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Hydraulics Engineering Quality
and Manufacturing Excellence

Who are we?
Since 1967 Hydraulic Projects has been designing and manufacturing hydraulic valves and hydraulic marine autopilots steering equipment from our UK base. With our own in house computer aided design linked to the latest CNC machines, we control the complete process from initial concept through assembly and test to ISO 9001 we guarantee the product to the very highest quality delivered on time.

What do we do?
We manufacture a large range of hydraulic directional control valves supplemented by ancillary valves such as pilot check, service line relief’s etc. Additionally, we produce a range of marine autopilot hydraulic steering equipment. We can also tailor our designs to suit your requirements.

Who are our customers?
You will find our valves on a vast range of equipment from recovery vehicles to refuse wagons, industrial jigs and fixtures, agricultural machinery, construction and plant equipment, boat winches and many other applications.

Now what do you do?
Just look through our catalogue or browse our web site www.hypro.co.uk for your directional control valves requirements. Or call us to discuss your circuit needs and we will be happy to help you choose the correct valve for your application.

So how can we help you?
Our contact details are shown on the back cover of this catalogue and our dedicated sales team are waiting to take your call.

Ordering
We are happy to accept orders by phone, fax email or post. Please use the catalogue order codes where possible. If you can’t see what you require please contact us as our range goes beyond what is printed here. Please check and confirm availability of items before ordering.

Shipping
We use a national carrier for most orders or 1st class post for smaller items where appropriate. Alternatively you may arrange your own collection but there will be a small packing charge.

Payment
Payment can be made by credit/debit card, cheque or bank transfer. New accounts are strictly on a profoma basis. Credit accounts are available on application and subject to the usual credit checks.

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TECHNICAL DATA

The following data applies to all Hy-Pro sectional and line mounted valves except where otherwise stated:

Maximum pressure 250 bar
210 bar (assemblies containing solenoid sections)

Maximum back pressure 25 bar

Temperature rating minimum -20°C
Temperature rating maximum +65°C

Recommended fluid type Mineral based hydraulic ISO VG37

Fluid cleanliness ≥ ISO 19/14/11

Materials

Cast Iron BS 1452-250
Aluminium manifolds BS 1490

External protection

Stainless steel BS 10088-3
Steel Zinc chromate BS 1706 Zn3
Nitrotech NQ3
Black paint HTS1006

Seals

Static Nitrile
Reciprocating Viton
Spool High Pressure PTFE
Anti-extrusion rings PTFE

Relief valves

Unless otherwise requested set 'full open' at 20 L/min / ISO VG37 @ 30 to 40 degrees C

Service line relief valves

Unless otherwise requested are set at 'crack'
ISO VG37 @ 30 to 40 degrees C

Electrical

Coil Voltage 12/24 VDC
Coil power 24W
Protection IP67
Connection DIN 43650
Cable Ø (not supplied) 6 - 8mm

Pneumatic supply 5-10 bar
DESCRIPTION

A low parallel connected sectional spool valve, lever, solenoid, pneumatic or cable operated. Suitable for open or closed centre series circuits. Spool mechanisms for 2, 3 & 4 position valves, all with excellent metering characteristics and with fine metering spools also available. Direct acting or pilot operated main relief valves can be incorporated into the inlet cover. Extensive range of lever options, inter-sections, solenoid sections and ancillaries are available.

On the solenoid sections the internal oil pilot system is switched by solenoid operated cartridges using compact 24-Watt DC coils. A damping orifice fitted in the pilot line eliminates the harshness associated with standard direct acting solenoid valves, giving a positive feel to the control system. Solenoid sections can be built in to a valve assembly containing manual sections and any of the extensive range of ancillary valves.

Application

Designed to be used in many applications requiring a compact, rugged sectional spool valve and suitable for use in the industrial, mobile, marine and agricultural markets. Using the comprehensive range of options, a valve bank can be assembled to control a variety of hydraulic circuits.

Features

- Excellent metering characteristics.
- Excellent load holding.
- Integral load check valve.
- Open and closed centre assemblies.
- Direct acting or piloted adjustable relief valves.
- Robust enclosed lever mechanism.
- Extensive range of ancillaries and intersections.
- Open and closed centre options.
- 100% production testing.

As well as the above the solenoid valves further feature

- 12 and 24V DC 24 Watt Coils
- Soft spool action.
- Manual and solenoid sections together in the same bank.
- Lever override option.
Maximum pressure 250 bar
210 bar*
Maximum back pressure 25 bar

* Assemblies with solenoids

Rated flow V4-40 40 L/min
Rated flow V5-60 60 L/min

Spool leakage @ 210 bar 20ºc A/B
Standard Spools <6cc/min
4 Position Spools <8cc/min

Materials
Cast Iron BS1452-250
Aluminium BS1490
Spools Case Harden BS6507
Tie studs BS970/191 817M40T

Tie stud torque 13.5Nm

External protection
Black Paint to HTS1006

Steel Parts
Zinc chromate BS 1706 Zn3
Nitrotech NQ3

Seals static Nitrile
Reciprocating Viton
Spool High Pressure PTFE
Anti extrusion PTFE

Electrical
Coil Voltage 12 or 24VDC
Max cont. Voltage 12V = 13.8V
24V = 27.5V
Coil Power 24W
Protection IP67
Connection DIN 43650
Cable Ø 6 - 8mm
(not supplied)
V4-40 & V5-60 INSTALLATION DETAILS

TYPICAL ASSEMBLY

INLET COVER

SOLENOID SECTION

MANUAL FLOW CONTROL

PNEUMATIC SECTION

MANUAL SECTION WITH SERVICE-LINE RELIEF AND MICROSWITCH

MANUAL SECTION

OUTLET COVER

RELIEF VALVE

A PORT

B PORT

P TO A

P TO B

4 MOUNTING HOLES M8 T 13

No. OFF SECTIONS x 38.1 + 12.7

28.7

60.0

74.0

69.9

165.6

245.0

123.0

28.7

28.7

No. OFF SECTIONS x 38.1 + 12.7

Hy-Pro

motion and control solutions
STANDARD INLETS

The inlet covers come with G(BSP) ports in either top or side positions. They can be fitted with or without a relief valve. They are supplied in open centre configuration as standard but can be specified for use in closed centre systems.

If a solenoid spool section is used in the assembly an ‘E’ type inlet is used which contains additional drillings for the pilot connections.

We can also include an auxiliary port for fitment of a pressure gauge.

Relief Valve
Adjustable.
Pilot Operated or Direct Acting.

Material  Cast Iron
Weight  0.75kg
V4-40 & V5-60 INLET COVERS

Option | Code | RELIEF VALVE | PORT POSITION | PORT SIZE | CLOSED CENTRE | SOLENOID
--- | --- | --- | --- | --- | --- | ---
Relief valve | RXXX | | | | | |
Side port | S | | | | | |
Top port | T | | | | | |
Port size G3/8 | 3 | S | 3 | C | E |
Port size G1/2 | 4 | S | 4 | C | E |
Closed centre* | C | | | | | |
Solenoid | E | | | | | |

‘XXX’ = relief valve setting in bar.

* On solenoid valves the closed centre is made at the outlet cover.

Example codes

<table>
<thead>
<tr>
<th>Code</th>
<th>Relief Valve set 190 Bar with G3/8 Top port</th>
</tr>
</thead>
<tbody>
<tr>
<td>R190</td>
<td>Relief Valve set 140 Bar with G1/2 Top port</td>
</tr>
<tr>
<td>T 3</td>
<td>Relief Valve set 140 Bar with G1/2 Top port for solenoid sections</td>
</tr>
<tr>
<td>R140</td>
<td>No Relief Valve, G1/2 Top port Closed centre</td>
</tr>
<tr>
<td>T 4</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
</tr>
</tbody>
</table>

Solenoid pilot drillings omitted for clarity

No Relief Valve | With Relief Valve | Closed Centre | Closed Centre with Relief Valve
INLET WITH FLOW SOLENOID UNLOADER

<table>
<thead>
<tr>
<th>Option</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relief valve</td>
<td>RXXX</td>
</tr>
<tr>
<td>Top G1/2 Port</td>
<td>T4</td>
</tr>
<tr>
<td>Solenoid</td>
<td>E</td>
</tr>
<tr>
<td>12VDC</td>
<td>12</td>
</tr>
<tr>
<td>24VDC</td>
<td>24</td>
</tr>
</tbody>
</table>

‘XXX’ = relief valve setting in

Example code

R210 T4E U 24  Relief Valve set 140 Bar, 24VDC

This special inlet includes the pilot pressurising valve for solenoid sections so is used with a standard outlet cover.

