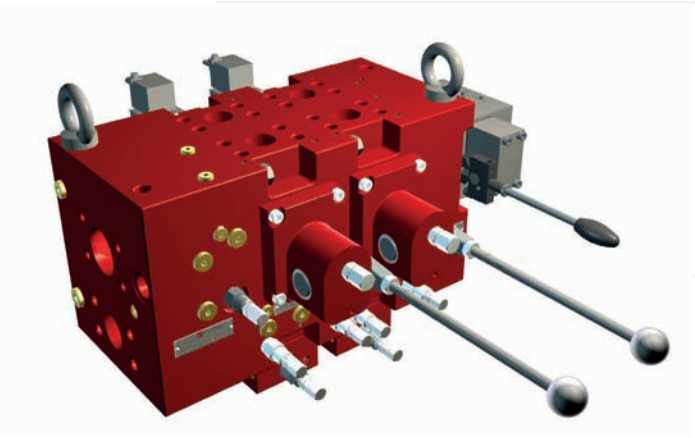
SECTION VALVE

HSV - 600

- Proportional modular valve
- Combination with HAWE PSL
- Pressure compensated
- Load sensing



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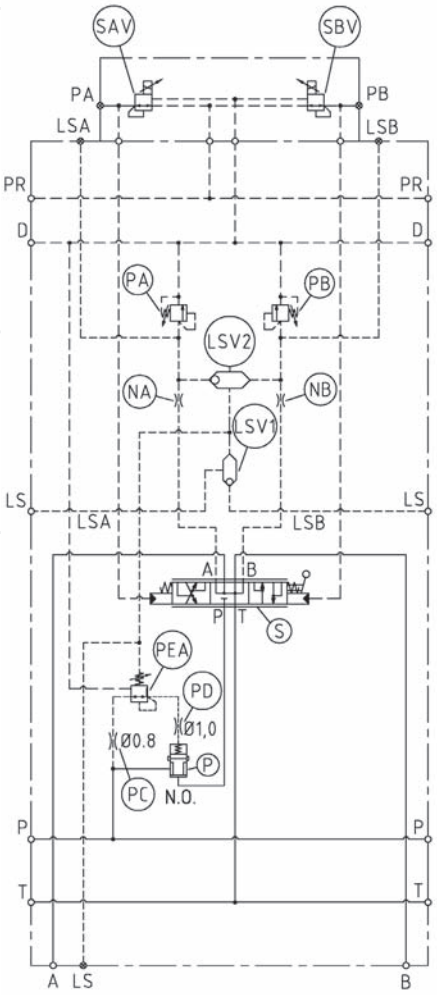

SERVI GROUP
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1. TECHNICAL DATA

Hydraulic features			
		Metric	**Imperial**
Rated flow[1)]	Inlet Section	1000 l/min	265 gpm
	Working section	0-600 l/min	0 - 160 gpm
Max working pressure	Port P, A and B	350 bar	5100 psi
	Drain D	< 10 bar	145 psi
	Return to T	< 10 bar	145 psi
	Test pressure	420 bar	6100 psi
Pilot pressure to spool	Port PA and PB	5-19 bar	73 - 276 psi
Spool	Stroke	± 9 mm	± 0,35 in
	Dead band	± 1,5 mm	± 0,06 in
	Proportional	± 7,5 mm	± 0,3 in
Oil temperature	Min	-20 °C	-4 °F
	Max	+70 °C	+158 °F
Ambient Temperature		-20 °C to +50 °C	-4 °F to 122 °F
Viscosity	Min	4 mm²/s	39 SUS
	Max	460 mm²/s	2090 SUS
Filtration	Max. contamination, class	20/18/15 at ISO 4406	NAS 9 at NAS 1638
HAWE working sections	For more information see HAWE datasheet D7700		
Weight sections	Inlet	34 kg	75 lb
	Working section	45 kg	99 lb
	Adapter/end plate HSV-600	34 kg	75 lb
	HAWE module SL5	4.5 kg	10 lb
	End plate HAWE	2.2 kg	5 lb
Seals	Standard	NBR - Buena Nitril	
Surface treatment			
Painting	Standard	2-compoment epoxy primer	
	Optional	On request	

1) ΔP see Fig. 2

Solenoid Data					
Coil type	**G12**	**G24**	**AMP Junior Timer**	**Deutsch DT 04-4P**	**G24TEX455**
Nom. voltage	12V DC	24V DC			
Current range	0-1.26 A	0-620 mA			0-630 mA
Nominal current	1.9 A	900 mA			880 mA
Coil resistance R20	6.3 Ω	26.6 Ω			
Required dither freq.	40-70 Hz (Best 55 Hz)				
Dither amplitude	20%<DA≤35%				
Ambient temperature	-20°C.....+60°C				-35°C.....+55°C
Protection class	IP65			IP67	
Connection	4 pin IP65 acc to IEC 60529		4-pin AMP Junior Timer	4-pin Co. DEUTSCH DT 04-4P suited for socket DT 06-4S	Flying lead IP67 acc. to IEC 60529
Cable type	N/A				Öflex 440P, 4 x 0.5 mm^2
IECEx Certificate					IECEx IBE 11.0016 X
EU type Certificate					IECExU11ATEX1109 X - IBE11.0016
Ex. protection marking					Ex d IIB T4 Gb
For more info see HAWE datasheet D7700 table 10					

2. INTRODUCTION

The Hydranor section valve is a load sensing proportional directional valve, it is load independent with stepless hydraulic actuator speed. With this system several actuators can be moved simultaneously, independent of each other. HSV600 is especially designed for marine surroundings, and can be used to control a wide range of hydraulic equipment, typically cranes, winch systems, drilling equipment etc.

The modular design incorporates one inlet section and a number of working sections.

INLET SECTION:

- Connections for pressure, return, drain and load sense signal.
- Measuring points.
- Pump versions:
    1. Inlet sections for variable pump system with pressure relief valve P-T.
    2. Inlet section for fixed displacement pumps with integrated by-pass compensator P-T.

WORKING SECTION:

- Proportional controlled directional valve with stroke limitation. To be controlled either by one of the options below, or combinations.
    1. Electro proportionally
    2. Hydraulic remote control
    3. Manually with hand lever

- Pressure compensated flow control with individual pressure limiter valves in A and B port.
- Load sensing by each section.
- Flow up to 600 l/min [160 gpm].
- Option with spool position sensor (LVDT).
- For HAWE sections see HAWE datasheet D7700.

ADAPTER PLATE:

- Extra P and T ports.
- Optional adaption to HAWE SL proportional valve.

END PLATE:

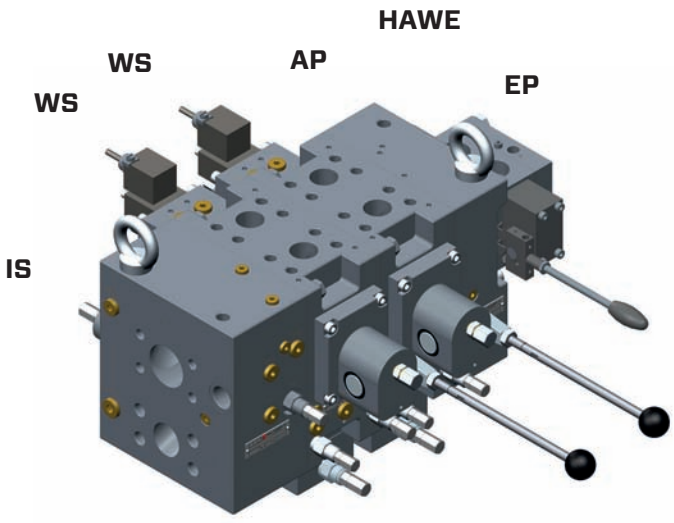
- For HSV600 extra P and T port.
- For more information see HAWE datasheet D7700

3. ORDER INFORMATION

All modules have individual codes depending on valve functions, and adjustment values. The valve on the right would have the following codes:

Top code for complete Servi Hydranor section valve:
HSV600-M - A2 – B1 – 0001

Inlet section: **IS-M – V**
Working section 1: **WS-M – E1 – G24 - 9C**
Working section 2: **WS-M - E1 – G24 - 9C**
Adapter plate: **AP-M - SL5**
Hawe section 1: **SL5 52 H 160/160 A200 B200/EA**
End plate: **EP – E1**



4. ORDERING CODE

TOP CODE **HSV600-M** **A2** **B1** **–** **0001**

VALVE
- **HSV600-M** - Hydranor section valve - metric interfaves
- **HSV600-I** - Hydranor section valve - imperial interfaces

WORKING SECTION HSV600
- **A#** - Total number of working sections (WS)

WORKING SECTION HAWE
- **B#** - Total number of HAWE sections
- **Omit** - N/A

SEALS
- **V** - Viton
- **Omit** - Buena Nitril - (standard)

SERIAL NUMBER
- **Omit** - Given by valve combination after ordering

INLET SECTION

IS-M V D - / 250

SECTION
- **IS-M** - Inlet section - metric interfaces
- **IS-I** - Inlet section - imperial interfaces

PUMP SYSTEM
- **V** - Variable pump
- **F** - Fixed pump

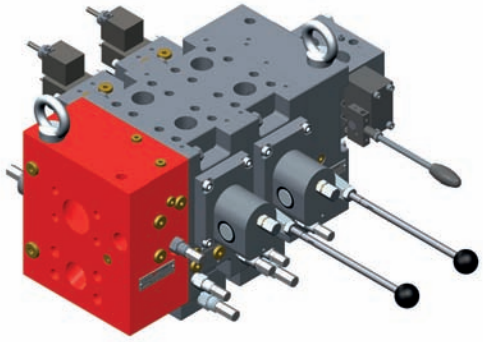
LOAD SENSING CONTROL
- **D** - Electrical drain of LS signal
- **S** - Electrical switch between fixed/adjustable LS pressure
- **06** - LS drain with 0.6 [0.024 in] nozzle
- **None** - LS drain plugged - (standard)

