

..... **INNOVATION AT WORK FOR YOU** .....

**TS90-31 replacing TS98-31**

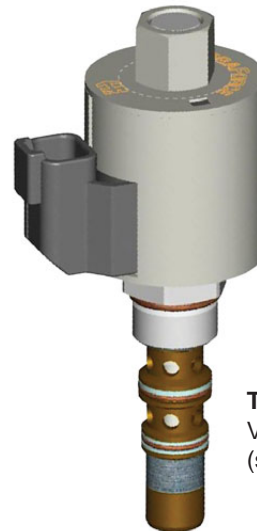
**Due to market requests for higher flow and pressure ratings, the TS98-31 valve will be discontinued and replaced with the TS90-31.**

Reducing pressure vs. current performance and port logic are the same for both valves. In addition, the **TS90-31** has a flow rating of up to 37.9 lpm/10 gpm increasing the application potential of the product to larger machine sizes.

The **TS90-31** uses a 10-size coil and tube, producing higher coil actuation force and a resulting increase in ratings, as well as fine metering capabilities across the full performance range of the valve.

The TS98-31 will no longer be available after June 1, 2010.

**For questions regarding HydraForce products or product availability, please contact your HydraForce representative, one of our authorized business partners, or e-mail us from our website at [www.hydraforce.com](http://www.hydraforce.com).**



**TS90-31** uses a 10-size coil.

**TS90-31** uses the VC98-3 cavity (same as TS98-31).

**The following pages are a side-by-side comparison of the TS90-31 vs. the TS98-31.**

If your Adobe PDF Reader is not automatically displaying the following pages in 2-page spreads, from the "View" menu, select "Page Display" and then "Two-Up."

**HYDRAFORCE, INC.**

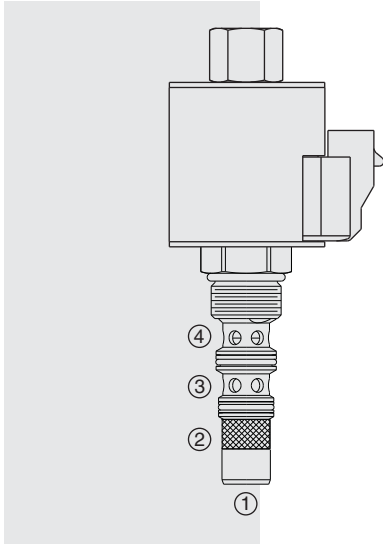
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# ELECTRO-PROPORTIONAL VALVES—PRESSURE CONTROLS

## TS90-31 Proportional Electric Reducing/Relieving



### DESCRIPTION

A screw-in, cartridge-style, pilot-operated, spool-type reducing/relieving valve, which can be infinitely adjusted across a prescribed range using a variable electric input. Pressure output is proportional to DC current input. This valve is intended for use as a pressure control device in demanding applications.

### OPERATION

Without applied current, the **TS90-31** allows flow from ③ to ④ while blocking ②. When the coil is energized, ③ is connected to ②, and pressure at ③ is controlled proportional to the amount of current applied to the coil. If pressure at ③ exceeds the setting induced by the coil, pressure is relieved to ④.

Back pressure on port ④ becomes additive to the pressure setting at a 1:1 ratio.

Note: This product may be customized for special OEM performance characteristics. Consult factory.

### FEATURES

- 12 and 24 volt coils standard.
- Optional waterproofed E-Coils rated up to IP69K.