Unloader
NO Normally open
Unloads P to T unless energised

Relief Valve
Adjustable. Pilot Operated

Manual Override
Screw in to operate

Body  Aluminium
Weight 1.7kg
Width  N/a

TYPICAL PRESSURE DROP UNLOADED

<table>
<thead>
<tr>
<th>FLOW L/MIN</th>
<th>PRESSURE BAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1.0</td>
</tr>
<tr>
<td>10</td>
<td>2.0</td>
</tr>
<tr>
<td>20</td>
<td>3.0</td>
</tr>
<tr>
<td>30</td>
<td>4.0</td>
</tr>
</tbody>
</table>

Hy-Pro
motion and control solutions
INLET WITH FLOW CONTROL

<table>
<thead>
<tr>
<th>Option</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relief valve</td>
<td>RXXX</td>
</tr>
<tr>
<td>Top G1/2 Port</td>
<td>T4</td>
</tr>
<tr>
<td>Solenoid</td>
<td>E</td>
</tr>
<tr>
<td>Handwheel</td>
<td>K</td>
</tr>
<tr>
<td>Screw &amp; lock nut</td>
<td>S</td>
</tr>
<tr>
<td>Standard needle</td>
<td></td>
</tr>
<tr>
<td>Fine needle</td>
<td>F</td>
</tr>
<tr>
<td>1 Turn needle</td>
<td>L</td>
</tr>
<tr>
<td>No shut off needle</td>
<td>O</td>
</tr>
<tr>
<td>Marinised</td>
<td>M</td>
</tr>
</tbody>
</table>

‘XXX’ = relief valve setting in bar.

Example codes

<table>
<thead>
<tr>
<th>Option</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relief Valve</td>
<td>RXXX</td>
</tr>
<tr>
<td>Top G1/2 Port</td>
<td>T4</td>
</tr>
<tr>
<td>Solenoid</td>
<td>E</td>
</tr>
<tr>
<td>Handwheel</td>
<td>K</td>
</tr>
<tr>
<td>Screw &amp; lock nut</td>
<td>S</td>
</tr>
<tr>
<td>Standard needle</td>
<td></td>
</tr>
<tr>
<td>Fine needle</td>
<td>F</td>
</tr>
<tr>
<td>1 Turn needle</td>
<td>L</td>
</tr>
<tr>
<td>No shut off needle</td>
<td>O</td>
</tr>
<tr>
<td>Marinised</td>
<td>M</td>
</tr>
</tbody>
</table>

Adjustable range 0-60 L/min
\( \Delta P \) Inlet to outlet 40 L/min 0.6 bar
\( \Delta P \) Inlet to service 40 L/min 4.6 bar

Relief Valve
Adjustable. Pilot Operated

Mounting 2x M8x1.5p-6H
Body Aluminium
Weight 2.0kg
INLET WITH FLOW CONTROL (100L/min)

This special unloading inlet cover maintains 60 L/min to the valve regardless of the inlet flow (up to a maximum of 100 L/min).

Excess flow is returned to the outlet port.

Features internal check valve for reverse connection protection.

Input flow 100L/min Max
Output flow 60L/min
Ports Inlet G3/4
Outlet G3/4
Relief Valve Adjustable. Pilot Operated
Body Aluminium
Weight 2.0kg
INLET WITH PROPORTIONAL FLOW CONTROL

This special inlet includes its own return line which is separate from the adjacent spool sections and must be connected to tank.

Adjustable range 0-60 L/min
Voltage 12 or 24VDC

Relief Valve
Adjustable. Direct Acting.

Mounting 2x M8x1.5p-6H
Body Aluminium
Weight 2.0kg

'XXX' = SETTING IN BAR
'XX' = 12 OR 24VDC
STANDARD OUTLETS

The outlet covers come with G (BSP) ports in either top or side positions. Pressure Carry Over is available by selection of an alternative outlet cover.

If a solenoid spool section is used in the bank an ‘E’ type outlet is used which contains the pilot pressurising valve and the additional drillings for the connections. Note that if a combined inlet/unloader is fitted the ‘E’ type outlet is not required.

---

**Body**

- **Cast Iron**

**Weight**

- **0.8kg**
# V4-40 & V5-60 OUTLET COVERS

<table>
<thead>
<tr>
<th>Option</th>
<th>Code</th>
<th>PORT POSITION</th>
<th>PORT SIZE</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top port</td>
<td>T</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Side port</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G1/2 Port</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G3/4 port</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outlet</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure Carry Over</td>
<td>P</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outlet - solenoid</td>
<td>OE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure Carry Over - Solenoid</td>
<td>PE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Closed Centre - Solenoid</td>
<td>CE</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Example codes

- **T 3 O**: G3/8 Top port
- **S 6 P**: G3/4 Side port and Pressure Carry Over
- **T 4 OE**: G1/2 Top port for Solenoid sections
- **T 4 CE**: G1/2 Top port, Closed centre for Solenoid sections

Pilot drillings omitted for clarity:

- Outlet
- Outlet with PCO
- Outlet for Solenoid Sections
- Outlet with PCO for Solenoid Sections
- Outlet Closed Centre for Solenoid Sections
DESCRIPTION

The V4-40 and V5-60 working sections have family of spools to suit most applications. There are standard or fine metering options and 2, 3 and 4 position detent / spring centring mechanism combinations. Actuation options are manual levers – standard / rotary / dual axis (x & +), cable, direct link to the spool, pneumatic or pilot solenoid (with or without manual lever override). The standard manual lever assembly has four orientation options and is universal across the range. Lever knobs are available in a variety of colours. Spool operated single or twin V3 series micro-switch assemblies can be fitted to manual sections with the option of IP67 environmental protection. Body options consist of standard threaded ports or an interface for the fitment of ancillary valves.
### SPOOL OPTIONS

<table>
<thead>
<tr>
<th>Manual</th>
<th>Code</th>
<th>Solenoid</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cylinder</td>
<td>D</td>
<td>Cylinder</td>
<td>D</td>
</tr>
<tr>
<td>Cylinder - fine metering</td>
<td>K</td>
<td>Motor*</td>
<td>M</td>
</tr>
<tr>
<td>Motor</td>
<td>M</td>
<td>Single acting A port</td>
<td>A</td>
</tr>
<tr>
<td>Motor - fine metering</td>
<td>MF</td>
<td>Single acting B port</td>
<td>B</td>
</tr>
<tr>
<td>Single acting A port</td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single acting B port</td>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Position float</td>
<td>4</td>
<td>4 Position float</td>
<td>4</td>
</tr>
<tr>
<td>Regenerative</td>
<td>R</td>
<td>Regenerative</td>
<td></td>
</tr>
<tr>
<td>Unloading (Dead mans handle)</td>
<td>P</td>
<td>Unloading (Dead mans handle)</td>
<td>P</td>
</tr>
</tbody>
</table>

**Solenoid Options**

- **Cylinder**: D
- **Motor**: M
- **Single acting A port**: A
- **Single acting B port**: B

**Manual Options**

- Cylinder: D
- Cylinder - fine metering: K
- Motor: M
- Motor - fine metering: MF
- Single acting A port: A
- Single acting B port: B
- 4 Position float: 4
- Regenerative: R
- Unloading (Dead mans handle): P

**Pneumatic**

- Cylinder: D
- Motor: M
- Single acting A port: A
- Single acting B port: B

*For flows <5 L/min please contact us.*
BODY OPTIONS

Body options are available with standard G (BSP) ports or with an ancillary interface to facilitate the fitment of Pilot Check, Service Line Relief or Solenoid 4th Position manifolds.

