TRANSMISSION VALVES
Slip-in configuration

MINI SERIES
Electro-Hydraulic Control Valves / Automotive Type

STD CAVITY RANGE
Proportional Pressure Reducing-Relieving Valves / Direct Acting

MID RANGE
Proportional Press. Reducing-Relieving Valves / Step Bore Design

HIGH RANGE
Proportional Press. Reducing & ON-OFF Valves / Pilot Operated

Manufacturers of hydraulic cartridge valves and electro-hydraulic systems
PROPORTIONAL PRESSURE REDUCING VALVES FOR SOFT ENGAGEMENT OF WET-DISC CLUTCHES

DESCRIPTION
Proportional Pressure Reducing Valves are used to generate a variable pressure in response to a PWM (Pulse Width Modulated) current signal.

PRINCIPLE OF OPERATION
QUICK FILL-UP: a high current peak fed to the proportional solenoid of the PPRV, generates a quick shifting of the valve spool to fill up the gap between clutch discs in the shortest possible time. Clutch discs enter in touch with each other to begin to transfer torque and speed (= power) from the INPUT to the OUTPUT shaft.

SOFT ENGAGEMENT: the PWM current signal is quickly reduced to a minimum value in order to let pressure start from the “kiss point” (2 bar) and then ramp up smoothly to a “high end” (16-18 bar) during which the torque is gradually transmitted to the driven shaft.

WET DISC CLUTCH SECTIONAL VIEW

Typical clutch cycle
• Preliminary “quick fill-up” phase at top current until pressure begins to raise within the clutch piston chamber.
• Modulated current ramp to generate a “soft engagement” of clutch discs.

TYPICAL LAY-OUT OF POWERTRAIN CONTROL HYDRAULICS FOR AGRICULTURAL TRACTORS

PTO / DIFFERENTIAL LOCK VALVE
This valve controls the engagement of the PTO (Power Take Off) and the differential lock function.

AUXILIARY VALVES
This valve supplies hydraulic power to implements such as planters, sprayers, plows, bailers, etc.

POWER BEYOND VALVE
This valve provides an additional source of hydraulic power on the tractor.

HITCH VALVE
This valve controls the raising and lowering of the 3-point hitch.

INCHING VALVE
This valve controls the engagement of the master clutch.

POWERSHIFT VALVES
There are three of these on each tractor. They control the shifting of each clutch through the 18, 19 or 21 speeds.

PRIORITY / REGULATOR VALVE
This valve makes sure steering always gets priority over all other hydraulic functions. The other half of the valve maintains regulated pilot pressure at 345 psi.
MINI SERIES - Proportional Cartridge Valves for Sequential & Dual Clutch Transmissions

MOD. IP-DNR-T235-AMQ12

Hydraulic Specifications
- Max. Input Pressure: 50 bar
- Max. Output Flow: 12 l/min
- Control Pressure Range: See Graph
- Typical Internal Leakage: 15 cc/min
- Cavity Tool: T235

Electrical Specifications
- Coil Resistance: 3.2 Ohms
- Current Supply Characteristics: See Graph
- Superimposed Dither Frequency: 150 Hz
- Coil Terminations: Amp Micro Quadlock

MOD. IQ-2WS-T227-AMQ

Hydraulic Specifications
- Max. Input Pressure: 25 bar
- Max. Output Flow: 45 l/min
- Control Pressure Range: See Graph
- Typical Internal Leakage: 15 cc/min
- Cavity Tool: T227

Electrical Specifications
- Coil Resistance: 3.2 Ohms
- Current Supply Characteristics: See Graph
- Superimposed Dither Frequency: 150 Hz
- Coil Terminations: Amp Micro Quadlock

MOD. IQ-4WI-T231-DT12

Hydraulic Specifications
- Max. Input Pressure: 60 bar
- Max. Output Flow: 8 l/min
- Control Pressure Range: See Graph
- Typical Internal Leakage: 15 cc/min
- Cavity Tool: T231

Electrical Specifications
- Coil Resistance: 5.4 Ohms
- Current Supply Characteristics: See Graph
- Superimposed Dither Frequency: 150-200 Hz
- Coil Terminations: Deutsch DTO4

SLIP-IN VALVES - Mounting styles

Open Bracket/Single Bolt
Built-in Flange/Dual Bolt

DUAL CLUTCH TRANSMISSION SCHEMATIC
MOD. IP-DAR-T043

Hydraulic Specifications
- Configuration: Direct acting / Slip-in type
- Max. Input Pressure: 50 bar (Std) / 350 bar (Opt)
- Max. Output Flow: 4 lt/min @ 6 bar Delta-P
- Control Pressure Range: See Graph
- Typical Internal Leakage at Rest: 15 cc/min
- Max. Back Pressure at T Port: 50 bar
- Media Operating Temp. Range: -30°C / +115°C
- Oil Viscosity Range: 3 cSt / 400 cSt
- Max. Contamination Level: 18/15 (ISO 4406)
- Cavity Tool: TCN T043