SOLENOID[1)]
- **OAI** - Ex solenoid (IECEx) 24VDC
- **Omit** - N/A or non EX

SETTING FOR PRESSURE RELIEF VALVE
- **...** - Custome pressure setting - (adjustment range 10,5 - 420 bar [152-6090 psi])
- **Omit** - 250 bar [3626 psi] - (standard)

1). Other solenoid options available on request

IS



WORKING SECTION

WS-M E1 G24 - 9C - - / A210B210

SECTION
- **WS-M** - Working section - metric interfaces
- **WS-I** - Working section - imperial interfaces

ACTIVATION OF SPOOL
- **E** - Electro proportional without hand lever
- **E1** - Electro proportional with hand lever
- **H** - Hydraulic remote without hand lever
- **H1** -Hydraulic remote with hand lever
- **M** - Manual with hand lever

SOLENOID[1)]
- **G12** - 12V DC connection conf. DIN EN 175 301-803 A
- **G24** - 24C DC connection conf. DIN EN 175 301-803 A
- **G24TEX455** - 24V DC explosion-proof version Protection class EEx d II B (T4)
- **AMP24** - 24V DC connection via AMP Junior Timer
- **DT24** - 24V DC connection via plug Co. DEUTSCH DT 04-4P, suited for socket DT 06-4S
- **Omit** - N/A

CABLE LENGTH FOR Ex COIL
- **3** - 3m [9 ft] cable
- **10** - 10 m [32 ft] cable
- **Omit** - N/A

SPOOL TYPE - SEE FIG. 1

• **9C**	In neutral: A, B, LSA, LSB to T Flow 275-600 l/min [73-160 GPM]	Meter in throttling
• **9C2**	In neutral: A, B, LSA, LSB to T Flow 150-400 l/min [40-106 GPM]	Meter in throttling
• **9Y**	In neutral: A, B closed, LSA, LSB to T Flow 275-600 l/min [73-160 GPM]	Meter in throttling
• **9Y2**	In neutral: A, B closed, LSA, LSB to T Flow 150-400 l/min [40-106 GPM]	Meter in throttling
• **9X**	In neutral: A, B closed, LSA, LSB to T Flow 250-500 l/min [66-132 GPM]	Meter in/out throttling
• **9X2**	In neutral: A, B closed, LSA, LSB to T Flow 150-400 l/min [40-106 GPM]	Meter in/out throttling
• **	Other spools on request	

1). More options available, see HAWE datasheet D7700 table

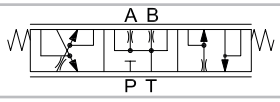
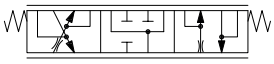
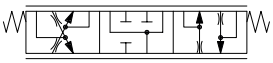
WS-M E1 G24 - 9C - - / A210B210

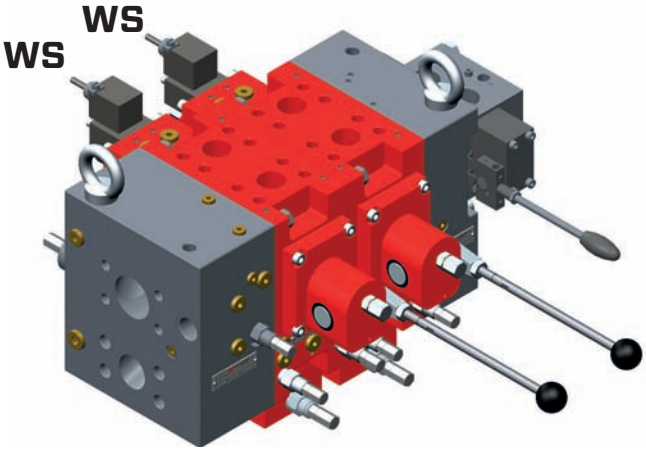
SPOOL POSITION SENSOR
- **F** - With LVDT 4/20 mA
- **Omit** - Without LVDT - (standard)

COMBINATION PLATE
- **C** - Connect two working sections with combination plate - Flow: up to 1200 l/min [317 GPM]
- **Omit** - Without combination plate - (standard)

SETTING FOR PRESSURE LIMITER A/B PORT
- **A...B...** - Custom pressure setting - (adjustment range 70 - 350 bar [1015-5100 PSI])
- **Omit** - PA 210 bar / PB 210 bar- [3046 PSI] (standard)

Fig.1

CODE	SPOOL DRAWING
9C, 9C2*	
* 9C/9C2 - In neutral A and B got 10% opening	
9Y, 9Y2	
9X, 9X2	



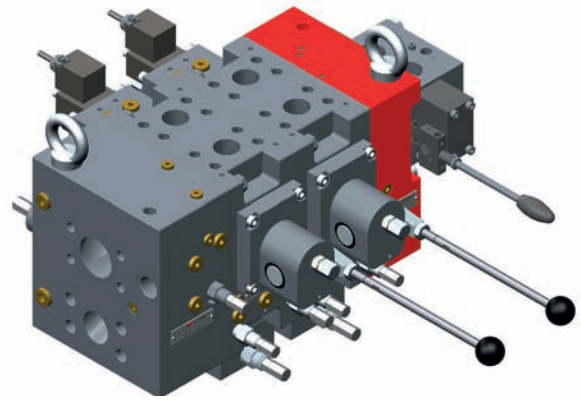
ADAPTER

AP-M **SL5**

SECTION
- **AP-M** - Adapter plate - metric interfaces
- **AP-I** - Adapter plate - imperial interfaces

ADAPTION TO
- **EP** - No adaption to HAWE - (End plate)
- **SL5** - Adaption to HAWE section SL5

AP



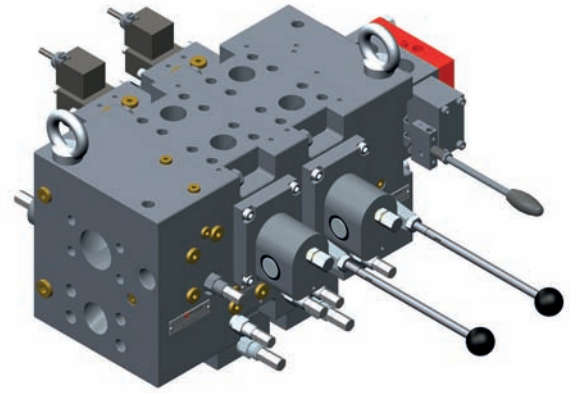
END PLATE

EP **E1**

TYPE OF VALVE SECTION
- **EP** - End plate

END PLATE
- **E1** - End plate - (standard)
- **E#** - Other options see HAWE datasheet D7700

EP

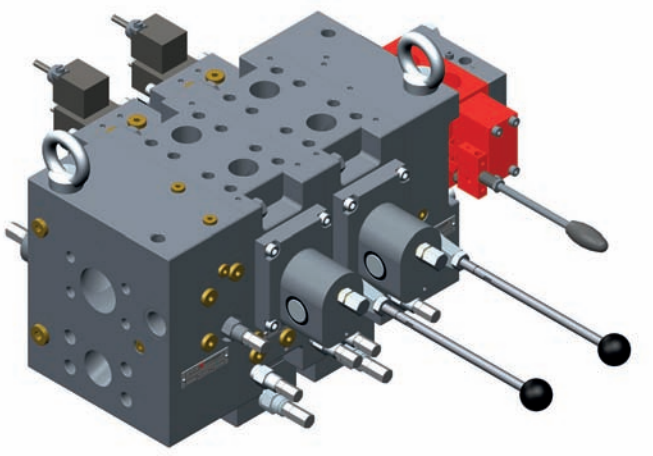


HAWE section – prop. directional spool valves

Features and benefits:

- One product for various control function and flow rates
- Energy-saving closed-center systems
- Compact and lightweight design
- Modular system with wide range of design variants

HAWE



Actuation:

- Manual
    - Return spring
    - Detent
- Electro-hydraulic
- Pressure-actuated
    - Hydraulic
    - Pneumatic

$Q_{max.}$ consumer:

- 3 ... 200 l/min [1 – 53 GPM]

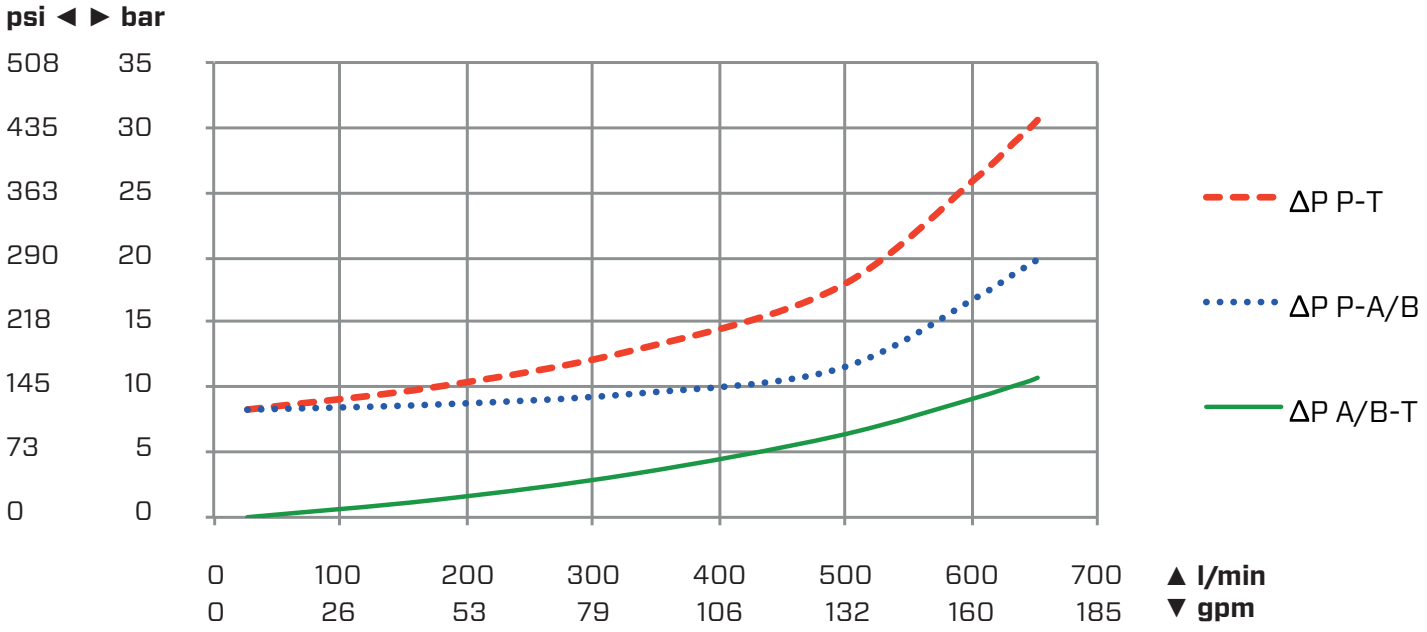
For more information see HAWE datasheet D7700