<table>
<thead>
<tr>
<th>Option</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard ports</td>
<td>-</td>
</tr>
<tr>
<td>Ancillary interface - Pilot check</td>
<td>Y</td>
</tr>
<tr>
<td>Ancillary interface - Service relief</td>
<td>Z</td>
</tr>
</tbody>
</table>

Material: Cast Iron
Weight: 2.0kg Manual
        2.5 kg Solenoid
Width: 38.1mm

Hy-Pro
motion and control solutions
SPOOL POSITIONING OPTIONS

2, 3 and 4 position centring mechanisms in a combination of spring return and detent location.

- **Spring - 3 Position**
  - Code: C
  - Code: 1
  - Code: 2
  - Code: 3

- **Spring - 2 Position P to B**
  - Code: 2C
  - Code: 0
  - Code: 2

- **Detent - 3 Position**
  - Code: L
  - Code: 1
  - Code: 2
  - Code: 3

- **Detent - 2 Position P to B**
  - Code: 2L
  - Code: 0
  - Code: 2

- **Detent - 2 Position P to A**
  - Code: 2Li
  - Code: 1
  - Code: 2

- **Detent Friction - 3 Position**
  - Code: O
  - Code: 1
  - Code: 2
  - Code: 3

- **Spring / Detent - 3 Position**
  - Code: F
  - Code: 1
  - Code: 2
  - Code: 3

- **Float - 4 Position**
  - Code: C
  - Code: 1
  - Code: 2
  - Code: 3

- **Detent - 4 Position**
  - Code: L
  - Code: 1
  - Code: 2
  - Code: 3

**Manual**

- Spring - 3 Position: C
- Spring - 2 position P-B: 2C
- Detent - 3 Position: L
- Detent - 2 position P-B: 2L
- Detent friction - 3 Position: O
- Spring / Detent - 3 Position: F
- Float - 4 Position: 4C
- Detent - 4 position: 4L

**Solenoid**

- Solenoid - 3 Position: E
- Solenoid - 2 position: 2E

**Pneumatic**

- Pneumatic - 3 Position: P
- Pneumatic - 2 position: 2P

---

Hy-Pro

motion and control solutions
CONTROL OPTIONS - STANDARD LEVER & CABLE

The standard lever is common across the sectional valve range. It can be supplied as standard or with environmental protection.

A further option on manual and solenoid sections is to have the lever fitted ‘sideways’ on - contact us for details.

<table>
<thead>
<tr>
<th>Option</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Lever*</td>
<td>X</td>
</tr>
<tr>
<td>No Lever - solenoid sections</td>
<td>-</td>
</tr>
<tr>
<td>Standard Lever</td>
<td>H</td>
</tr>
<tr>
<td>Standard Lever - 90º</td>
<td>N</td>
</tr>
<tr>
<td>Standard Lever - Reversed</td>
<td>R</td>
</tr>
</tbody>
</table>

* For cable operation select code X. The mounting holes for the lever accept a standard ‘Morse’ type cable.

Fixing
- 2x M6 Cap screw
  - Torque - 13.5Nm manual valves
  - 8 Nm Solenoid valves

Knob
- Black standard,
  - Red, Blue, Green,
  - Yellow or Ident’ type

Body
- Aluminium LM24TF

Fasteners
- Deltatone

Weight
- 0.3kg
CONTROL OPTIONS - ROTARY LEVER

Used extensively in the forestry and fishing industry to control the speed of conveyors and winches. The Hy-Pro rotary lever has been developed specifically to enable the operator precise control of motors and cylinders. The lever rotates through a ±65° arc and operates a scroll which converts the rotary action of the lever into axial movement of the spool. The mechanism has a friction detent feature which positively holds the spool in neutral or will maintain the selected position when operated. Because of the geometry of the lever it is not possible to include it in multi-section valves but it is a retro-fit to existing single section assemblies.

Body: Manganese bronze CZ114
Lever: Stainless steel
Weight: 2.0kg
Width: N/a

Refer to page 29 for full ordering code.
**CONTROL OPTIONS - MULTI AXIS**

The V4 and V5 dual axis levers operate two sections either simultaneously or individually, allowing the operator to have total control of two sections using 360 degrees of movement.

The H+ version controls section one in the north and south planes and section two in the east and west. Combinations of movement are achieved between these points.

The Hx version controls both sections in the north, south, east and west planes and individual sections between these points.

**Minimum operating Force**
- One spool: 2.5 kg
- Two spool: 5.0 kg

**Body**
- Aluminium

**Pivots**
- Carburised steel

**Width**
- N/a
ENVIRONMENTAL PROTECTION OPTIONS

The valves are available with a marinised finish to withstand harsh environments. It comprises black anodised lever housings with stainless steel handles and locknuts. For further protection such as in marine applications the spool can be supplied with electro-less nickel plating.

Refer to the order and example codes on pages 28 and 29.

WORKING SECTIONS - MICRO-SWITCH OPTIONS

The V4-40 and V5-60 ranges can be fitted with a micro-switch to enable the activation of auxiliary functions with spool operation.

<table>
<thead>
<tr>
<th>Micro-switch Options</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring centred</td>
<td>C</td>
</tr>
<tr>
<td>Detent</td>
<td>L</td>
</tr>
<tr>
<td>Spring/Detent</td>
<td>F</td>
</tr>
<tr>
<td>Main spool S/Acting B</td>
<td>B</td>
</tr>
<tr>
<td>Main spool S/Acting A</td>
<td>A</td>
</tr>
<tr>
<td>Main spool D/Acting</td>
<td>D</td>
</tr>
<tr>
<td>Standard V3 Switch</td>
<td>-</td>
</tr>
<tr>
<td>IP67 V3 Switch</td>
<td>WP</td>
</tr>
</tbody>
</table>
ORDER CODES

Create the order code by reading left to right, following the paths between options. A selection of typical codes are shown on the next page.
### ORDER CODES - EXAMPLES

A selection of typical spool section order codes generated by the matrix shown on the previous page. Manual, solenoid and pneumatic spool sections can be used in the same valve assembly.

<table>
<thead>
<tr>
<th>SPOOL</th>
<th>BODY</th>
<th>POSITIONING</th>
<th>LEVER</th>
<th>PROTECTION</th>
<th>OTHER</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td></td>
<td>C</td>
<td>H</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td></td>
<td>L</td>
<td>H</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>K</td>
<td></td>
<td>L</td>
<td>H</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>Z</td>
<td>C</td>
<td>R</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td></td>
<td>C</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Cylinder spool**
  - Standard ports
  - Spring centred
  - Standard lever

- **Motor spool**
  - Standard ports
  - Detented
  - Marinised lever

- **Fine metering cylinder spool**
  - Standard ports
  - Detented
  - Marinised lever and spool

- **Motor spool**
  - Interface for service line relief manifold
  - Spring centred
  - Reversed marinised lever

- **Single acting cylinder spool**
  - Standard ports
  - Spring centred
  - No lever

### SPOOL BODY POSITIONING LEVER PROTECTION VOLTAGE

<table>
<thead>
<tr>
<th>SPOOL</th>
<th>BODY</th>
<th>POSITIONING</th>
<th>LEVER</th>
<th>PROTECTION</th>
<th>VOLTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td></td>
<td>E</td>
<td>H</td>
<td>S</td>
<td>12</td>
</tr>
<tr>
<td>M</td>
<td>Z</td>
<td>2E</td>
<td></td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>M</td>
<td>Y</td>
<td>E</td>
<td></td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>D</td>
<td></td>
<td>P</td>
<td>H</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Cylinder spool**
  - Standard ports
  - Solenoid control
  - Marinised lever
  - 12VDC

- **Motor spool**
  - Interface for service line relief manifold
  - 2 position solenoid control
  - 24VDC

- **Motor spool**
  - Manifold interface for pilot check valves
  - Solenoid control
  - 24VDC

- **Cylinder spool**
  - Standard ports
  - Pneumatic control
  - Standard lever
FLOW CONTROL SECTION - MANUAL

A fully pressure and flow-compensated metering type flow control, which can be included in V4 and V5 manual and solenoid valve assemblies. The regulated flow is supplied via the pressure gallery to downstream sections, while those upstream are unaffected. A variety of controls are available to allow the flow to be pre-set or continually adjustable. A relief valve option limits the maximum pressure within the pressure gallery and a series link version can be supplied to ensure full pump flow is available to the regulated sections even when up-stream sections are in use.

