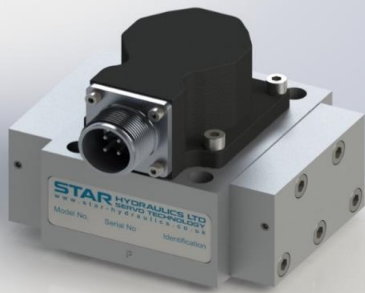


series  
**595**  
2-Stage Pressure  
Control Servovalve



### Features

- Maximum operating pressure 280 bar
- ISO 10372-04-04-0-92 mounting pattern
- Suitable for 3-way or 4-way applications
- Low hysteresis & zero point drift
- High spool drive forces
- Spool in bushing design
- Dry torque motor with mechanical feedback
- Long life Sapphire Technology



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ST-595-2016.1-En

# Benefits and Features

## Sapphire ball in slot design

- Incorporated into Star designs since 1988
- Many billions of cycles per service life
- Increased spool life due to spool rotation
- Ultra low coefficient of friction sapphire to steel
- Feedback mechanism unhindered by spool rotation
- Extended warranties available



## Safety

- Flame proof
- Intrinsic safety
- Class, Div & Zone coverage
- Mechanical failsafe
- Double & triple coil redundancy



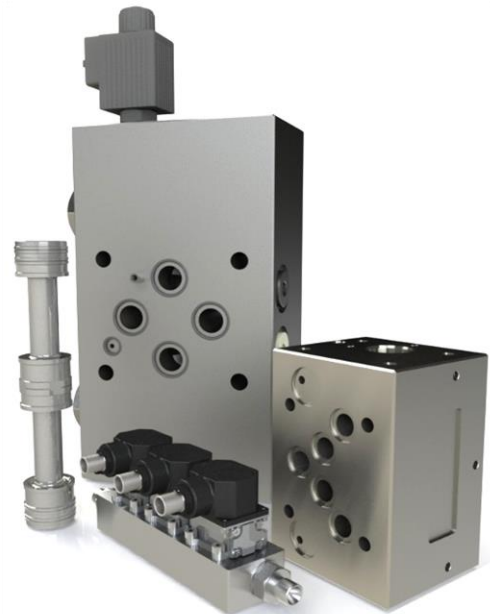
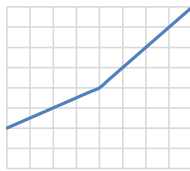
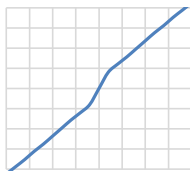
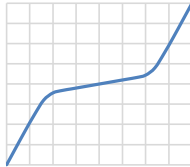
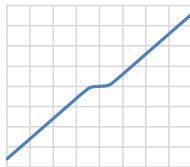
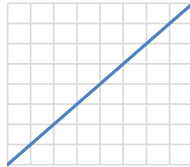
## Quality



- Independent audit process is our commitment on quality
- Focus on customer needs and expectations
- Delivery schedules on time
- Continual improvements on products and services
- Maintaining design and manufacturing integrity

## Custom spool lap & bushing port geometries

- Zero overlap
- Overlap (closed center)
- underlap (open center)
- Dual gain
- Asymmetric gain



## Special projects

- Compact servo designs
- Special interfaces
- Modular components

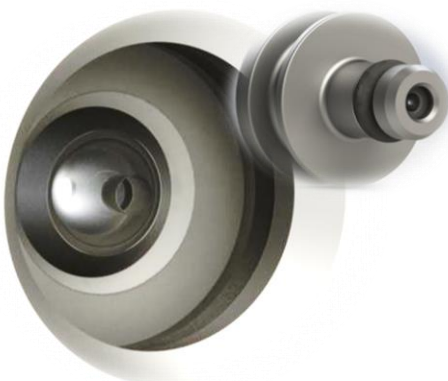


## Sealing materials

- Nitrile
- Fluorocarbon (Viton)
- Ethylene-Propylene
- Fluorosilicone

## Sapphire flow

- Ensuring first stage stability
- Precisely matched flow properties
- Long life in extreme environments