6. CONTROL CURVES

Characteristics pressure drop curves with 9C spool

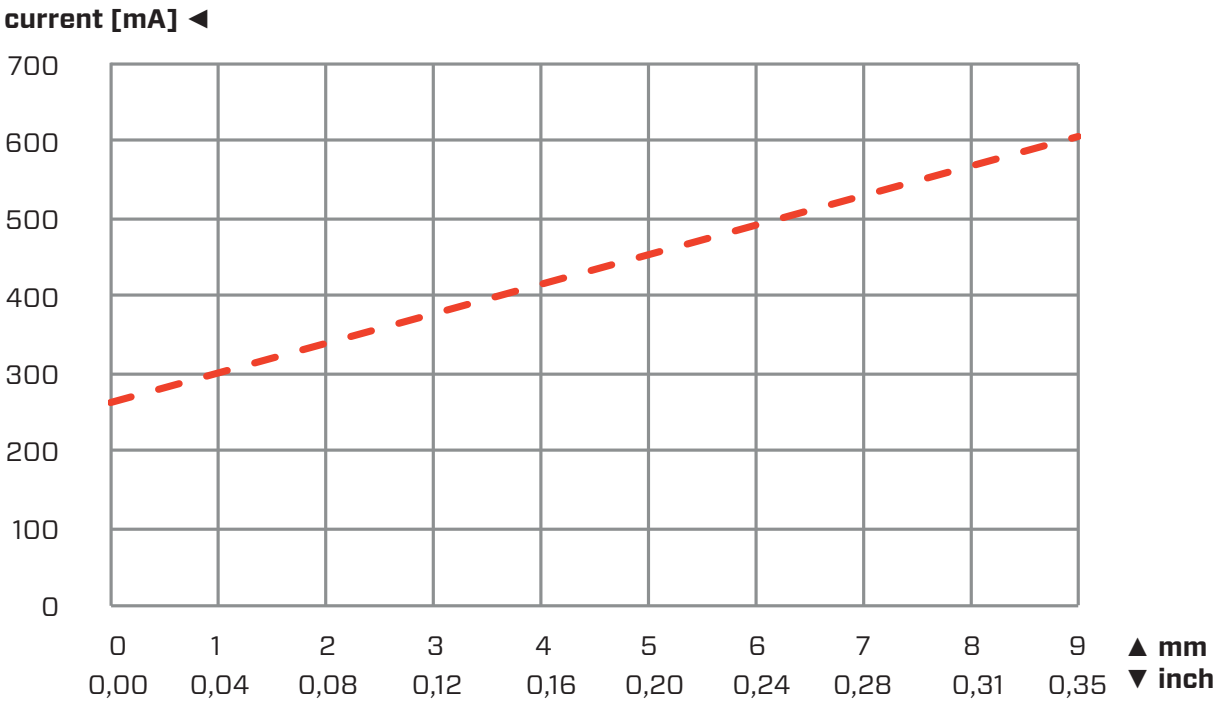
Pressure drop measured from inlet section P port to working section A/B port.
Return flow from A/B to T port inlet section.

Fig. 2



9C spool movement against mA signal to proportional coil

Fig. 3



Performance curve flow vs command signal to proportional coil

Performance curves for rated flow vs command signal to proportional coil with pressure compensator pilot valve PA set to max flow 300 l/min [79 GPM], 450 l/min [119 GPM] and 600 l/min [160 GPM], with spool 9C.

Fig. 4

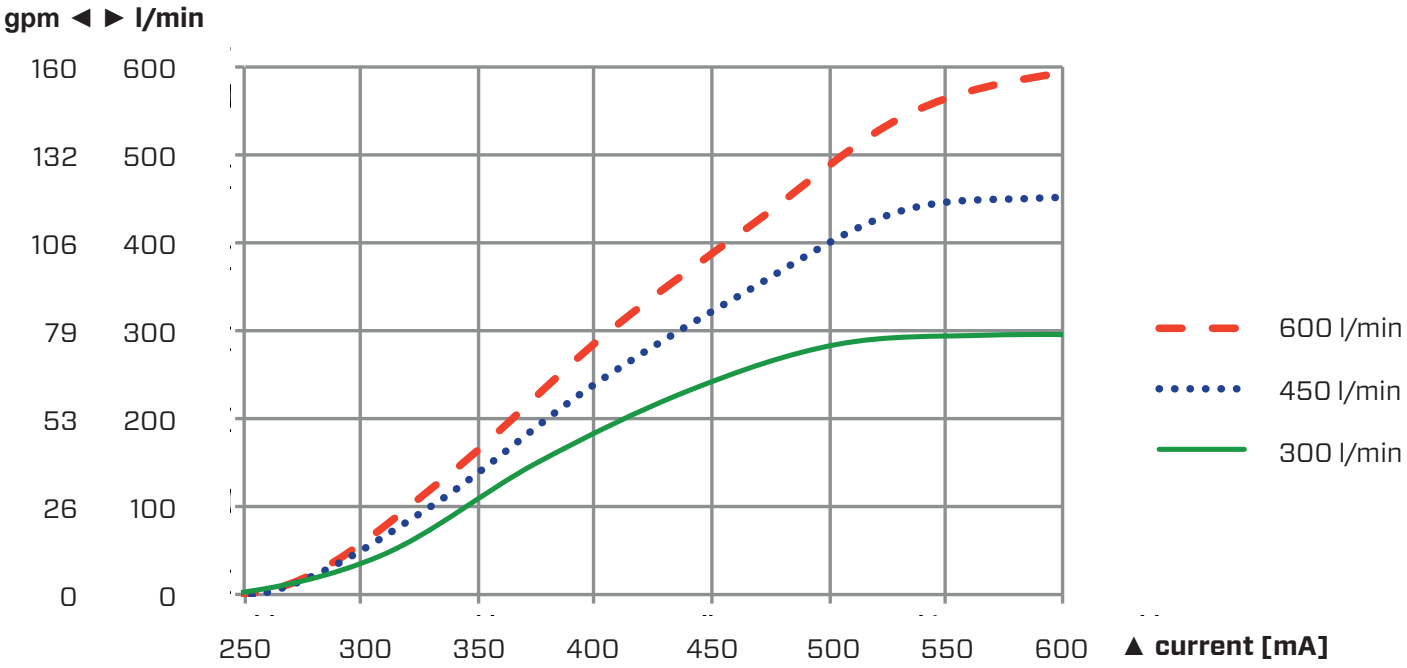


Fig. 5

COMPENSATOR ADJUSTMENT FOR MAX FLOW (+-10%) FOR SPOOL 9C		
Minimum	260 l/min	69 GPM
Turn clockwise 1 turn from minumum	310 l/min	82 GPM
Turn clockwise 2 turn from minumum	370 l/min	98 GPM
Turn clockwise 3 turn from minumum	430 l/min	114 GPM
Turn clockwise 4 turn from minumum	490 l/min	129 GPM
Turn clockwise 5 turn from minumum	540 l/min	143 GPM
Turn clockwise 6 turn from minumum	600 l/min	160 GPM