Adjustable range 0-60 L/min
ΔP Inlet to outlet 40 L/min 0.6 bar
ΔP Inlet to service 40 L/min 4.6 bar

Relief Valve
Adjustable. Pilot Operated

Body Aluminium
Weight 2.0kg
Width 38.1mm
50.8mm (Series

Handwheel adjustment
Screw adjustment with Relief valve
Cable operation
Series connection
Fixed flow
With relief valve

Hy-Pro
motion and control solutions
V4-40 & V5-60 INTERSECTIONS

<table>
<thead>
<tr>
<th>Option</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handwheel</td>
<td>K</td>
</tr>
<tr>
<td>Screw &amp; lock nut</td>
<td>S</td>
</tr>
<tr>
<td>Cable</td>
<td>C</td>
</tr>
<tr>
<td>Fixed Flow</td>
<td>SX</td>
</tr>
<tr>
<td>Standard metering</td>
<td>-</td>
</tr>
<tr>
<td>Fine metering</td>
<td>F</td>
</tr>
<tr>
<td>1 Turn metering</td>
<td>L</td>
</tr>
<tr>
<td>No shut off metering</td>
<td>O</td>
</tr>
<tr>
<td>Marinisation</td>
<td>M</td>
</tr>
<tr>
<td>Relief valve</td>
<td>RXXX</td>
</tr>
<tr>
<td>Series connection</td>
<td>S</td>
</tr>
</tbody>
</table>

‘X’ = flow setting L/min
‘XXX’ = relief valve setting in bar.

**EXAMPLES**

- **CABLE OPERATION**
  - SERIES CIRCUIT
  - HANDWHEEL ADJUST
  - STANDARD NEEDLE
  - SCREW ADJUST
  - RELIEF VALVE SET 210 BAR
  - CABLE OPERATION
  - SERIES CIRCUIT
  - FLOW FIXED AT 5.0 L/MIN
  - RELIEF VALVE SET 80 BAR
  - MARINISATION

- **Standard**
- **Relief valve**
- **Relief valve & Series link**
The flow divider inter-section allows two hydraulic circuits to be built into one valve assembly. Flow is fed directly to the section. The adjustable priority flow is fed to the left hand sections and the remaining flow to the right hand sections, thus allowing two circuits to be run simultaneously and independently. A series link can be incorporated in the flow divider section, re-combining the flow and feeding the full flow to the right hand sections, whilst maintaining priority flow to the left hand sections. The pressure compensated flow divider can be supplied with either a graduated handwheel for continuous adjustment or preset with a lock nut.

**Input flow @ 60 L/min**
- **Priority flow maximum**: 36 L/minute
- **Priority flow minimum**: 0 L/minute
- **Secondary flow maximum**: 60 L/minute
- **Secondary flow minimum**: 24 L/minute
- **ΔP inlet to service**: 6.9 bar

**Body**: Aluminium
**Weight**: 0.9 Kg
**Width**: 50mm
**Option**
Handwheel
Screw & lock nut

Parallel Connection
Series Connection
Parallel - Priority to Tank Internal connection
Parallel - Priority Tank External Port
Series - Priority Flow Available when no
Upstream section Selected
Parallel - Priority Flow to External Port

**Code**
K
S

**CONTROL**
FD

**CIRCUIT**
S
X
XT
SP
PST

---

**Option**
Parallel with Priority Flow to Tank

**Code**
K
S

**CONTROL**
FD

**CIRCUIT**
S
X
XT
SP
PST

---

**Option**
Parallel with Priority Flow to Port

**Code**
XT

**CONTROL**
FD

**CIRCUIT**
S
X
XT
SP
PST

---

**Option**
Series with Priority Tank port

**Code**
SP

**CONTROL**
FD

**CIRCUIT**
S
X
XT
SP
PST

---

**Option**
Parallel with Priority Tank port

**Code**
PST

**CONTROL**
FD

**CIRCUIT**
S
X
XT
SP
PST
FLOW CONTROL SECTION - ELECTRIC

The priority type pressure compensated flow control varies the flow available to the downstream sections in the valve assembly. If used in conjunction with solenoid sections complete remote control can be achieved electronically.

When used in conjunction with a proportional PWM driver plug, the control is obtained with a 10kΩ potentiometer or 0 to 10V DC external signal.

Adjustable range 0–60 L/min
Δp inlet to outlet 60L/min 0.9 bar
Δp inlet to service 60L/min 0.9 bar
Maximum pressure 210 bar
Coil Power 28 Watts
Coil Max Current 3.4 Amps @ 20°C

Relief Valve
Adjustable.
Pilot Operated
Body Aluminium
Weight 2.0kg
Width 51mm
FLOWS DIVIDER SECTION - ELECTRIC

The adjustable priority flow is unaffected by variable pump delivery or pressure changes in either priority or secondary circuits. Control is via a proportional driver plug and 10KΩ Potentiometer. A manually controlled version is also available.

**Option** | **Code** | **CONTROL**
---|---|---
Proportional 12 VDC | 12 | FDEN
Proportional 24 VDC | 24 |
Manual handwheel | K |
Manual Screw Adjuster | S |

**Priority flow** | 0-60 L/min | **Secondary flow** | 0-60 L/min |

**ΔP inlet to tank 40 lpm** | 2.0 bar | **ΔP inlet to priority service 40 L/min** | 1.6 bar |

**ΔP inlet to secondary service 40 L/min** | 2.0 bar | **Maximum pressure** | 210 bar |

**Coil Power** | 28 Watts | **Coil Max Current** | 3.4 Amps @ 20°C |

**Body** | Aluminium | **Weight** | 1.5 Kg |

**Width** | 70mm

---

**Hy-Pro**

**motion and control solutions**

35
Solenoid Unloader Section

Designed to rapidly unload the pressure gallery to tank when power to the coil is interrupted. Can be used in both manual and solenoid operated valve assemblies to override the other controls of the valve bank.

Relief Valve
Adjustable.
Pilot Operated

Manual Override
Screw in to operate

Unloader
NC Normally closed
Unloads P to T unless energised

Material  Aluminium
Weight  1.7kg
Width  38.1mm

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SERIES CONNECTOR SECTION

Series connector sections are designed to be fitted between two working sections, connecting in series the actuators that they control. Series connectors can be used to synchronize two hydraulic motors where the return oil from one is fed to the inlet of the second.

The series connector effects only the valve sections immediately upstream and downstream of its position in the valve bank. Other sections remain connected in parallel. When using the series connectors, consideration must be given to upstream sections. This is because the normally open tank gallery in the valve bank is pressurized when the series connected actuators are on load. If this is a problem specially designed inlet covers are available which contain a separate outlet port for the relief valve bypass flow. Special provision has also to be made for ancillary valves when used with series-connected valve banks. In such cases, customers are advised to discuss their circuit design with Hy-Pro.

<table>
<thead>
<tr>
<th>Material</th>
<th>Aluminium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>0.3kg</td>
</tr>
<tr>
<td>Width</td>
<td>19.0mm</td>
</tr>
</tbody>
</table>
SERIES PARALLEL SECTION

The series parallel section is used to give priority to up stream sections.

The pressure gallery is isolated from down stream sections when the up stream section is selected. If the up stream section is single acting, the pressure gallery is only closed when in the raised position, i.e. the down stream sections will have a pressure feed when in the lower position.

The series parallel connector can be used in manual and solenoid valve assemblies to provide an interlock or ensure a service is activated in the correct sequence.