## Special connectors

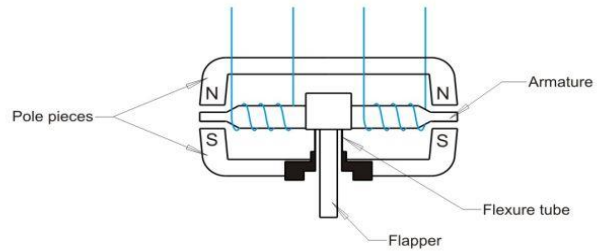
- MIL-C-5015
- MIL-DTL-38999
- Conduit style male/female
- Hermetic

## Functionality

The Star 595 Pressure Control Servovalve is a two stage, four way design that provides a differential pressure output in response to a low power electrical input signal.

The 595 has been designed provide a far greater level of proportional pressure control of a load across the C1 and C2 control ports independant of required flow rate.

Conventional flow control sero valves have extremely high pressure gain and therefore not best suited to many force control systems. The 595 has been designed with a dynamic response bandwidth suitable for most servo control applications but can also be modified to specific system parameters.

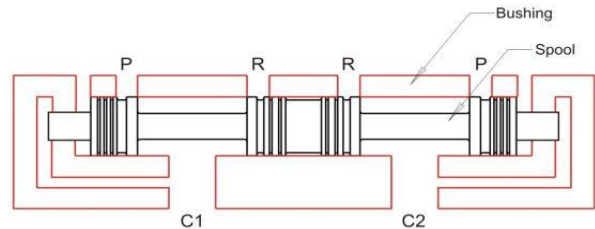


### First Stage (Torque Motor)

The flapper is rigidly fixed perpendicular to the armature (soft iron). These components are supported and pivot on the flexure tube, the tube also acts as a seal between the electromagnetic first stage and the hydraulics of the second stage.

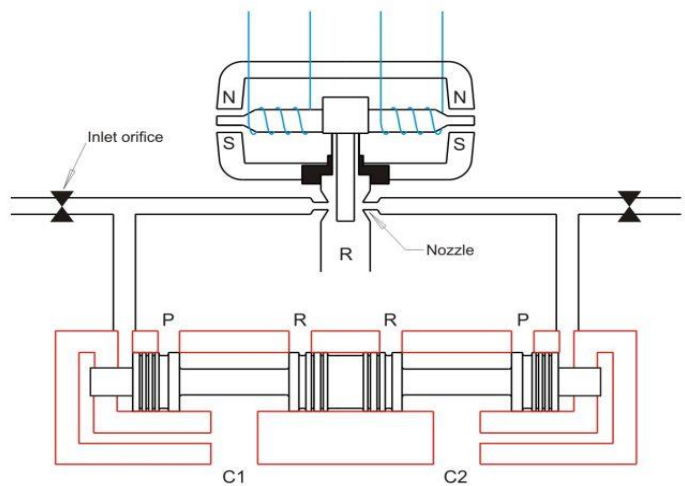
Permanent magnets fix a magnetic field through the pole pieces towards the ends of the armature. The air gaps between the armature and pole pieces are set equally so that the flapper is in the vertical position.

The armature is positioned inside two coils (one either side)