Characteristics pressure drop curves with 9X2 spool

Fig. 6

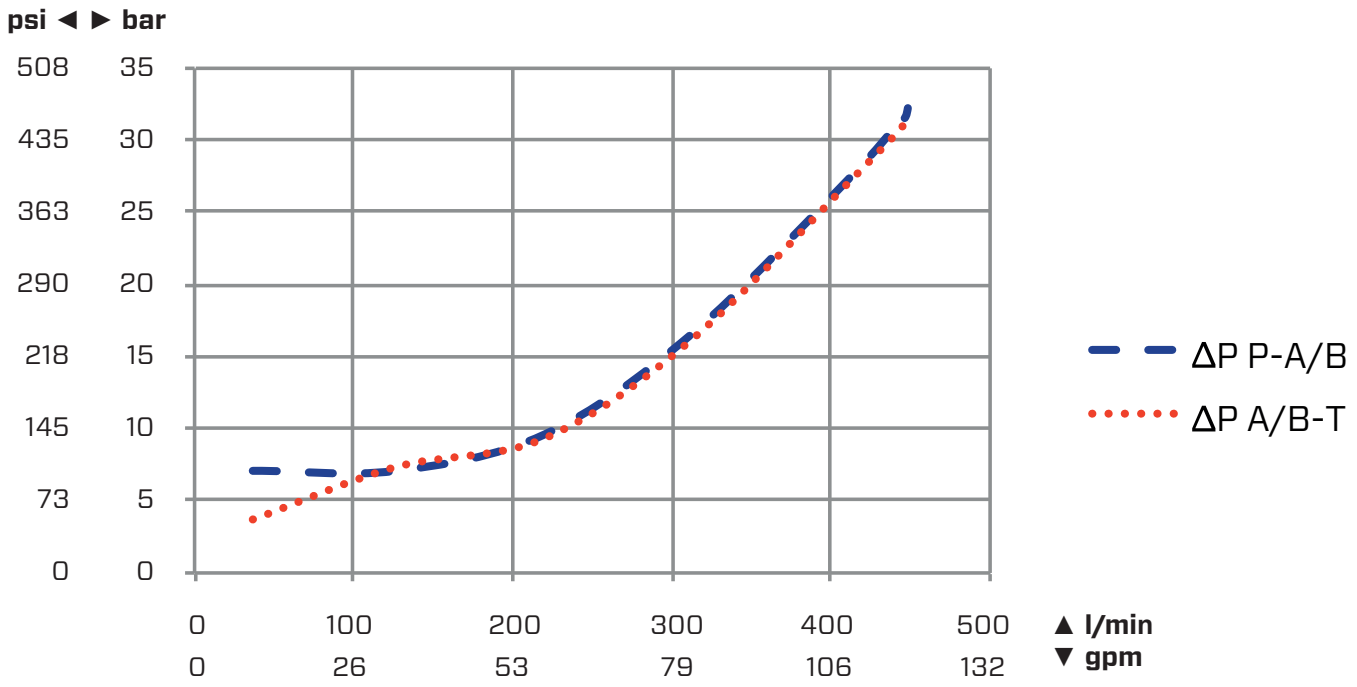


Fig. 7

COMPENSATOR ADJUSTMENT FOR MAX FLOW (+-10%) FOR SPOOL 9X2		
Minimum	150 l/min	40 GPM
Turn clockwise 1 turn from minumum	190 l/min	50 GPM
Turn clockwise 2 turn from minumum	230 l/min	61 GPM
Turn clockwise 3 turn from minumum	260 l/min	69 GPM
Turn clockwise 4 turn from minumum	300 l/min	79 GPM
Turn clockwise 5 turn from minumum	340 l/min	90 GPM
Turn clockwise 6 turn from minumum	380 l/min	100 GPM
Turn clockwise 6.5 turn from minumum	400 l/min	106 GPM

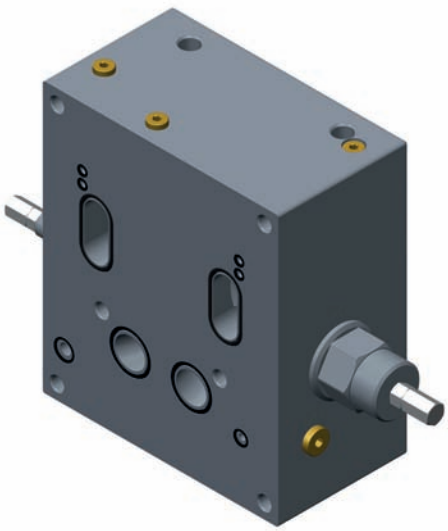
INLET SECTION

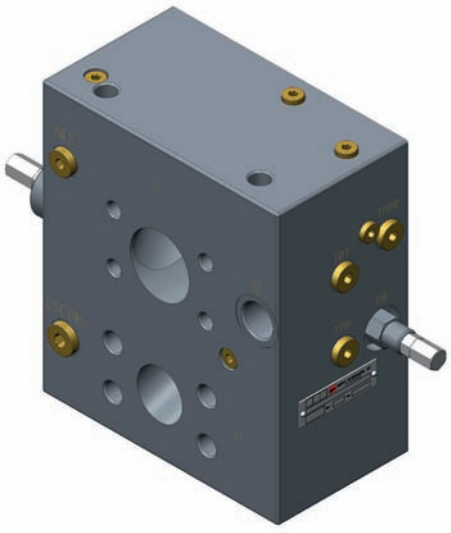
Minimess **Minimess – TPLS/TPP**
Inlet section is standard delivered with minimess on TPLS and TPP.

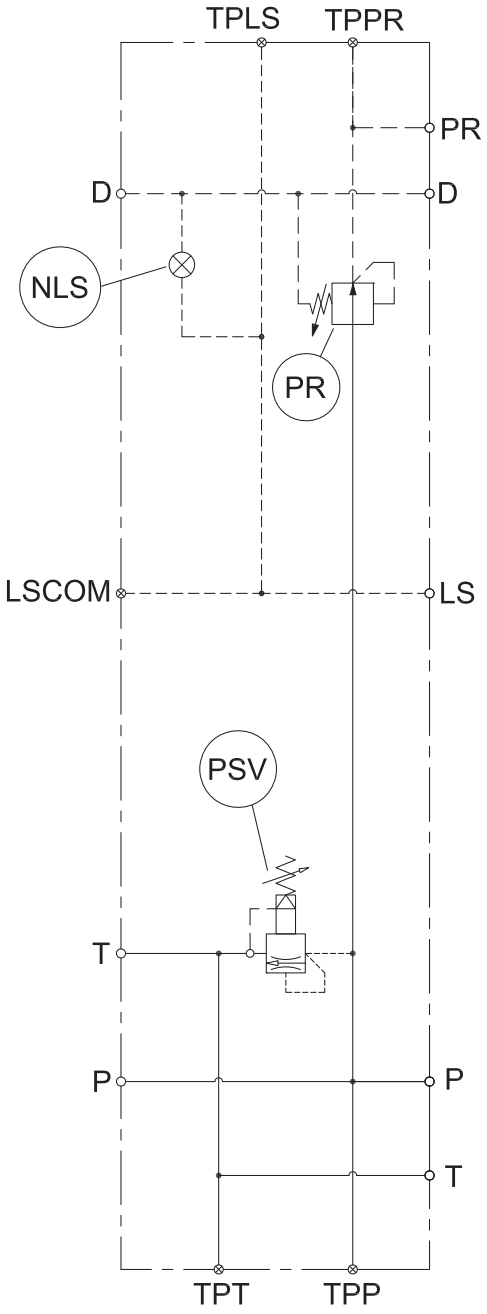
Item PSV **Pressure relief valve P-T**
Pilot operated pressure relief valve to secure the hydraulic system.
If presetting is not stated in the order, the pressure relief valve item PSV is set to 250 bar [3626 psi].

Item PR **Pressure reducing valve**
Pressure supply to electro/hydraulic valve on each working section.
Preset to 25 bar [363 psi].

Inlet section: **IS-M – V**
With section schematic.







WORKING SECTION

Item S — **Directional control valve 4/3**
Three-position proportional direction spool with spring return to position 0. The spool has adjustable end stoppers in both end covers to limit the spool stroke. A shorter travel of the spool will result in decrease of maximum flow through the valve.

Item P & PEA — **Pressure compensator system**
Load independent system, which means a fixed spool stroke on the directional valve will give equal flow independent of the load at the actuator.

Main directional spool (S) in conjunction with pressure compensator element (P) forms a pressure compensated flow control system, and regulates proportional oil flow to either A or B port by sensing the load pressure. When operating directional valve (S), the spool opens progressively for flow either to A or B port. Pressure compensation element (P) will maintain equal Δp across the directional valve. Maximum flow over the main directional valve is dependent on the force induced on the pressure compensator element (P). This force is made up of a spring force in the compensator element item (P), the load in A or B, and the setting on the pilot valve item PEA. When adjusting force at the pressure compensator element (P), Δp through the directional valve alters, thus causing maximum flow to the hydraulic actuator.

Item P — **Pressure compensator element**
Normally open modulating element, which acts as a pressure compensator to maintain a constant pressure drop across the directional valve.

Item PEA — **Pilot valve for the pressure compensator**
Spring on the valve PEA is adjusted to a given ΔP, set to a requested flow from P to A or B. ΔP cannot be higher than ΔP on the Load sensing pump. The pilot valve PEA can handle up to Δ28 bar [406 psi].

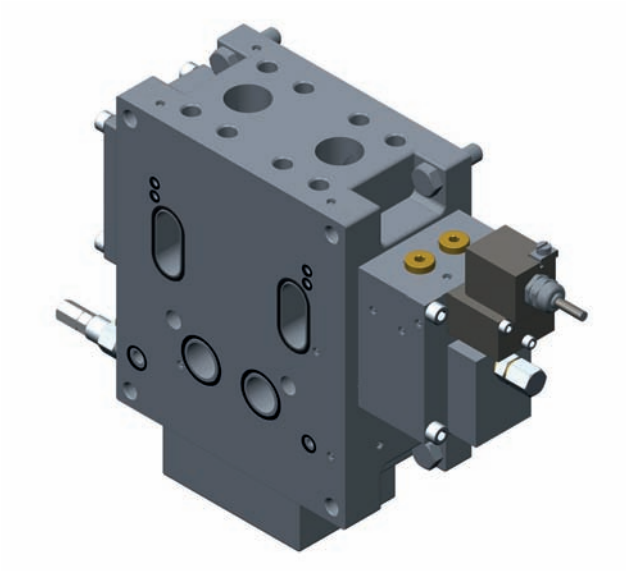
Item LSV — **Shuttle valve for load sensing pressure**

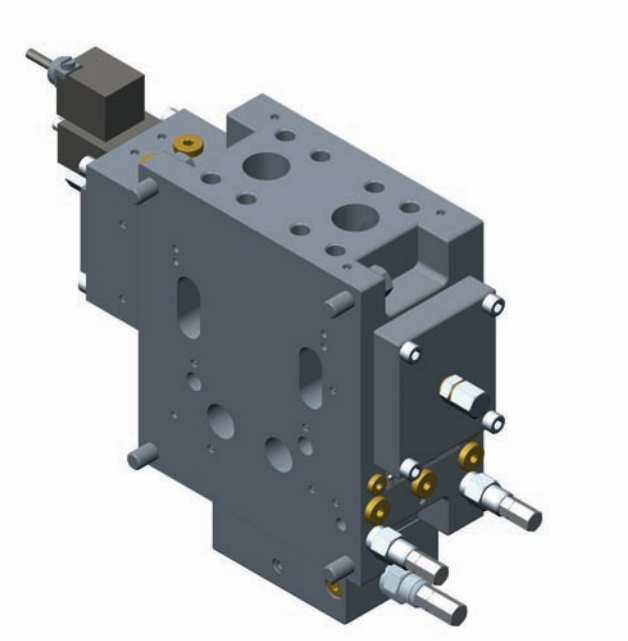
Item PA/PB — **Pressure limiter for A/B port**
Adjustable direct operated pressure relief valve, to pressure limit port A or B. When pressure in port A, respectively B, increase up to the preset setting, item PA for A and PB for B port start to open , and the compensator load sensing signal will prevent the compensator from opening for even higher pressure.