Electrical Specifications
- Coil Resistance: 5.4 Ohm (12 VDC)
- Current Supply Characteristics: PWM (See Graph)
- Superimposed Dither Frequency: 100 / 150 Hz
- Coil Terminations: Deutsch DTO4
- Environmental Protection Rating: IP69K
- Duty Cycle: 100% EDI

Deutsch DTO4 Connector
AMP Junior Timer Connector

32mm OD

Pressure (bar) vs. Current (mA) Characteristic
12 VDC coil / 5.4 Ohm / Toil = 50°C

MOD. IP-DAR-250-DT

Hydraulic Specifications
- Nominal Flow Rate: 4 lt/min
- Max. Inlet Pressure: 50 bar
- Controlled Pressure Range: 32 bar
- Media Operating Temp. Range: -30°C / +120°C
- Oil Viscosity Range: 3 ÷ 647 cSt
- Cavity Tool: T250

Electrical Specifications
- Coil Resistance: 4.8 Ohm (12 VDC) at 20°C
- Current Supply Characteristics: PWM (See Graph)
- Rated Current Range 12 VDC Coil: 200-1500 mAmps
- Coil Terminations: Deutsch DTO4

Hydraulic Schematic
MOD. IP-RDS-T216/T222

Hydraulic Specifications

- **Configuration**: Direct acting w/Step bore
- **Max. Input Pressure**: 60 bar
- **Max. Output Flow**: 30 l/min @ 4 bar Delta-P
- **Control Pressure Range**: See Graph
- **Typical Internal Leakage at Rest**: 15 cc/min
- **Max. Back Pressure at T Port**: 25 bar (Std)
- **Media Operating Temp. Range**: -30°C / +115°C
- **Oil Viscosity Range**: 3 cSt / 647 cSt
- **Max Contamination Level**: 18/15 (ISO 4406)
- **Cavity Tool**: TCN T216

Electrical Specifications

- **Coil Resistance**: 5.2 Ohm (12 VDC)
- **Current Supply Characteristics**: PWM (See Graph)
- **Superimposed Dither Frequency**: 100 / 150 Hz
- **Coil Terminations**: Deutsch DT04
- **Environmental Protection Rating**: IP69K
- **Duty Cycle**: 100% EDI

**Hydraulic Schematic**

**Pressure (bar) vs. Current (mA) Characteristic**

Inlet pressure 22 Bar, Oil viscosity 46 cSt @ 45°C and PWM 100 Hz
**MOD. IP-PRZ-59**

**Hydraulic Specifications**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration</td>
<td>Pilot Operated</td>
</tr>
<tr>
<td>Max. Input Pressure</td>
<td>50 bar</td>
</tr>
<tr>
<td>Max. Output Flow</td>
<td>40 l/min @ 4 bar Delta-P</td>
</tr>
<tr>
<td>Control Pressure Range</td>
<td>See Graph</td>
</tr>
<tr>
<td>Typical Internal Leakage at Rest</td>
<td>450 cc/min</td>
</tr>
<tr>
<td>Max. Back Pressure at T Port</td>
<td>25 bar (Std) / 350 bar (Opt)</td>
</tr>
<tr>
<td>Media Operating Temp. Range</td>
<td>-30°C / +115°C</td>
</tr>
<tr>
<td>Oil Viscosity Range</td>
<td>3 cSt / 647 cSt</td>
</tr>
<tr>
<td>Max Contamination Level</td>
<td>18/15 (ISO 4406)</td>
</tr>
<tr>
<td>Cavity Tool</td>
<td>TCN T059</td>
</tr>
</tbody>
</table>

**Electrical Specifications**

- **Coil Resistance**: 9.9 Ohm (12 VDC)
- **Current Supply Characteristics**: PWM (See Graph)
- **Superimposed Dither Frequency**: 120 Hz ±15%
- **Coil Terminations**: Packard MP150 (Amp Superseal Compatible)
- **Environmental Protection Rating**: IP69K
- **Duty Cycle**: 100% EDI

**Pressure (bar) vs. Current (mA) Characteristic**

**MOD. IE-S2H-T056**

- 2way-2pos

**MOD. IF-S3A-T057**

- 3way-2pos

**MOD. IG-S4A-T058**

- 4way-2pos / Criss-Cross

**HIGH RANGE - Pilot Operated Proportional Pressure Reducing Valves**

**HIGH RANGE ON-OFF Directional Control Valves**
**FUNCTION**

Proportional Pressure Reducing Valves are designed to generate a variable pressure in response to a PWM (Pulse Width Modulated) Current Input signal.