### Second Stage (Bushing & Spool)

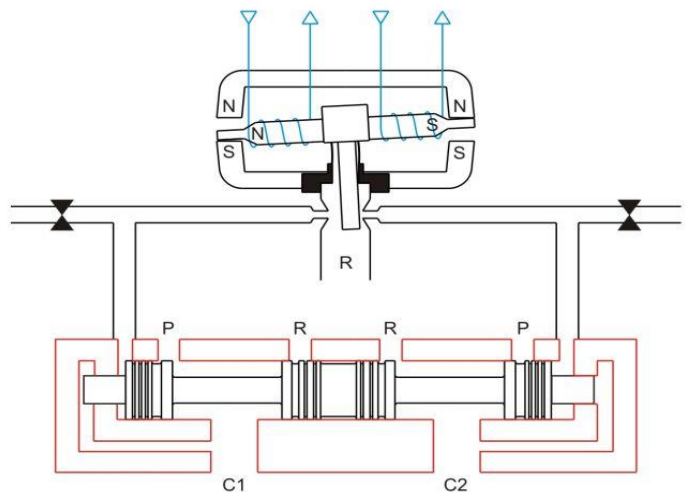
The bushing (sleeve) has a number of fixed ports which vary in area and frequency depending on the operational design and flow requirements, these are shown as 'P' and 'R'. A spool outside diameter is match ground to the bushing bore and spool lands are also precision ground to the bushing ports to provide a knife edge condition whilst opening and closing the ports. The bushing has additional galleries which provide spool drive force and proportional feedback.



### First & Second Stages

The torque motor flapper is mechanically positioned between a pair of matched nozzles (jets). The nozzles are fed by a matched pair of inlet orifices which drop the main supply pressure to approximately half. With no input signal to the coils there is zero pressure differential across these nozzles and therefore the spool is held at null.

When input current is applied the armature becomes polarised and moves in accordance to the level of current flowing. This movement is translated to the flapper which now causes a differential across the nozzles and in turn forces the spool away from null. At the same instance the control port pressures rise one side and fall the other, these pressures are monitored at the ends of the spool so that the output pressures can be controlled extremely accurately. The pressure curve is factory set based on nominal operating pressure set back at the pump.



## Technical data

### Hydraulic

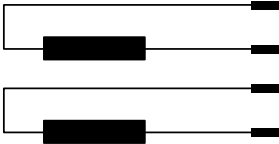
Operating pressure (max)	Ports	P, C1, C2, R
Seal material	NBR, FPM	280 bar
Fluid viscosity range (recommended)		10 to 100 mm <sup>2</sup> /s (cSt)
Fluid type		Mineral oil to ISO 11158, DIN 51524 or equivalent MIL-H-5606 Kerosene Water glycols others on request
Filter rating (recommended)	Pressure line Off-line	Beta 10 = 200 (10 µm abs), non by-pass & indicator Beta 2 = 1000 (2 µm abs)
Fluid cleanliness	ISO 4406: 1999 minimum recommended	16/ 14/ 11 15/ 13/ 10