### RATINGS

**Maximum Operating Pressure at Ports 1 and 2:** 207 bar (3000 psi)

**Maximum Tank Pressure at Port 3:** 69 bar (1000 psi)

**Regulated Pressure Range from Zero to Max. Control Current:**  
0 to 137.9 bar (2000 psi)

**Maximum Control Current: E-Coils:** 0.88 amps for 12 VDC coil; 0.44 amps for 24 VDC coil  
**D-Coils:** 0.68 amps for 12 VDC coil; 0.34 amps for 24 VDC coil

**Deadband:** 0.150 amps @ 12 VDC; 0.075 amps @ 24 VDC

**Hysteresis:** 3.0% PWM

**Rated Flow:** 38 lpm (10 gpm)

**Maximum Pilot Flow:** 0.85 lpm (0.23 gpm) with No Current

**Flow Path:** Free Flow: ③ to ④ coil de-energized; Reduced: ② to ③ coil energized; Relieving: ③ to ④ coil energized; Port ① is not plumbed externally

**Temperature:** -40 to 100°C (-40 to 212°F) with standard Buna N seals  
-26 to 204°C (-15 to 400°F) with Fluorocarbon seals

**Filtration:** See page 9.010.1

**Fluids:** Mineral-based or synthetics with lubricating properties at viscosities of 7.4 to 420 cSt (50 to 2000 sus); See Temperature and Oil Viscosity, page 9.060.1

**Installation Recommendation:** When possible, the valve should be mounted below the reservoir oil level. This will maintain oil in the armature preventing trapped air instability. If this is not feasible, mount the valve horizontally for best results.

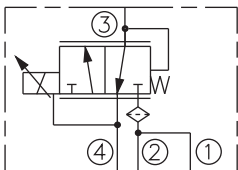
**Cavity:** VC98-3; See page 9.110.1; **Cavity Tool:** CT98-3XX; See page 8.600.1

**Seal Kit:** SK90-3X-BM; See page 8.650.1

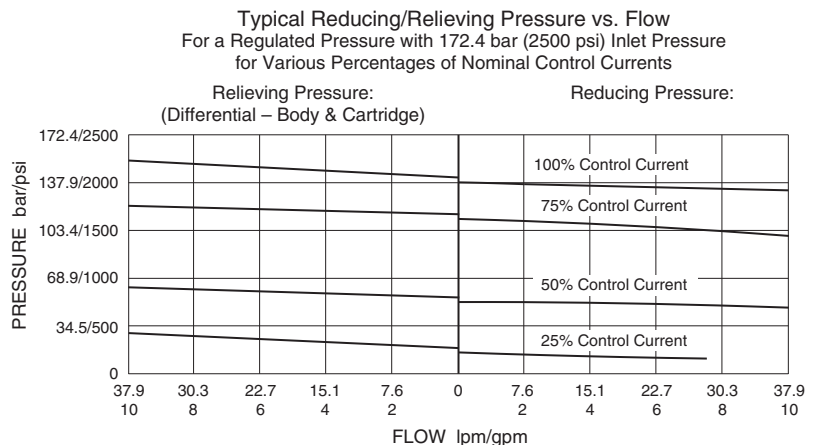
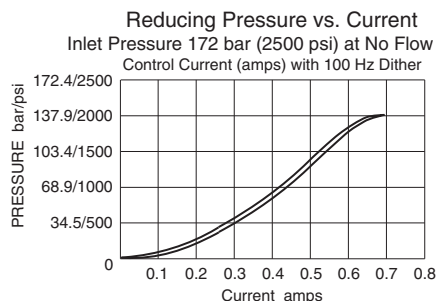
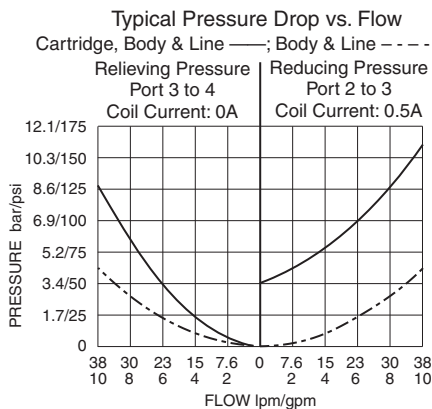
**Coil Nut:** Part No. 4540560