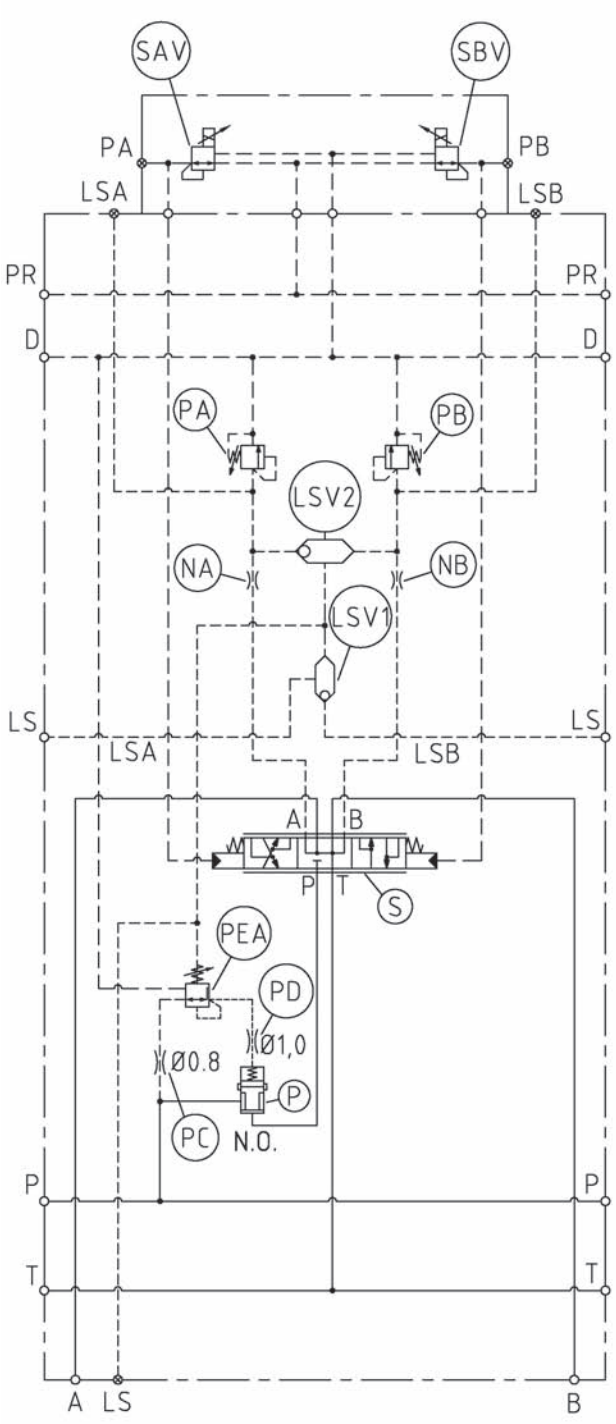
If presetting is not stated in the order, the pressure relief valve item PA/PB is set to 210 bar [3046 psi].

Item SAV/SBA — **Item SAV/SBA Electro operated proportional pressure reducing valve**
Proportional 3/2 electric operated pressure reducing valve HAWE PMZ 1, remote control of main directional spool position.

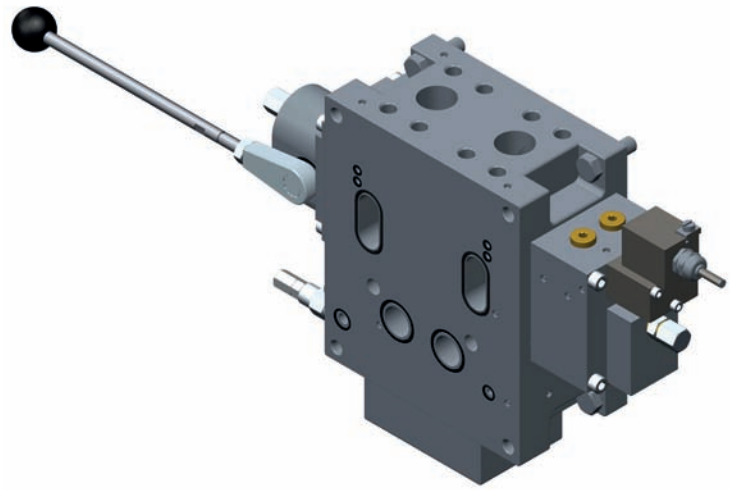
Working section: **WS-M - E - G24 - 9C** (without hand lever)
With section schematic.

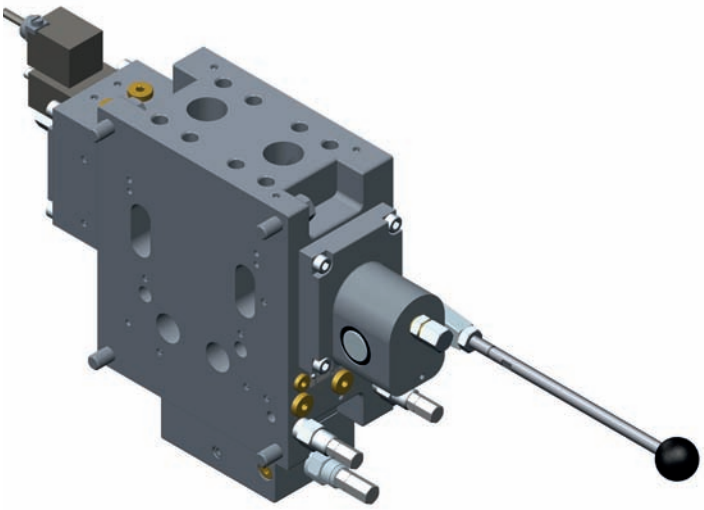


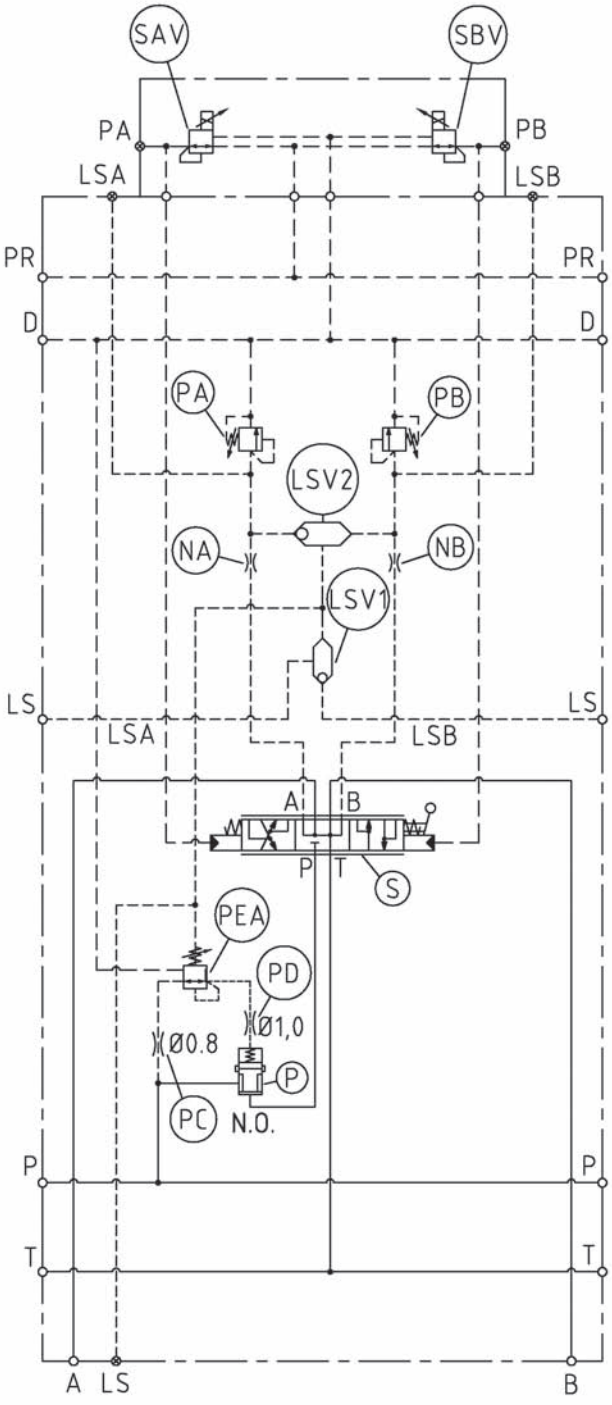




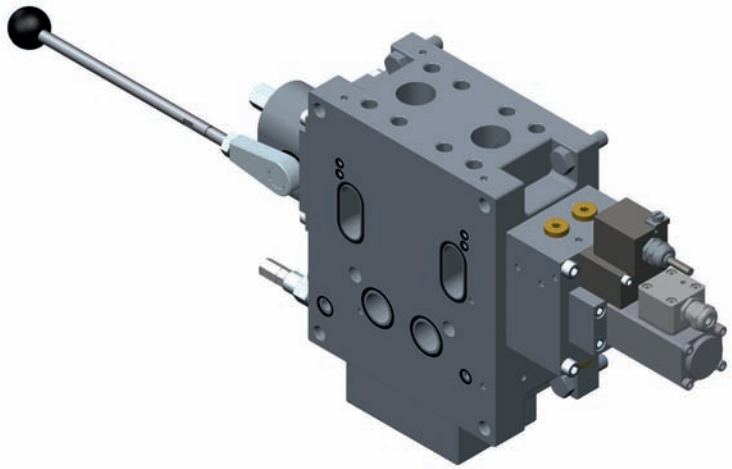
Working section: **WS-M - M - E1 - G24 - 9C** (with hand lever)
With section schematic.