### Operational parameters

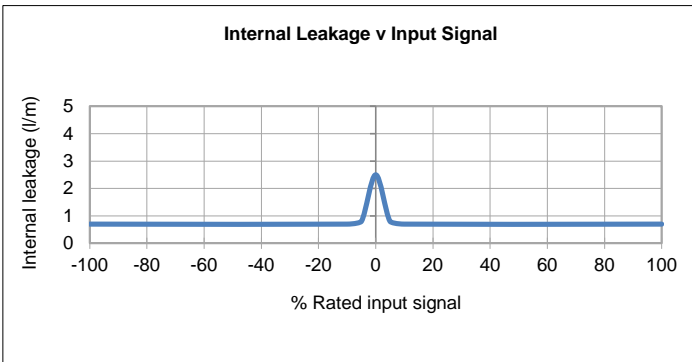
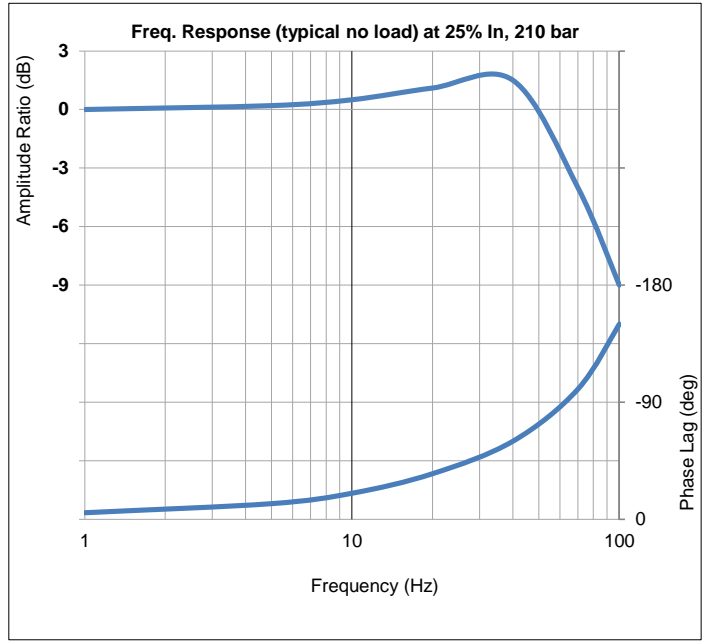
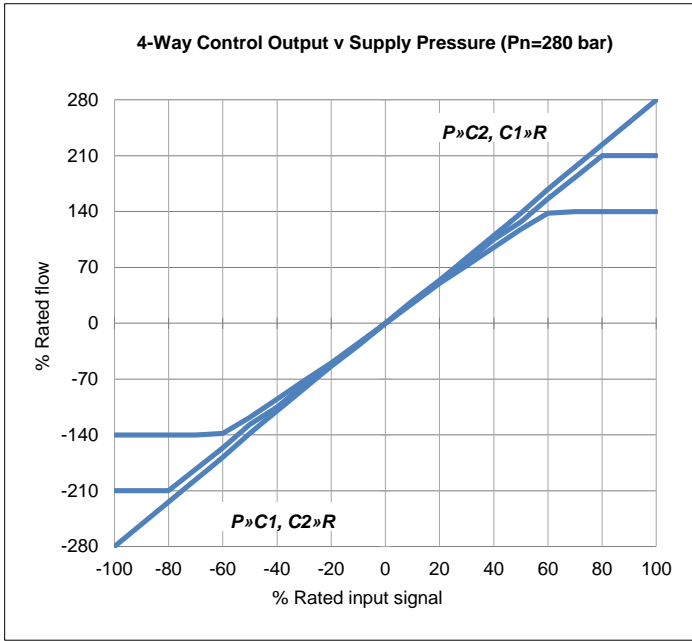
Hysteresis		≤ 2.0% without dither
Threshold		≤ 0.5% without dither
Null shift	ΔT 40°C	≤ 2.0%
Internal leakage	140 bar supply (0.5% overlap)	≤ 2.5 l/min
Load pressure difference	140 bar rated 210 bar rated 280 bar rated	1.4 bar/1% rated signal 2.1 bar/1% rated signal 2.8 bar/1% rated signal
Output flow ratings [±15%]	at 70 bar Δp	4, 10, 20, 40, 60 l/m
Response time	0-100%	5 ms
Mounting pattern		ISO 10372-04-04-0-92 without X port
Mounting position		Any, fixed or movable
Weight	std unit	1.2 kg
Design protection	EN 60529	IP 65
Shipping protection		Sealed base plate
Vibration		30 g all axis, 5 Hz to 2,000 Hz
Shock		30 g all axis
Seal material options		NBR, FPM
Temperature range		-30 to 135 °C

## Technical data

### Electrical

Rated input ± (mA)	single (differential)	<b>8</b>	<b>15</b>	<b>30</b>	<b>40</b>	<b>100</b>	<b>200</b>
Other coil rates available	series	4	7.5	15	20	50	100
	parallel	8	15	30	40	100	200
Coil resistance (Ω)	per coil	1000	200	300	80	28	22
Power (W)	single	0.064	0.045	0.27	0.128	0.280	0.88
	series	0.032	0.023	0.135	0.064	0.140	0.440
	parallel	0.032	0.023	0.135	0.064	0.140	0.440
Connector pin out identification		A	B	C	D		
Polarity P»C2, C1»R	single	A +, B - or C +, D -					
	series	A +, D -, B & C linked					
	parallel	A & C linked +, B & D linked -					
Valve connector type	MIL-C-5015	MS3102E-14S-2P mates with MS3106F-14S-2S Consult factory for more options					
Standard connector orientation		P port					
	also available over	C1, C2 or R port; please advise when ordering					