---

**Body**  
Aluminium

**Weight**  
0.5 kg

**Width**  
38.1mm

---

**TYPICAL PRESSURE DROP P TO T**

<table>
<thead>
<tr>
<th>FLOW L/MIN</th>
<th>PRESSURE DROP BAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.2</td>
</tr>
<tr>
<td>10</td>
<td>0.4</td>
</tr>
<tr>
<td>20</td>
<td>0.6</td>
</tr>
<tr>
<td>30</td>
<td>0.8</td>
</tr>
<tr>
<td>40</td>
<td>1.0</td>
</tr>
<tr>
<td>50</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td></td>
</tr>
</tbody>
</table>
MID INLET SECTION

A mid inlet section is used to enable two separate control valves to be built into one assembly. The first valve is fed from the inlet cover whilst the second is fed by the mid-inlet intersection. An adjustable relief valve is included to protect the pump supplying the sections fed by the mid-inlet. The mid inlet section combines elements of our standard inlet and outlet covers thus permitting a very compact installation with less hoses and connections than two separate valve banks. Options are available to have the outlet flow from both sides of the assembly combined into one outlet (MI) or as 2 separate outlets if the combined return flow is greater than 60 lpm (MIT).

<table>
<thead>
<tr>
<th>Option</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal tank connection</td>
<td>-</td>
</tr>
<tr>
<td>External tank connection</td>
<td>T</td>
</tr>
<tr>
<td>Relief Valve</td>
<td>RXXX</td>
</tr>
</tbody>
</table>

\[ \Delta p \text{ at rated flow } P \text{ to } T \] 0.5 bar

Body  
Aluminium

Weight  
0.6 kg

Width  
38.1mm

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PILOT OPERATED CHECK VALVE

The check valves are mounted on the service port face of a ‘Y’ type spool section. Where a single acting check valve is used, the section must be fitted with an ‘M’ spool to ensure pilot pressure is available to unlock the check valve.

When used with cylinders, whose rod is large in relation to the diameter of the bore, it is possible for pressures to be generated in the rod end which cannot be unloaded. To avoid this the ratio of the cylinder full area to the rod annular area must not be greater that 4:1, which is the pilot ratio of this check valve.

When lowering a loaded cylinder, the pump may not maintain the pilot pressure. This can result in jerky operation caused by oscillation of the pilot piston. This can be overcome by restricting the flow out of the cylinder to maintain pilot pressure at the check valve.

Opening pressure 3.0 bar
Leakage @210 bar 0 cc/min
Ratio 4:1
Body Cast iron
Mounting interface Y
Ports V4-40 G3/8
Ports V5-60 G1/2
Weight 1.2kg

Example code
DYCH PC D

Working section with ‘Y’ type interface

<table>
<thead>
<tr>
<th>Option</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Double Acting</td>
<td>D</td>
</tr>
<tr>
<td>Single Acting ‘A’ Port</td>
<td>A</td>
</tr>
<tr>
<td>Single Acting ‘B’ Port</td>
<td>B</td>
</tr>
<tr>
<td>Double Acting ‘A’ Port Only 1/2</td>
<td>A</td>
</tr>
<tr>
<td>Double Acting ‘B’ Port Only 1/2</td>
<td>B</td>
</tr>
</tbody>
</table>

FUNCTION

<table>
<thead>
<tr>
<th>PC</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>1/2 A</td>
<td>1/2 B</td>
</tr>
</tbody>
</table>

TYPICAL PRESSURE DROP

PRESSURE DROP BAR

FLOW L/MIN

Hy-Pro
motion and control solutions
The service line relief valve is used to limit the pressure in individual service lines and provide anti-cavitation protection in circuits with overrun situations to maintain oil in the actuators.

The valve is mounted onto the service port face of a "Z" type valve section using four cap screws. The body has a cavity for each service line. This will accept one of four cartridges, relief, anti-cavitation, relief and anti-cavitation or a blanking cartridge. Relief valves are pre-set but are fully adjustable retrospectively using the socket screw located under the cap nut. The service line relief and anti-cavitation valves can be used on manual and solenoid operated sections.

**Option**
- No Function: 0
- Service Line Relief: XXX
- Anti-Cavitation: AC
- Service Line Relief & Anti-Cavitation: XXXAC

XXX = Relief valve setting in Bar

Example code: DZCH SLR 140 140AC

Working section with ‘Z’ type interface

**Example code**
140 Bar A port
140 Bar & AC B port

**Relief valve range**
20 bar to 205 bar

**Adjustment (approx)**
35 bar per turn

**Anti-cavitation**
0.5 bar

**Mounting interface**
Z type

**Body**
Aluminium

**Ports V4-40**
G3/8

**Ports V5-60**
G1/2

**Weight**
0.5 kg
CROSS-LINE RELIEF VALVE

The cross line relief valve relieves pressure in the service port and unloads it into the tank port. It is uni-directional but the manifold can be rotated so that the relief valve acts upon either the A service port or B service port. Note that on solenoid sections B port relief only is possible. Adjustment is made by either screw and locknut or by a handwheel.

Option | Code
--- | ---
Screw & Locknut | -
Handwheel | K
Acting on A port | A
Acting on B port | B

**Option Code**
- Screw & Locknut: -
- Handwheel: K
- Acting on A port: A
- Acting on B port: B

**CONTROL**

**PORT**

**RELIEF VALVE**

"XXX" = SETTING IN BAR

**Relief Valve Range**: 20 bar to 250 bar
**Adjustment**: 35 bar per turn
**Mounting interface**: Y Type
**Body**: Aluminium
**Ports V4-40**: G3/8
**Ports V5-60**: G1/2
**Weight**: 0.5 kg
**Width**: N/A
SOLENOID 4 POSITION VALVE

The solenoid 4 position valve connects both sides of a double acting cylinder to tank allowing it to float. For example when used with a D spool solenoid section on grass cutting or snow ploughing equipment the blades will follow the contours of the ground when the solenoid is actuated.

Example code
DZEH 12 4 12

Working section with ‘Z’ type interface

- **VOLTAGE**
  
<table>
<thead>
<tr>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
</tr>
<tr>
<td>12</td>
</tr>
<tr>
<td>12</td>
</tr>
<tr>
<td>24</td>
</tr>
</tbody>
</table>

- **Coil Power** 24 Watt
- **Connector** IP67
- **Mounting interface** Z Type
- **Ports** G3/8
- **Body** Aluminium
- **Weight** 1.0kg
- **Width** N/a
DESCRIPTION

The V3-100 directional sectional spool valve is one of the most compact 100 l/min valve available. Designed for pressures up to 250 bar the valve is available with two, three and four position spool control options and a range of spool types. The lever mechanism is a pressure die casting which totally encloses the spool for added protection. A range of optional ancillary valves are also available to be able to match the requirements of the most complicated and demanding circuits.

The V3-100 is also available with solenoid control. It uses 12V and 24V 24 Watt DC coils to switch the internal oil pilot to engage the main spool. A damping orifice fitted in the pilot line eliminates the harshness usually associated with standard direct acting solenoid valves and gives a positive feel to the control system.

Both manual and solenoid sections can be built into a valve assembly and the solenoid sections have the options of lever override.

Application

Designed to be used in applications requiring a rugged, compact control valve with the option of remote control. Typically in the automotive recovery, recycling and agricultural industries where a mix of manual and solenoid control is essential.