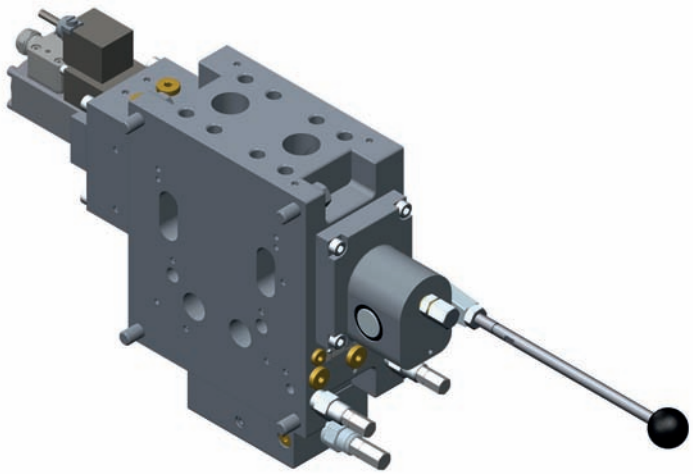


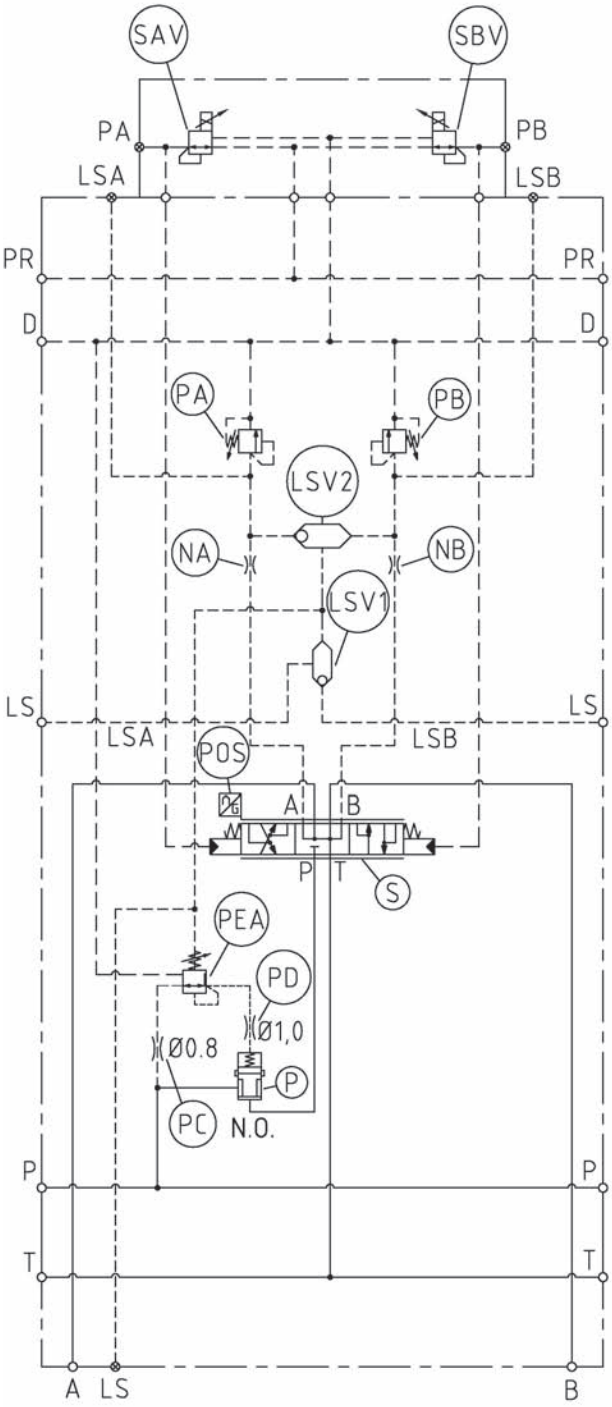




Working section: **WS-M - E1 - G24TEX455 - 10 - 9C - F** (with hand lever)
With section schematic.

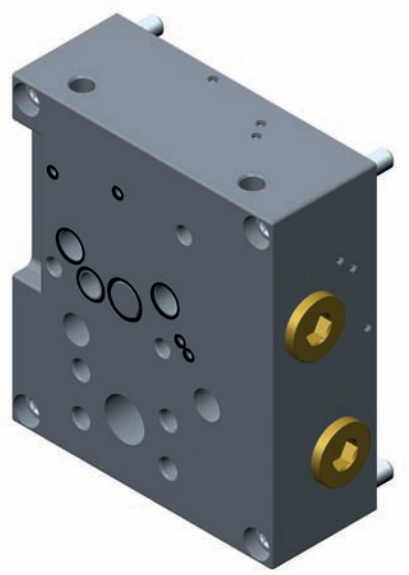


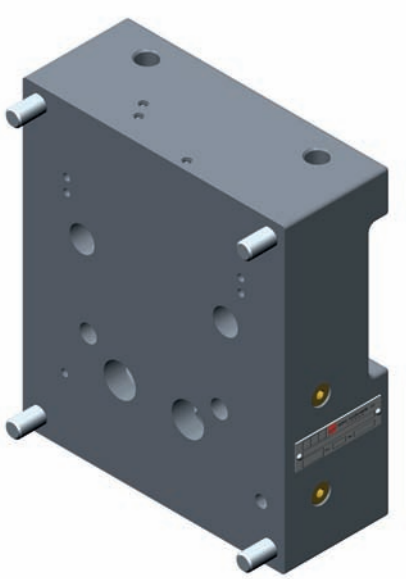


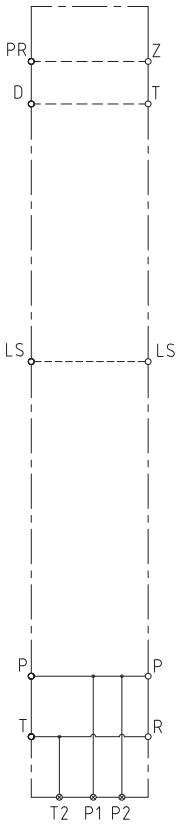


ADAPTER

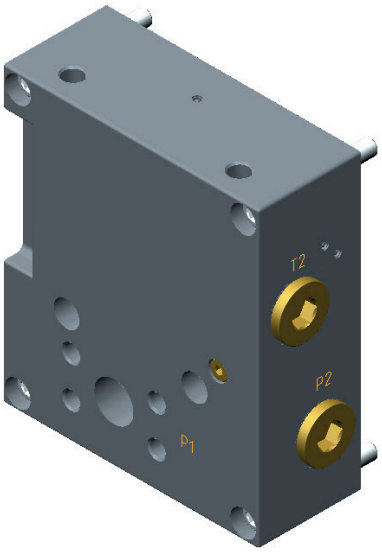
Adapter plate: **AP-M - SL5** (The adapter provides transition to Hawe SL5 section.)
With section schematic.

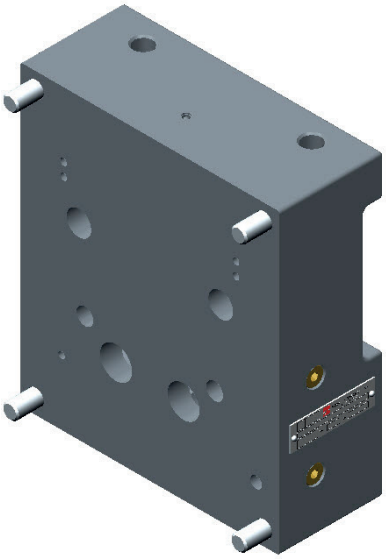


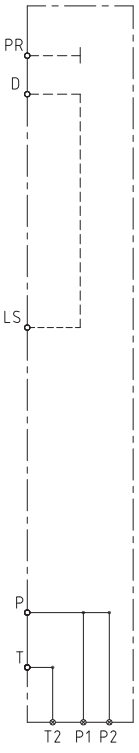




Adapter plate: **AP-M - EP** (The adapter serves as end plate)
With section schematic.