### SYMBOLS

#### USAS/ISO:

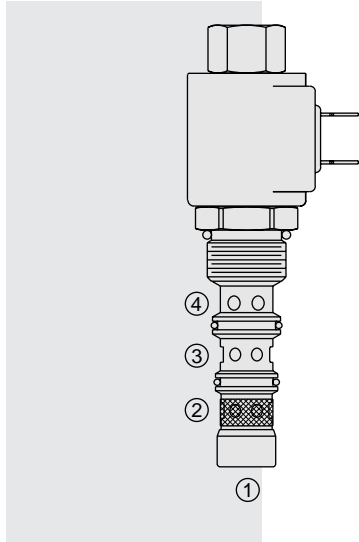


### PERFORMANCE



# ELECTRO-PROPORTIONAL VALVES—PRESSURE CONTROLS

## TS98-31 Proportional Electric Reducing/Relieving



### DESCRIPTION

A screw-in, cartridge-style, pilot-operated, spool-type reducing/relieving valve, which can be infinitely adjusted across a prescribed range using a variable electric input. Pressure output is proportional to DC current input. This valve is intended for use as a pressure control device in demanding applications.

### OPERATION

Without applied current, the **TS98-31** allows bidirectional flow from ③ to ④ while blocking ②. When the coil is energized, ③ is connected to ②, and pressure at ③ is controlled proportional to the amount of current applied to the coil. If pressure at ③ exceeds the setting induced by the coil, pressure is relieved to ④.

Back pressure on port ④ becomes additive to the pressure setting at a 1:1 ratio.

Note: This product may be customized for special OEM performance characteristics. Consult factory.

### FEATURES

- 12 and 24 volt coils standard.
- Optional waterproof E-Coils rated up to IP69K.

### RATINGS

**Maximum Inlet Pressure at Port ②:** 207 bar (3000 psi)

**Maximum Control Current:** 0.70 amps for 12 VDC coil; 0.35 amps for 24 VDC coil

**Deadband:** 0.150 amps @ 12 VDC; 0.075 amps @ 24 VDC

**Hysteresis:** 3.0% PWM

**Reducing/Relieving Pressure Range from Zero to Maximum Control Current:** 0–138 bar (0–2000 psi)

**Rated Flow:** 11.4 lpm (3 gpm) at 45 psid port ③ to ④ with coil de-energized

**Maximum Pilot Flow:** 0.4 lpm (0.12 gpm)

**Flow Path:** Free Flow: ③ to ④ bidirectional coil de-energized; Reduced: ② to ③ coil energized; Relieving: ③ to ④ coil energized; Port ① is not plumbed externally

**Temperature:** -30 to 175°C (-20 to 350°F), with standard Fluorocarbon seals

**Filtration:** See page 9.010.1

**Fluids:** Mineral-based or synthetics with lubricating properties at viscosities of 7.4 to 420 cSt (50 to 2000 sus); See Temperature and Oil Viscosity, page 9.060.1

**Installation Recommendation:** When possible, the valve should be mounted below the reservoir oil level. This will maintain oil in the armature preventing trapped air instability. If this is not feasible, mount the valve horizontally for best results.

**Cavity:** VC98-3; See page 9.110.1; **Cavity Tool:** CT98-3XX; See page 8.600.1

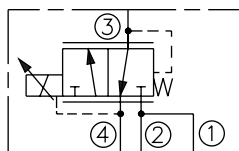
**Seal Kit:** SK90-3V; See page 8.650.1

**Coil Nut:** Part No. 7004410;

For E-coils manufactured prior to 1-1-04, see page 3.400.1 for coil nut info.