Features

- Excellent metering characteristics.
- Excellent load holding.
- Integral load check valve.
- Open and closed centre option.
- Adjustable, pilot operated relief valve.
- Robust enclosed lever mechanism.
- Flow control option.
- 100% production testing.
- Environmental protection option.
- 12 and 24V DC 24 Watt coils.
- Soft spool action.
- Interchangeable with manual sections.
- Lever override option.
V3-100 OPERATING CONDITIONS

Maximum pressure 250 bar
210 bar*
Maximum back pressure 25 bar

* Assemblies with solenoids
Rated flow 100 l/min

Spool leakage 210 bar 20ºc
Standard Spools <6cc/min
4 Position Spools <8cc/min

Materials
Cast Iron BS1452-250
Aluminium BS1490
Spools Case Harden BS6507
Tie studs BS970/191 817M40T

Tie stud torque 13.5Nm

External protection
Black Paint to HTS1006

Stainless steel
BS 10088-3
Steel
Zinc chromate BS 1706 Zn3
Nitrotech NQ3
Black paint HTS1006

Static Seals Nitrile
Reciprocating Viton
Spool High Pressure PTFE
Anti Extrusion PTFE

Electrical
Coil Voltage 12 or 24VDC
Max cont. Voltage 12V = 13.8V
24V = 27.5V
Coil Power 24W
Protection IP67
Connection DIN 43650
Cable Ø 6 - 8mm
(not supplied)
V3-100 INSTALLATION DETAILS

- A PORT
- B PORT
- INLET COVER
- SOLENOID SECTION
- FLOW CONTROL
- MANUAL SECTION
- OUTLET COVER

RELIEF VALVE

A PORT COIL
B PORT COIL

3 MOUNTING HOLES
Ø 10.3 THRO
Inlet Covers
Pages 50-51

Intersections
Pages 62-64

Spool Sections
Pages 54-61

Outlet Covers
Pages 52-53
The inlet covers come with G(BSP) ports in either top or side positions. They can be fitted with or without a relief valve.

**Option**
- Relief valve: RXXX
- Side port: S
- Top port: T
- Port size G3/4: 6

‘XXX’ = relief valve setting in bar.

Example codes:
- T 6: Inlet with Top G3/4 port
- S 6: Inlet with Side G3/4 port
- RXXX T 6: Inlet with Top G3/4 port and Relief valve
- RXXX S 6: Inlet with Side G3/4 port and Relief valve

**Relief Valve**
Adjustable. Pilot Operated

**Mounting**
1 x Ø10.3 Through Holes

**Material**
Cast Iron

**Weight**
0.75kg

**Width**
N/a
## V3-100 INLET COVERS

### INLET WITH FLOW CONTROL

<table>
<thead>
<tr>
<th>Option</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handwheel</td>
<td>K</td>
</tr>
<tr>
<td>Screw &amp; lock nut</td>
<td>S</td>
</tr>
<tr>
<td>Relief valve</td>
<td>RXXX</td>
</tr>
<tr>
<td>Top port G3/4</td>
<td>T6</td>
</tr>
<tr>
<td>Side port G3/4</td>
<td>S6</td>
</tr>
<tr>
<td>Marinisation</td>
<td>M</td>
</tr>
</tbody>
</table>

‘XXX’ = relief valve setting in

### Relief Valve

Adjustable. Pilot Operated

### Pressure & Flow Compensated

- **Adjustable range**: 0-100 L/min
- ΔP Inlet to outlet 40 L/min: 0.6 bar
- Inlet to service 40 L/min: 4.6 bar
- **Max Pressure**: 210 bar

### Example codes

<table>
<thead>
<tr>
<th>Code</th>
<th>Handwheel</th>
<th>Relief Valve</th>
<th>Port</th>
<th>Marinisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCN</td>
<td>K</td>
<td>RXXX</td>
<td>T6</td>
<td>M</td>
</tr>
<tr>
<td>FCN</td>
<td>S</td>
<td></td>
<td>S6</td>
<td></td>
</tr>
</tbody>
</table>

- **Handwheel, relief valve set 210 Bar, Top G3/4 port**

- **Screw adjuster, no relief valve, Side G3/4 port**

---

**Hy-Pro**

Motion and Control Solutions

---

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STANDARD OUTLETS

The outlet covers come with G(BSP) ports in either top or side positions. Pressure carry over is available by selection of an alternative outlet cover.

If a solenoid spool section is used in the assembly an ‘E’ type outlet is used which contains the pilot pressurising valve and the additional drillings for the pilot connections.

Body: Cast Iron
Weight: 1.7kg
V3-100 OUTLET COVERS

**Option**
- Top port
- Side port
- G3/4 port
- Outlet
- Outlet - solenoid
- Pressure Carry Over
- Closed Centre - Solenoid

**Code**
- Top port: T
- Side port: S
- G3/4 port: 6
- Outlet: O
- Outlet - solenoid: OE
- Pressure Carry Over: P
- Closed Centre - Solenoid: CE

**Example codes**

- T 6 O: Outlet with G3/4 Top port
- S 6 P: Outlet with G3/4 Side port and Pressure Carry Over
- T 6 OE: Outlet with G1/2 Top port for Solenoid sections
- T 6 CE: Outlet with G1/2 Top port, Closed centre for Solenoid sections

**Pilot connections omitted for clarity**

Outlet
Outlet for solenoid sections
Outlet with PCO
Outlet Closed centre manual and solenoid sections
DESCRIPTION

The V3-100 working sections spools to suit most applications. There are positioning options for 2, 3 and 4 position detent / spring centring mechanism combinations. Actuation options are manual levers – standard, rotary, cable, direct link to the spool, or pilot solenoid (with or without manual lever override). The standard manual lever assembly has four orientation options and is universal across the range. Lever knobs are available in a variety of colours.

Weight
- 3.0kg Manual
- 4.9kg Solenoid

Width
44.5mm
SPOOL OPTIONS

There are spools to suit most applications, all with excellent metering characteristics.

<table>
<thead>
<tr>
<th>Manual</th>
<th>Code</th>
<th>Solenoid</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cylinder</td>
<td>D</td>
<td>Cylinder</td>
<td>D</td>
</tr>
<tr>
<td>Motor</td>
<td>M</td>
<td>Motor</td>
<td>M</td>
</tr>
<tr>
<td>Single acting A port</td>
<td>A</td>
<td>Single acting A port</td>
<td>A</td>
</tr>
<tr>
<td>Single acting B port</td>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Position float</td>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Solenoid pilot connections
Omitted for clarity.

Cylinder
Motor
SINGLE ACTING ‘A’ PORT
SINGLE ACTING ‘B’ PORT
4 POSITION (FLOAT)
2, 3 and 4 position control mechanisms in a combination of spring return and detent location.

**Manual**
- Spring - 3 Position: C
- Spring - 2 Position: 2C
- Detent - 3 Position: L
- Detent - 2 Position: 2L
- Detent friction - 3 Position: O
- Spring / Detent - 3 Position: F
- Float - 4 Position: 4C

**Solenoid**
- Solenoid - 3 Position: E
- Solenoid - 2 position: 2E

**V3-100 WORKING SECTIONS**

**SPOOL POSITIONING MECHANISMS**

- Spring - 3 Position
  - C
  - \[102\]

- Spring - 2 Position
  - 2C
  - \[02\]

- Detent - 3 Position
  - L
  - \[102\]

- Detent - 2 Position
  - 2L
  - \[02\]

- Detent Friction - 3 Position
  - O
  - \[102\]

- Spring / Detent - 3 Position
  - F
  - \[102\]

- Float - 4 Position
  - C
  - \[1023\]

**Hy-Pro**

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CONTROL OPTIONS

The standard lever is common across the sectional valve range. It can be supplied with environmental protection.

Fixing
2x M6 Cap screws
Torque - 13.5Nm

Knob
Black standard,
Red, Blue, Green,
Yellow or Ident’ type

Body Fasteners
Aluminium LM24TF
Deltatone

Cable
N/a

Option Code
No Lever* X
No Lever - solenoid sections -
Standard Lever H
Standard Lever - 90º N
Standard Lever - Reversed R

* For cable operation select code X.
The mounting holes for the lever accept a standard ‘Morse’ type cable.
CONTROL OPTIONS - ROTARY LEVER

Used extensively in the forestry and fishing industry to control the speed of conveyors and winches. The Hy-Pro rotary lever has been developed specifically to enable the operator precise control of motors and cylinders. The lever rotates through a ± 90° arc and operates a scroll which converts the rotary action of the lever into axial movement of the spool. The mechanism has a friction detent feature which positively holds the spool in neutral or will maintain the selected position when operated. Because of the geometry of the lever it is not possible to include it in multi-section valves but it is a retro-fit to existing single section assemblies.