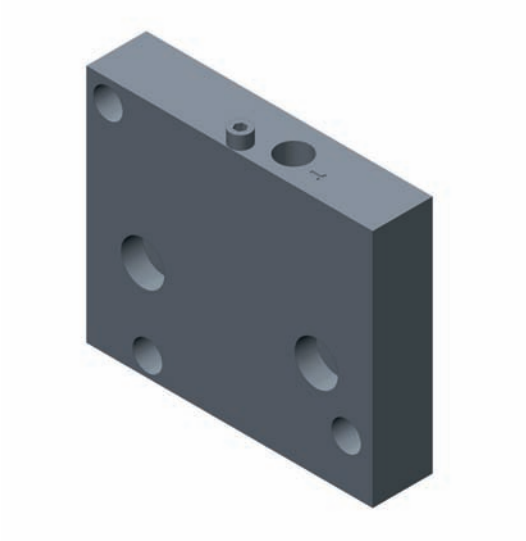


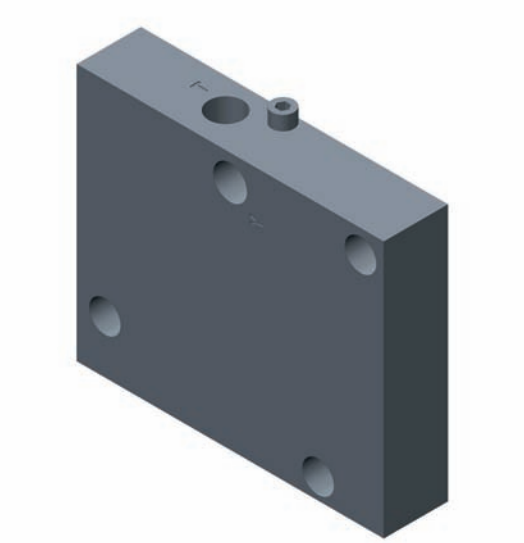


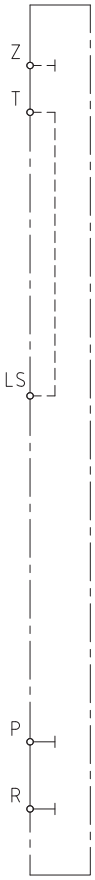


END PLATE

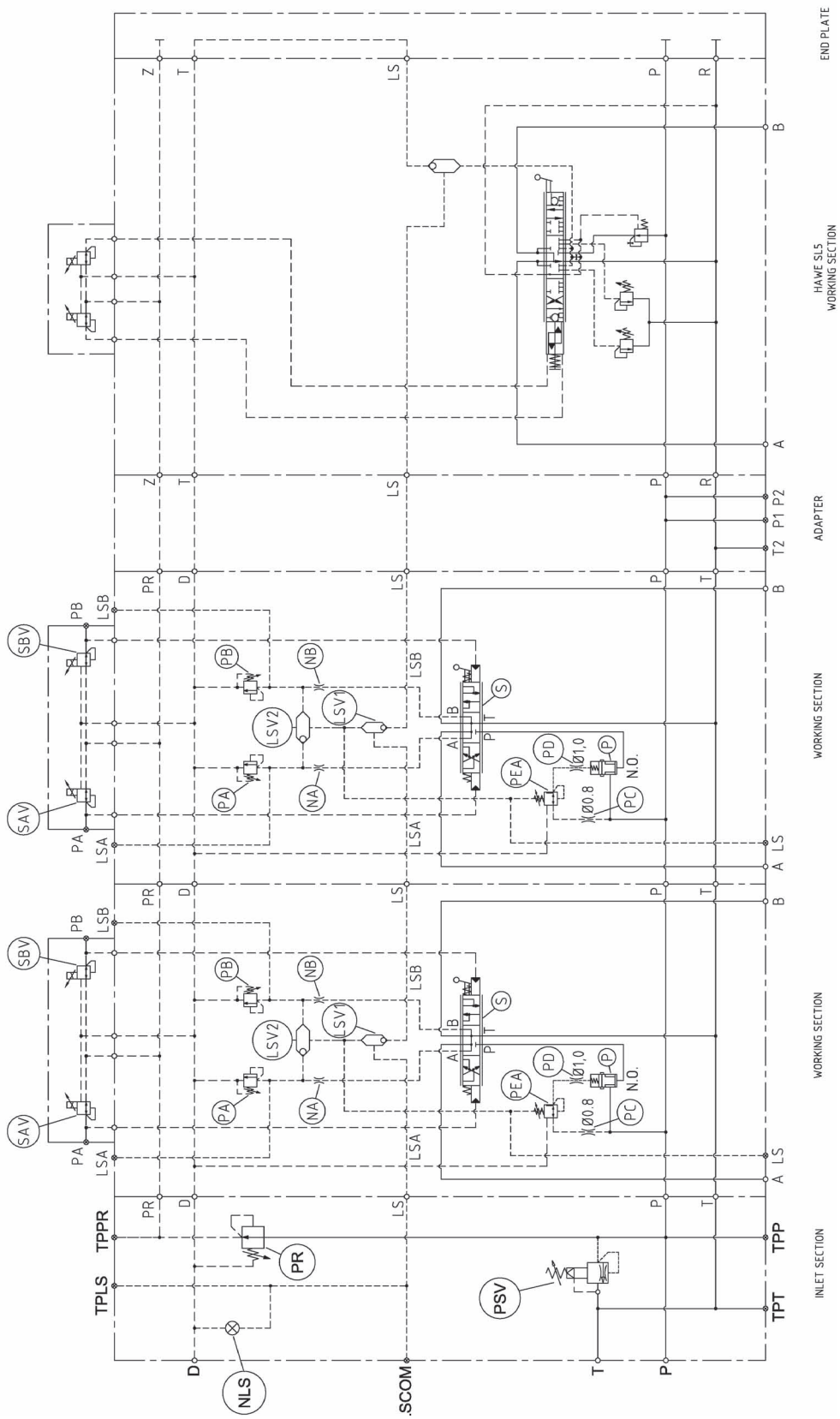
End plate: **EP – E1** (The plate serves as end cap for Hawe SL5)
With section schematic.







9. HYDRAULIC SCHEMATIC DRAWING

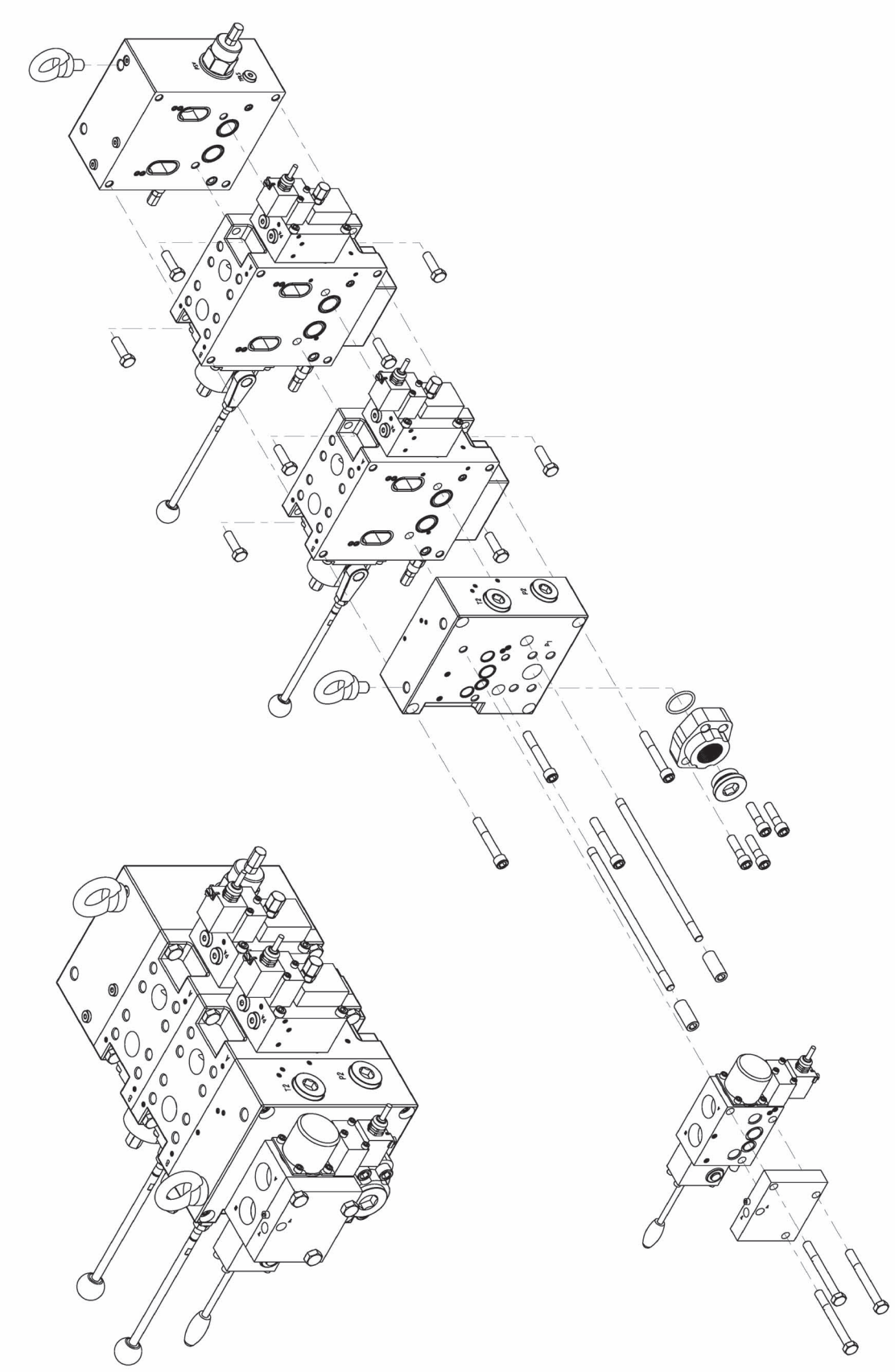


10. INTERFACES

Metric				
Connections	**Port**	**Dimension**	**Pmax**	**Mounting screw**
Inlet section	P	1 ½" SAE 6000	350 bar	M16 x 60
	T	2" SAE 3000	10 bar	M12 x 50
	D	3/4" BSPP	10 bar	
	LSCOM	3/8" BSPP	350 bar	
	TP**	1/4" BSPP		
Valve section	A and B	1 ¼ SAE 6000	350 bar	M14 x 50
	LSA, LSB	1/4" BSPP	350 bar	
	LS	1/4" BSPP	350 bar	
	PA, PB	1/4" BSPP	30 bar	
Adapter plate	P1	1 ¼" SAE 6000	350 bar	M14 x 50
	P2	1" BSPP	350 bar	
	T2	1" BSPP	10 bar	
Mounting screw	4 x M16, thread depth 25 mm			