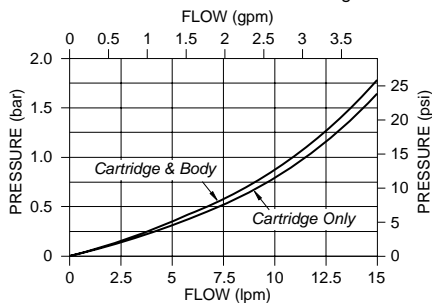
### SYMBOLS

#### USASI/ISO:

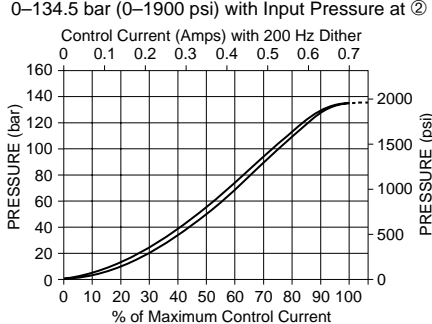


### PERFORMANCE

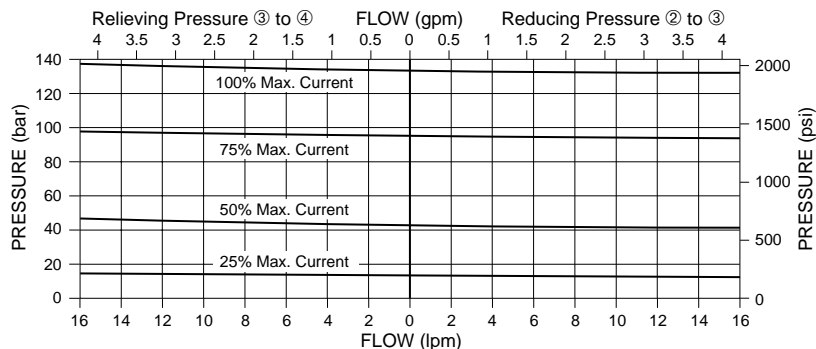
Pressure Drop vs. Flow Characteristic  
For Flow ③ to ④ with Coil De-energized



Reduced Pressure vs. Current Characteristic  
For a Regulated Pressure Range of  
0–134.5 bar (0–1900 psi) with Input Pressure at ②



Reducing/Relieving Pressure vs. Flow Characteristic  
Regulated Pressure Range: 0–134.5 bar (0–1950 psi) with 137.9 bar (2000 psi) Input  
Pressure at ③ for Various Control Currents (ΔP Shown for Cartridge & Body)

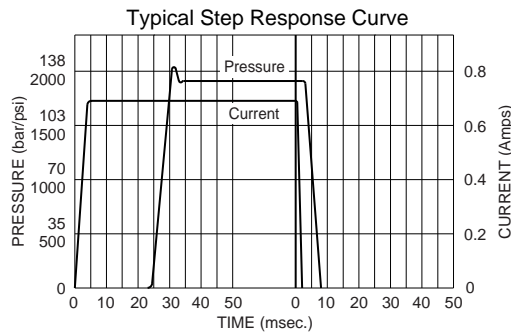
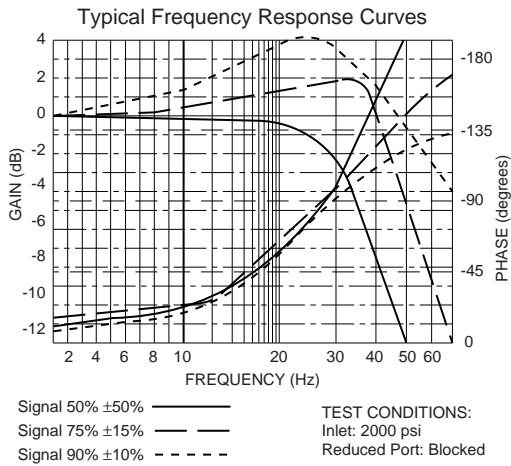