Refer to page 58 for full ordering code.

Body: Manganese bronze CZ114
Lever: Stainless steel
Weight: 2.0kg
Width: N/a
ENVIRONMENTAL PROTECTION OPTIONS

The valves are available with a marinised finish to withstand harsh environments. It comprises black anodised aluminium housings with stainless steel levers and locknuts. For further protection such as in marine applications the spool can be supplied with electro-less nickel plating.

Refer to the order codes and examples on pages 58 and 59.

<table>
<thead>
<tr>
<th>Option</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>-</td>
</tr>
<tr>
<td>Stainless steel lever &amp; Anodised housing</td>
<td>S</td>
</tr>
<tr>
<td>Stainless steel lever, Anodised housings &amp; Nickel plated spool</td>
<td>M</td>
</tr>
</tbody>
</table>
ORDER CODES

Create the order code by reading left to right, following the paths between options. A selection of typical codes are shown on the next page.
## ORDER CODES - EXAMPLES

A selection of typical spool section order codes generated by the matrix shown on the previous page. Manual and solenoid spool sections can be used in the same valve assembly.

### SPOOL  POSITIONING  CONTROL  PROTECTION

| D  | C  | H  |   | Cylinder spool  
|    |    |    |   | Spring centred  
|    |    |    |   | Standard lever  |

| M  | 2L | H  | S | Motor spool  
|    |    |    |   | 2 position detent  
|    |    |    |   | Marinised lever  |

### MANUAL

| D  | O  | HO | M | Cylinder spool  
|    |    |    |   | Rotary lever  
|    |    |    |   | Marinised spool  |

| M  | C  | R  | S | Motor spool  
|    |    |    |   | Spring centred  
|    |    |    |   | Reversed marinised lever  |

| A  | C  | X  |   | Single acting cylinder spool  
|    |    |    |   | Spring centred  
|    |    |    |   | No lever  |

### SOLENOID

| D  | E  | H  | S  | Cylinder spool  
|    |    |    |   | 12V solenoid control  
|    |    |    |   | with manual override  
|    |    |    |   | Marinised lever  |

| M  | 2E |   |   | Motor spool  
|    |    |   |   | 2 position  
|    |    |   |   | 24V solenoid control  |
A pressure and flow compensated meter-in type flow control which can be included in V3-100 valve manual or solenoid assemblies. The regulated flow is supplied via the pressure gallery to ‘down stream’ sections, while ‘up stream’ are unaffected. The flow can be continuously adjusted using a handwheel or preset with a screw and lock nut. A relief valve can be fitted to protect the circuit. There are options for alternate metering and environmental protection.

Adjustable range 0-100 L/min
\( \Delta P \) Inlet to outlet 40 L/min 0.6 bar
\( \Delta P \) Inlet to service 40 L/min 4.6 bar

Relief Valve
Adjustable. Pilot Operated

Body  Aluminium
Weight  2.5kg
Width  44.5mm
**Option**  | **Code**  
--- | ---  
Handwheel  | K  
Screw & lock nut  | S  
Standard metering  |  
Fine metering  | F  
1 Turn 64 L/min metering  | L  
Marinisation  | M  
Relief valve  | RXXX  

‘XXX’ = relief valve setting in bar.

**Examples**

<table>
<thead>
<tr>
<th>FCN</th>
<th>K</th>
<th>Handwheel adjust standard needle</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCN</td>
<td>S</td>
<td>Relief valve set 210 bar</td>
</tr>
<tr>
<td>FCN</td>
<td>K</td>
<td>Marinised body</td>
</tr>
</tbody>
</table>
Hy-Pro series connectors are designed to be fitted between two valve sections, connecting in series the actuators that they control. Series connectors are often used to synchronize two hydraulic motors where the return oil from one is fed to the inlet of the second.

The series connector effects only the valve sections immediately upstream and downstream of its position in the valve bank. Other sections remain connected in parallel. When using the series connectors, consideration must be given to upstream sections. This is because the normally open tank gallery in the valve bank is pressurized when the series connected actuators are on load. If this is a problem specially designed inlet covers are available which contain a separate outlet port for the relief valve bypass flow.

<table>
<thead>
<tr>
<th>Body</th>
<th>Aluminium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>0.5kg</td>
</tr>
<tr>
<td>Width</td>
<td>24mm</td>
</tr>
</tbody>
</table>
This compact valve has been specifically designed to operate hose and cable reels. It features a pressure compensated speed control with integral relief valve combined with a 4 position spool valve.

The desired speed is selected using the handwheel then the direction of rotation is selected using the spring centred lever. The lever can also be detented into a fourth position which allows the reel to ‘free wheel’. In the neutral position the reel is locked hydraulically.

**HRV HOSE-REEL VALVE**

**Rated flow**  40 L/min  
**Flow control adjustment:** 0-40 L/min  
**Relief valve adjustment:** 7-250 bar  
**Relief valve range:** 20-250 bar  
**Weight**  3.3kg
The V1830 is a two-way design with flow from A to B open in the on position and closed in the off.

It features male threads with 60 degree sealing cones for connection to either rigid or flexible pipe-work.

Typically used to isolate components in a hydraulic circuit.

**Ports**
- G3/8

**Rated flow**
- 27 l/min

**Internal leakage @210 bar**
- <2cc/min

**Materials**
- **Body**: Steel zinc plated
- **Knob**: Thermoplastic
- **Spool**: Hardened & ground

**Weight**
- 0.18kg

---

*Hy-Pro*

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The Hy-Pro in-line flow divider valve allows independent control of two hydraulic circuits from one input. The flow is split into a controlled ‘Priority’ (1) flow to feed one circuit and ‘a secondary’ (2) flow to feed the other. The priority flow is unaffected by varying pump delivery or pressure changes in either circuit.

Control is either by handwheel (KI) or Screw and locknut (S).

### Performance
- **Rated flow**: 60 L/min
- **Priority flow maximum**: 36 L/min
- **Priority flow minimum**: 0 L/min
- **ΔP inlet to service**: 6.9 bar
- **Maximum pressure**: 250 bar
- **Ports**: G1/2
- **Weight**: 0.63 kgs

**ADJUSTMENT**

**V2650M**

**KI**

**S**

**IN**

**1**

**2**

**147.5 (KI)**

**38.1**

**134.8 (S)**

**2x Ø7 THRO**

**14.7**

**50.8**

**9.14**

**62.5**

**Hy-Pro**

**motion and control solutions**

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Performance

<table>
<thead>
<tr>
<th>Option</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>27 L/min</td>
<td>V1837</td>
</tr>
<tr>
<td>40 L/min</td>
<td>V1030</td>
</tr>
<tr>
<td>60 L/min</td>
<td>V2050</td>
</tr>
<tr>
<td>Double acting</td>
<td>M</td>
</tr>
<tr>
<td>Single acting</td>
<td>M SA</td>
</tr>
</tbody>
</table>

Maximum pressure bar

<table>
<thead>
<tr>
<th>Model</th>
<th>V1837</th>
<th>V1030</th>
<th>V2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bar</td>
<td>210</td>
<td>210</td>
<td>210</td>
</tr>
</tbody>
</table>

Pilot ratio

<table>
<thead>
<tr>
<th>Model</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1837</td>
<td>2.25:1</td>
</tr>
<tr>
<td>V1030</td>
<td>4:1</td>
</tr>
<tr>
<td>V2050</td>
<td>3.28:1</td>
</tr>
</tbody>
</table>

Port size

<table>
<thead>
<tr>
<th>Model</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1837</td>
<td>G3/8</td>
</tr>
<tr>
<td>V1030</td>
<td>G3/8</td>
</tr>
<tr>
<td>V2050</td>
<td>G1/2</td>
</tr>
</tbody>
</table>

Weights

<table>
<thead>
<tr>
<th>Model</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1837</td>
<td>0.28 kg</td>
</tr>
<tr>
<td>V1030</td>
<td>0.95 kg</td>
</tr>
<tr>
<td>V2050</td>
<td>1.28 kg</td>
</tr>
</tbody>
</table>

Hy-Pro

motion and control solutions
The RV40 is a direct acting cartridge valve. It is used in a range of inline mounted manifolds with 3 or 4 G3/8 Ports or as a stand alone cartridge for incorporation in to your manifold. The dual line manifold with two cartridges is commonly used to prevent shock loads in hydraulic motors and equal ended cylinders.