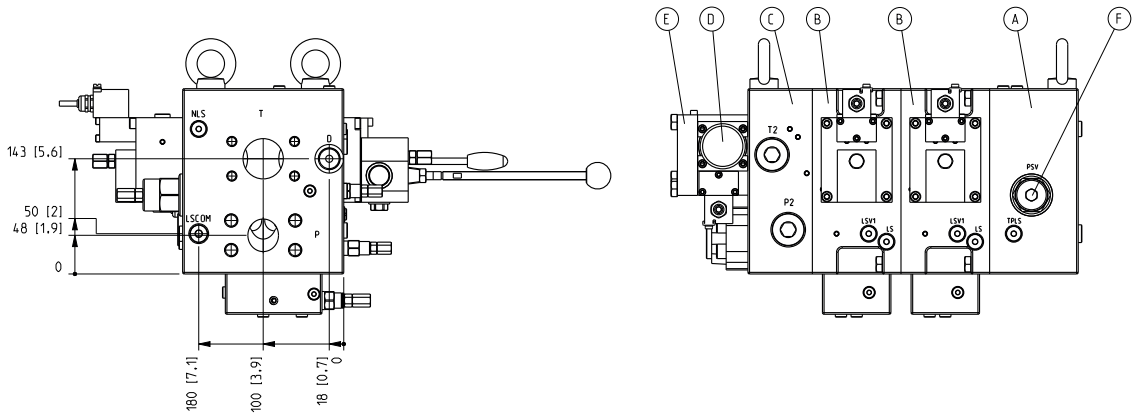
Imperial				
Connections	**Port**	**Dimension**	**Pmax**	**Mounting screw**
Inlet section	P	1 ½" SAE 6000	5100 psi	5/8" x 2 ½" UNC
	T	2" SAE 3000	145 psi	1/2 x 1 ¾ UNC
	D	1 1/16-12 UN (SAE-12)	145 psi	
	LSCOM	9/16-18 UN (SAE-06)	5100 psi	
	TP**	7/16-20 UN (SAE-04)		
Valve section	A and B	1 ¼ SAE 6000	5100 psi	1/2 x 1 ¾ UNC
	LSA, LSB	7/16-20 UN (SAE-04)	5100 psi	
	LS	7/16-20 UN (SAE-04)	5100 psi	
	PA, PB	7/16-20 UN (SAE-04)	435 psi	
Adapter plate	P1	1 ¼" SAE 6000	5100 psi	1/2 x 1 ¾ UNC
	P2	1 5/16-12 UN (SAE-16)	5100 psi	
	T2	1 5/16-12 UN (SAE-16)	145 psi	
Mounting screw	4 x 5/8-11 UNC, thread depth 1"			

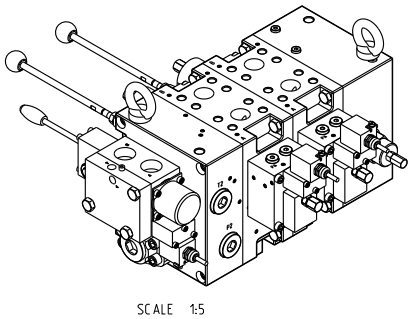
11. INSTALLATION

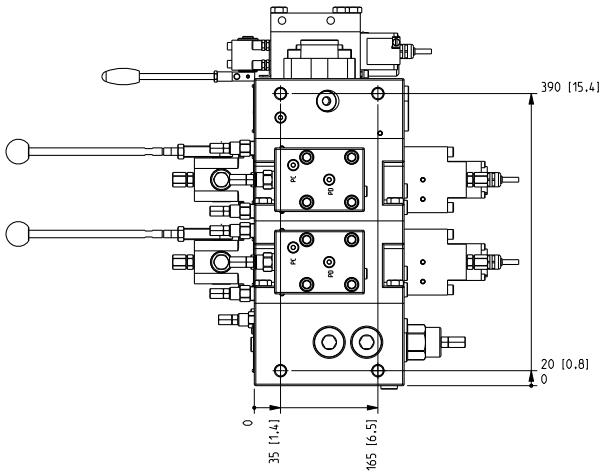


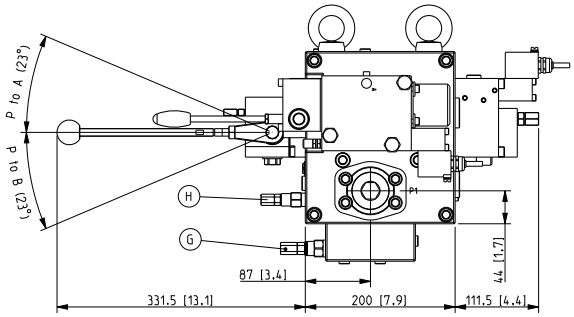
12. GRAPHIC INFORMATION

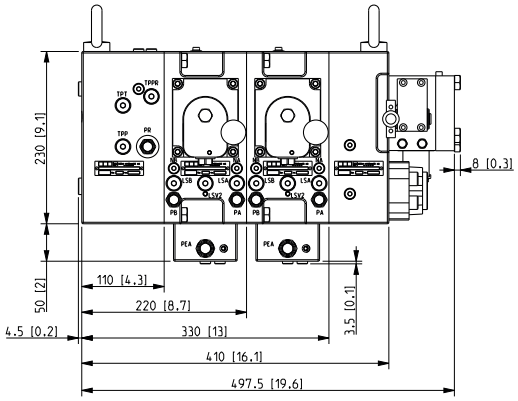
Position	Quantity	Description
A	1	Inlet section
B	2	Working section
C	1	Adapter plate
D	1	Working section
E	1	End plate
F	1	Pressure relief valve
G	2	Pressure comp pilot valve
H	4	Pressure limiter valve

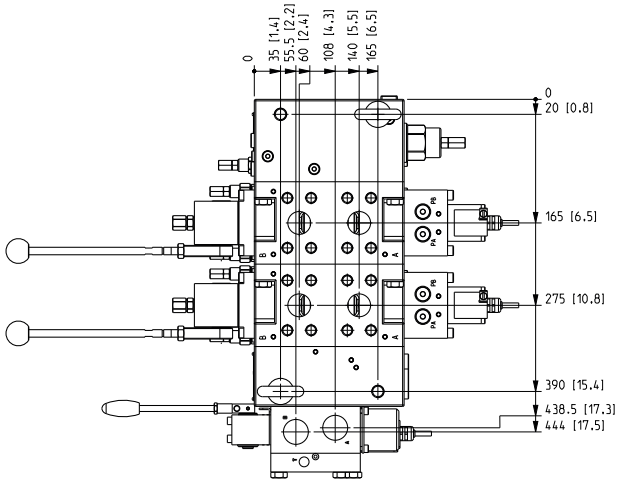


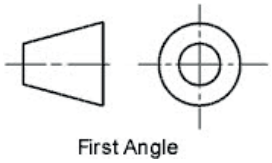



390 [15.4]
20 [0.8]
0
0
35 [1.4]
165 [6.5]


P to A (23°)
P to B (23°)
H
G
87 [3.4]
331.5 [13.1]
200 [7.9]
111.5 [4.4]
44 [1.7]


230 [9.1]
8 [0.3]
50 [2]
4.5 [0.2]
110 [4.3]
220 [8.7]
330 [13]
410 [16.1]
497.5 [19.6]
3.5 [0.1]


0
35 [1.4]
55.5 [2.2]
60 [2.4]
108 [4.3]
140 [5.5]
165 [6.5]
0
20 [0.8]
165 [6.5]
275 [10.8]
390 [15.4]
438.5 [17.3]
444 [17.5]


First Angle

13. INSTALLATION

The HSV600 can be installed in any position onto a bracket or foundation. Refer to “Interfaces”, for details about screws.

14. OPERATION

The valve can be operated either electro proportionally, by hydraulic remote control or manually by a hand lever or by any combination of those mentioned.
It is delivered with a centering spring which ensures that the spool returns to neutral position after operation.

Electro proportional - An electric signal applied to the 3/2 proportional reducing valve will create a pressure which is proportional to the current applied on the PA/PB port. The pilot pressure moves the spool to requested position.

Hydraulic directly - external pilot pressure moves the spool to the requested position. Pilot pressure is 5-19 bar [73 – 276 psi]. The valve is equipped with hand lever for overriding the pilot pressure.

Manual control - by hand lever.

15. ADJUSTMENT

PRESSURE LIMITER IN A OR B:

Maximum working pressure in port A or B can be adjusted by pilot valve PA/PB. Install a pressure gauge to the valve port LSA or LSB, and turn the adjustment screw until requested pressure is achieved.

- Connect pressure gauge to port LSA or LSB.
- Block the actuator.
- Loosen cap nut and nut for the relief valve adjusting screw (item PA/PB).
- Switch directional valve to position A or B.
- Turn adjusting screw clockwise to increase pressure setting for the pressure relief valve (item PA/PB). Turn adjusting screw counter clockwise to decrease pressure setting for the pressure relief valve (item PA/ PB).

  Complete adjustment range is 5 turns.

- Tighten nut and cap nut for (item PA/PB).

ADJUSTMENT OF MAX FLOW

- Loosen cap nut and nut for the adjustable pilot valve item PEA at the compensator cover.
- Switch directional valve to end/full deflection.
- Turn adjusting screw clockwise at the compensator to increase the flow, and thus increase the force induced on the pressure compensator element.
  Turn adjusting screw counter clockwise to decrease the flow.

- Tighten nut and cap nut for pilot valve item PEA.

If the flow is still too high after adjusting the spring to the minimum value, it is possible to lower the flow further by adjusting the spool end stoppers for the directional valve. When spool deflection is decreasing, pressure drop will increase over the directional valve. Be aware that handle deflection will decrease correspond ingly when adjusting the end stoppers.

- Loosen cap nuts and nuts for the spool end stoppers in both end covers.
- Turn adjusting screw clockwise for decrease of the flow in both directions.
- Tighten nuts and cap nuts for the spool end stopper.

16. MAINTENANCE

Check the valve for proper function. Visually check the valve, and if required, paint unpainted (damaged) areas.

CAUTION
Do not paint the hand lever shaft seals.

SPARE PARTS
Seal Kit is available.

STORAGE
If storage longer than 6 months is expected, the valve must be kept in a dry room, free from dust and protected against sudden, large temperature variations. For storage longer than 12 months, the valve must be filled with inhibition oil. Before use check all visible seals and flush with clean oil.

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