# Valve w/Internally Piloted Spool

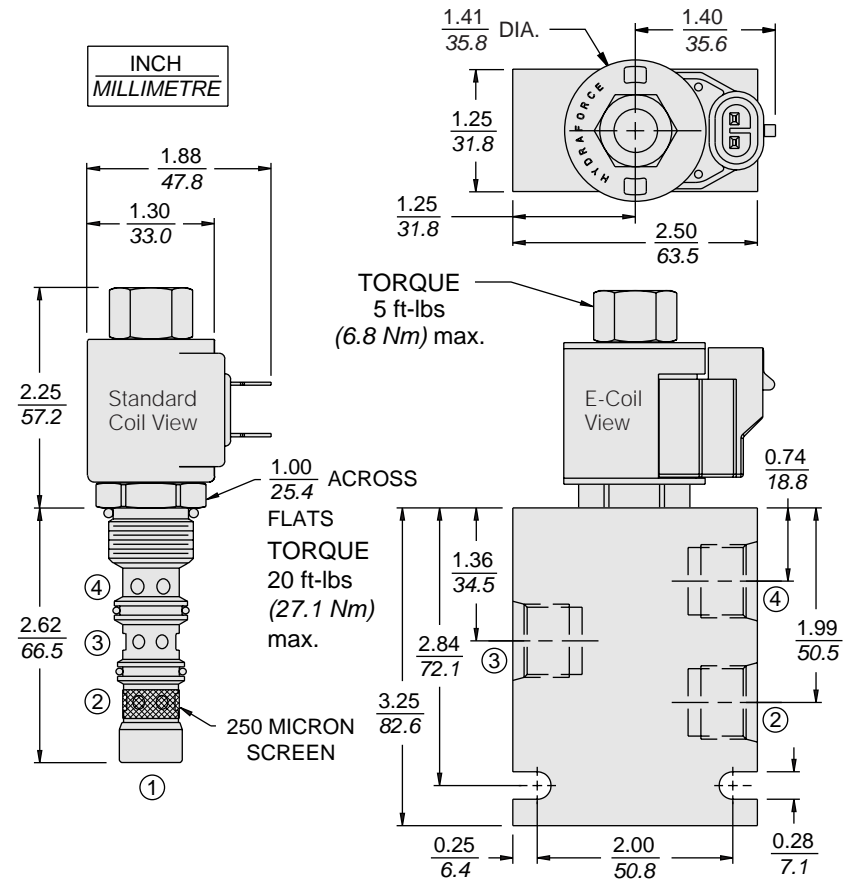
TS98-31

## PERFORMANCE



**Recommended Electronic Controllers:**  
 See page 2.001.1 or our Electronics catalog.

## DIMENSIONS



## MATERIALS

**Cartridge:** Weight: 0.25 kg. (0.55 lbs.) Steel with hardened work surfaces. Zinc-plated exposed surfaces. O-rings standard.

**Standard Ported Body:** Weight: 0.34 kg. (0.75 lbs.) Anodized high-strength 6061 T6 aluminum alloy, rated to 207 bar (3000 psi). Ductile iron bodies available; dimensions may differ. See page 8.010.1

**Standard Coil:** Weight: 0.27 kg. (0.60 lbs.) Unitized thermoplastic encapsulated, Class H high temperature magnet-wire. See page 3.200.1

**E-Coil:** Weight: 0.14 kg. (0.3 lbs.) Perfect wound, fully encapsulated with rugged external metal shell. Rated up to IP69K with integral connectors.

**Note:** See page 3.400.1 for all E-Coil retrofit applications.

## TO ORDER

|                      |                            |   |
|----------------------|----------------------------|---|
| <b>TS98-31 - - -</b> |                            |   |
| <b>Porting</b>       |                            | <b>Termination Std. Coil</b>                              |
| Cartridge Only 0     |                            | DS Dual Spades  |
| SAE 6 6T             |                            | DG DIN 43650  |
| SAE 8 8T             |                            | DL Leadwires (2)  |
|                      |                            | DL/W Leads w/Weatherpak® Connectors                       |
| <b>Seals</b>         |                            | DR Deutch DT04-2P   |
| Fluorocarbon V       |                            | <b>Termination E-Coil</b>                                 |
|                      | <b>Voltage</b>             | ER Deutch DT04-2P (IP69K Rated)                           |
|                      | Less Coil 0                | EY Metri-Pack® 150 (IP69K Rated)                          |
|                      | 10 VDC (0.84 amps max.) 10 |   |
|                      | 12 VDC (0.70 amps max.) 12 |   |
|                      | 20 VDC (0.42 amps max.) 20 |   |
|                      | 24 VDC (0.35 amps max.) 24 |   |
|                      |                            | Coils with internal diode are available. Consult factory. |