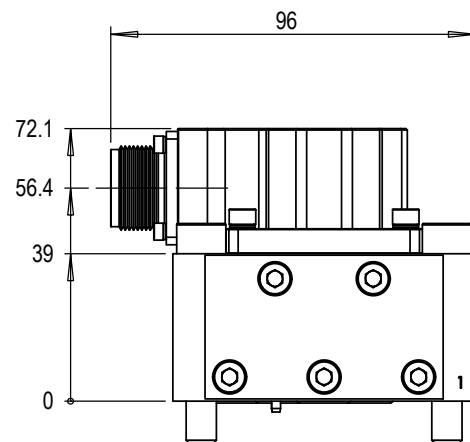
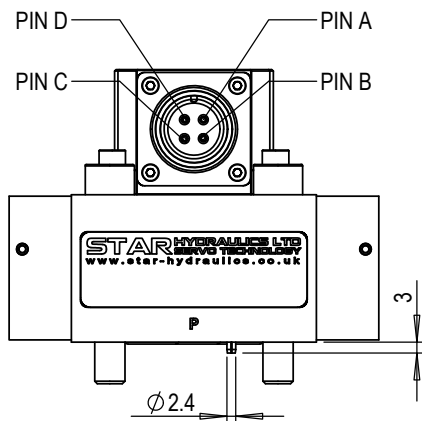
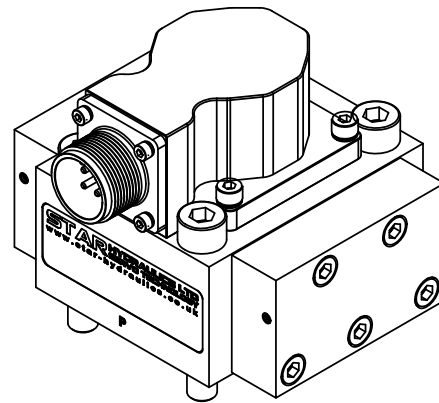
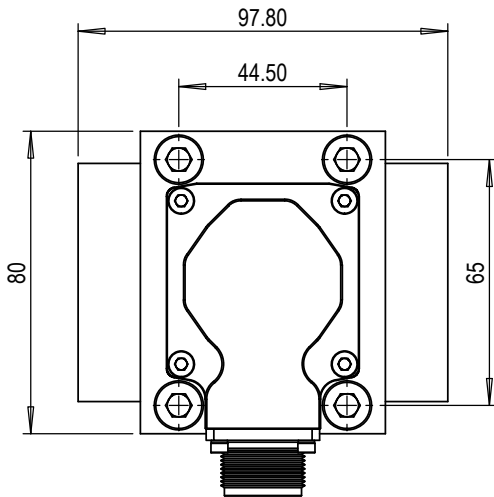
# Technical data



595 series  
INSTALLATION DETAILS



Mounting screws	Skt head cap screws M8 x 50 - 10.9 ISO 4762
Porting details	P, C1, C2, R ports $\varnothing 9.0$ , $\square$ $\varnothing 14.25$ $\nabla 1.40$ on 23.8 P.C.D.
Interface seals	Ports P, C1, C2, R - ID 10.82 x $\varnothing 1.78$ O-Ring



Mounting interface conforms to ISO 10372-04-04-0-92 (X port must not be used)										
	P	C1	C2	R	X	F1	F2	F3	F4	G
size	$\varnothing 9$	$\varnothing 9$	$\varnothing 9$	$\varnothing 9$	-	M8	M8	M8	M8	$\varnothing 3 \nabla 5$
x	22.25	11.14	33.35	22.25	-	0	44.50	44.50	0	12.35
y	21.39	32.50	32.50	43.61	-	0	0	65	65	19.80
Surface flat within 0.01 / 100 : finish better than 0.8 $\mu\text{m}$										

