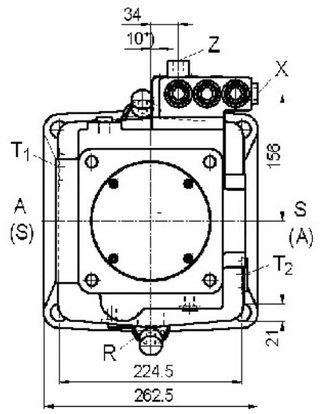
Power control with high-pressure related override, pressure cut-off and load sensing control

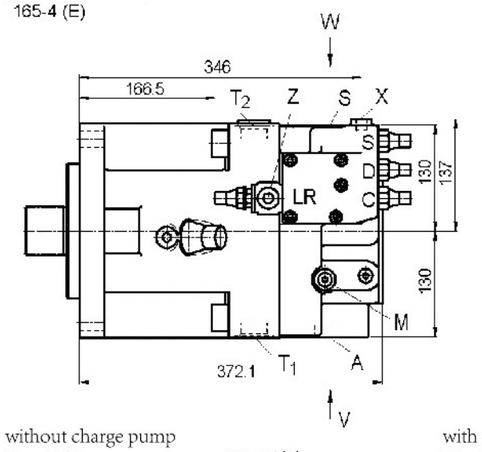


LRDCS

Power control LR with pressure cut-off D, cross sensing control C and load sensing control S

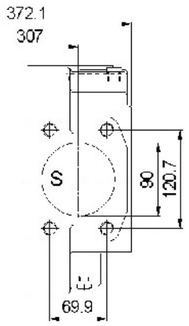




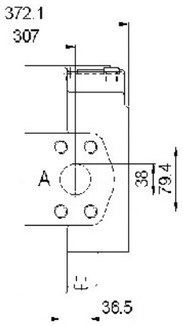


without charge pump

Detail W

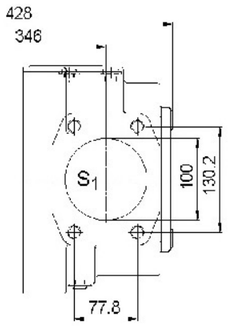


Detail V

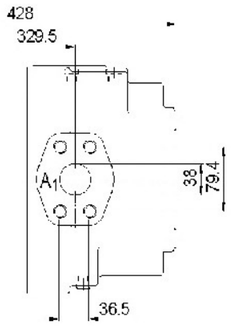


with charge pump

Detail W



Detail V



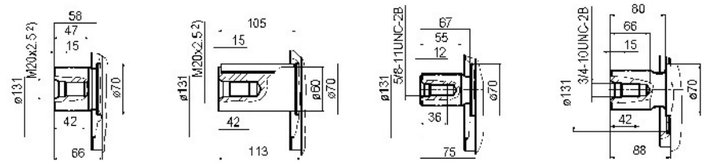
Shaft ends

Z Splined shaft DIN 5480 W60x2x30x28x9g

P Parallel keyed shaft 6885-as18x11x100

S Splined shaft 1 3/4 in 13T 8/16DP (SAE J744-44-4(D))

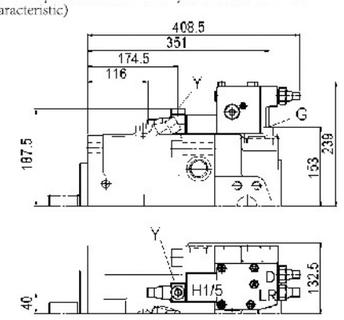
T Splined shaft 2 in 15T 8/16DP (SAE J744-50-4(F))



A, A_1	Service line port	1 1/2 in
	Fixing thread	M16×2;Deep 21
S	Suction port	3 1/2 in
	Fixing thread	M16×2;Deep 21
S1	Oil suction port (standard series)	4in
	Fixed thread	M16×1;Deep 21
T_1, T_3	Tank port	M33×2;Deep 16
R	Air bleed	M33×2;Deep 16
M_1	Measurement point, positioning chamber	M12×1.5;Deep 12
M	Measurement point, service line port	M12×1.5;Deep 21
X,Y,Z	Pilot pressure port	M14×1.5;Deep 21
G	Port for control pressure (controller)	M14×1.5;Deep 21

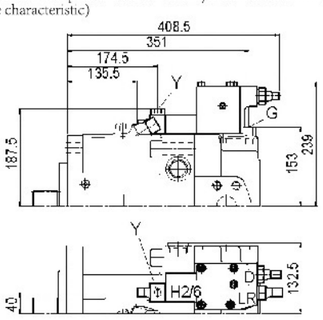
LRDH1/LRDH5

Power control with pressure cut-off and hydraulic stroke limiter (negative characteristic)



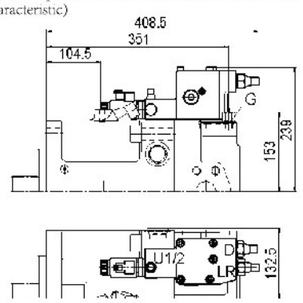
LRDH2/LRDH6

Power control with pressure cut-off and hydraulic stroke limiter (positive characteristic)



LRDU1/LRDU2

Power control with pressure cut-off and electric stroke limiter (positive characteristic)



DRS/DRG

Power control with high-pressure related override, pressure cut-off and load sensing control