**Hydraulic Symbol**

<table>
<thead>
<tr>
<th>Function</th>
<th>IP-DNR-T235</th>
<th>IP-DAR-T043</th>
<th>IP-RDS-216/222</th>
<th>IP-PRZ-T059</th>
</tr>
</thead>
<tbody>
<tr>
<td>MINI SERIES</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slip-in Negating Rod</td>
<td></td>
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<tr>
<td>STD CAVITY</td>
<td></td>
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</tr>
<tr>
<td>Slip-in Direct acting</td>
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</tr>
<tr>
<td>MID-RANGE</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slip-in Step bore</td>
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<td></td>
</tr>
<tr>
<td>HIGH-RANGE</td>
<td></td>
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</tr>
<tr>
<td>Slip-in Pilot Operated</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Configuration</th>
<th>MINI SERIES Slip-in Negating Rod</th>
<th>STD CAVITY Slip-in Direct acting</th>
<th>MID-RANGE Slip-in Step bore</th>
<th>HIGH-RANGE Slip-in Pilot Operated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure Control Range</td>
<td>0-30 bar (std) / 0-45 bar (opt)</td>
<td>0-30 bar (std) / 0-45 bar (opt)</td>
<td>0-30 bar (std) / 0-45 bar (opt)</td>
<td>0-30 bar (std) / 0-45 bar (opt)</td>
</tr>
<tr>
<td>Nominal Flow Rate (Press Drop &lt;4 bar)</td>
<td>4 lt/min</td>
<td>6 lt/min</td>
<td>30 lt/min</td>
<td>35 lt/min</td>
</tr>
<tr>
<td>Leakage at rest</td>
<td>15 cc/min</td>
<td>15 cc/min</td>
<td>15 cc/min</td>
<td>450 cc/min</td>
</tr>
<tr>
<td>PWM Current Control Range @ 12 VDC</td>
<td>300-1400 mA (PWM)</td>
<td>300-1400 mA</td>
<td>300-1200 mA</td>
<td>100-750 mA</td>
</tr>
<tr>
<td>Ohmic Resistance @ 12 VDC</td>
<td>5.4 Ohm</td>
<td>3.2 Ohm</td>
<td>5.5 Ohm</td>
<td>9.9 Ohm</td>
</tr>
<tr>
<td>Coil Termination</td>
<td>Amp Junior Timer Deutsch DTO4</td>
<td>Amp Micro Quadlock</td>
<td>Amp Junior Timer Deutsch DTO4</td>
<td>Packard Metripack MP 150</td>
</tr>
</tbody>
</table>

**APPLICATIONS**

- Microprocessor-controlled powershift transmissions for off-highway equipment and agricultural tractors
- CVT transmissions (Continuously Variable Transmission)
- Anti-Block and Anti-Slip traction systems
- Hi-Low transmission stages
- Marine inverters

**REFERENCES**

- **CNH AG** Worldwide
- **CNH CE** Worldwide
- **JOHN DEERE TRACTORS** USA
- **CARRARO TRANSMISSIONS** Worldwide
- **ZF** Germany, Italy
- **LUK** Germany
- **OERLIKON GRAZIANO** Italy
- **CONTINENTAL HYDRAULICS** USA
- **HY-PRO HYDRAULICS** USA
- **FUJI UNIVANCE** Japan
- **XUANGONG** China
- **TURK TRACTOR** Turkey
- **TÜMOSAN** Turkey
- **SAI HYDRAULIC MOTORS** Italy
- **HEMA INDUSTRIES** Turkey
- **LOVOL ARBOS GROUP** China
- **HIDROMEK** Turkey

**NEW HOLLAND T7000 SERIES**

**CASE IH MAGNUM**

**STEIGER & QUADTRACK SERIES**

**JD DF5000 TRANSMISSION**

TECNORD
COMPREHENSIVE PRODUCT LINE

- SOLENOID OPERATED ON-OFF CARTRIDGE VALVES
- MECHANICAL CARTRIDGE VALVES
- PROPORTIONAL CARTRIDGE VALVES
- TRANSMISSIONS & BRAKE VALVES
- HYDRAULIC INTEGRATED CIRCUITS (HIC)

- PWM DRIVERS
- MACHINE MANAGEMENT SYSTEMS (MMS)
- CUSTOMIZED SOFTWARE
- JOYSTICK CONTROLLERS AND GRIPS
- CABLE REMOTE CONTROL BOX
- RC-DBM RADIO REMOTE CONTROL
- RC-TRL RADIO REMOTE CONTROL CANBUS

- MULTIDROM PROPORTIONAL ACTUATORS
- TDV 100 DIRECTIONAL VALVES

- PRE-ENGINEERED SYSTEMS
- ECOMATIC SYSTEM
- ARM-REST CONTROL UNIT
- AUTOMATIC LEVELLING SYSTEM