Adjustments are made using the cap and lock nut, which can be supplied tamper evident and pre-set if desired.

**Performance**
- Rated flow: 40 l/min
- Max pressure: 250 bar
- Manifold ports: G3/8
- Relief re-seat: 80% of setting
- Range: 30-250 bar (ref options)

**Installation Torque**
- Cartridge: 27 Nm
- Lock Nut: 8 Nm

**Weights**
- RV40DSNKC: 0.13 kg
- RV40DSNM2: 0.20 kg
- RV40DSNM3: 0.22 kg
- RV40DSNM4: 0.54 kg
**RV40 DIRECT ACTING RELIEF VALVE**

<table>
<thead>
<tr>
<th>Option</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screw adjustment</td>
<td>S</td>
</tr>
<tr>
<td>Knob adjustment</td>
<td>K</td>
</tr>
<tr>
<td>Tamper Evident</td>
<td>T</td>
</tr>
<tr>
<td>30-70 Bar</td>
<td>L</td>
</tr>
<tr>
<td>50-200 Bar</td>
<td>N</td>
</tr>
<tr>
<td>100-250 Bar</td>
<td>H</td>
</tr>
<tr>
<td>Setting</td>
<td>XXX</td>
</tr>
<tr>
<td>Cartridge only</td>
<td>C</td>
</tr>
<tr>
<td>2 Port manifold</td>
<td>M2</td>
</tr>
<tr>
<td>3 Port manifold</td>
<td>M3</td>
</tr>
<tr>
<td>Dual relief valves</td>
<td>M4</td>
</tr>
</tbody>
</table>

‘XXX’ = relief valve setting in bar

RV40DSNXXXM2

RV40DSNXXXM3

RV40DSNXXXM4

HANDWHEEL K NOT ILLUSTRATED

Cavity details supplied on request

7/8" A/F HEX
The 60 L/min relief valve is a fast acting direct acting cartridge valve. It is used in a range of inline mounted manifolds with 3 or 4 G1/2 Ports or as a stand lone cartridge for incorporation into your manifold. The dual line manifold with two cartridges is commonly used to prevent shock loads in hydraulic motors and equal ended cylinders. Adjustments are made using the socket screw and lock nut, which can be fitted with an optional tamper evident cap. Alternatively a hand wheel adjuster can be specified.

**Performance**
- Rated flow: 60 L/min
- Max pressure: 250 bar
- Range: 25 to 250 bar
- Rate: 25 bar per turn
- Manifold ports: G1/2

**Installation Torque**
- Cartridge: 27 Nm
- Lock Nut: 8 Nm

**Weights**
- RV60DSNC: 0.13 kg
- RV60DSNM3: 0.44 kg
- RV60DSNM4: 0.73 kg
**RV60 DIRECT ACTING RELIEF VALVE**

<table>
<thead>
<tr>
<th>Option</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screw adjustment</td>
<td>S</td>
</tr>
<tr>
<td>Hand wheel</td>
<td>K</td>
</tr>
<tr>
<td>Tamper Evident</td>
<td>T</td>
</tr>
<tr>
<td>25 -250 bar</td>
<td>N</td>
</tr>
<tr>
<td>Setting</td>
<td>XXX</td>
</tr>
<tr>
<td>Cartridge only</td>
<td>C</td>
</tr>
<tr>
<td>3 Port manifold</td>
<td>M3</td>
</tr>
<tr>
<td>Dual relief valves</td>
<td>M4</td>
</tr>
</tbody>
</table>

‘XXX’ = relief valve setting in bar

Option   Code
---   ---
Screw adjustment S
Hand wheel K
Tamper Evident T
25 -250 bar N
Setting XXX
Cartridge only C
3 Port manifold M3
Dual relief valves M4

---

**Hy-Pro**

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The RV60P is a pilot operated relief valve cartridge. They can be used in the Hy-Pro range or V4-40 and V5-60 sectional valves or as an inline valve with a manifold. Two relief valves together in a manifold give dual line relief commonly used to prevent shock loads in hydraulic motors and equal ended cylinders.

**Performance**
- Rated flow: 60 L/min
- Max pressure: 250 bar
- Range: 20 to 250 bar
- Rate: 63 bar per turn
- Manifold ports: G1/2

**Installation Torque**
- Cartridge: 27 Nm
- Lock Nut: 8 Nm

**Weights**
- RV60PSNC: 0.13 kg
- RV60PSNM3: 0.44 kg
- RV60PSNM4: 0.73 kg
RV60 PILOT OPERATED RELIEF VALVE

**Option**
- Screw adjustment: S
- Handwheel: K
- Tamper Evident: T
- 20 - 250 bar: N
- Setting: XXX
- Cartridge only: C
- 3 Port manifold: M3
- Dual relief valves: M4

‘XXX’ = relief valve setting in bar

<table>
<thead>
<tr>
<th>Option</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screw adjustment</td>
<td>S</td>
</tr>
<tr>
<td>Handwheel</td>
<td>K</td>
</tr>
<tr>
<td>Tamper Evident</td>
<td>T</td>
</tr>
<tr>
<td>20 - 250 bar</td>
<td>N</td>
</tr>
<tr>
<td>Setting</td>
<td>XXX</td>
</tr>
<tr>
<td>Cartridge only</td>
<td>C</td>
</tr>
<tr>
<td>3 Port manifold</td>
<td>M3</td>
</tr>
<tr>
<td>Dual relief valves</td>
<td>M4</td>
</tr>
</tbody>
</table>

**Diagram**

RV60PSNXXXM3

RV60PSNXXXM4

Hy-Pro
motion and control solutions
The RV100 relief valve is a very reliable, pilot operated cartridge valve, with excellent repeatability. Available as a cartridge to fit a standard Hy-Pro cavity or in a range of single and twin cartridge manifolds. The twin cartridge, 4 ported manifold is commonly used to prevent shock loads in hydraulic motors and equal ended cylinders.

Performance
- Rated flow: 100 L/min
- Max pressure: 250 bar
- Manifold ports: G3/4
- Adjustment: 70 Bar/turn

Installation Torque
- Cartridge: 27 Nm
- Lock Nut: 8 Nm

Weights
- RV100 PSNXXXC: 0.19 kg
- RV100PSNXXXM3: 0.64 kg
- RV100PSNXXXM4: 1.23 kg
RV100 PILOT OPERATED RELIEF VALVE

**Option**
- Screw adjustment: S
- Handwheel: K
- Tamper Evident: T
- 20-250 bar: N
- Setting: XXX
- Cartridge only: C
- 3 Port manifold: M3
- Dual relief valves: M4

‘XXX’ = relief valve setting in bar

**Code**

<table>
<thead>
<tr>
<th>Option</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screw adjustment</td>
<td>S</td>
</tr>
<tr>
<td>Handwheel</td>
<td>K</td>
</tr>
<tr>
<td>Tamper Evident</td>
<td>T</td>
</tr>
<tr>
<td>20-250 bar</td>
<td>N</td>
</tr>
<tr>
<td>Setting</td>
<td>XXX</td>
</tr>
<tr>
<td>Cartridge only</td>
<td>C</td>
</tr>
<tr>
<td>3 Port manifold</td>
<td>M3</td>
</tr>
<tr>
<td>Dual relief valves</td>
<td>M4</td>
</tr>
</tbody>
</table>

**RV100PSNXXXXM3**

**RV100PSNXXXXM4**

*Hy-Pro*

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## FC60 & FC100 Flow Control Valves

### Performance

<table>
<thead>
<tr>
<th>Option</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow 60 L/min</td>
<td>FC60</td>
</tr>
<tr>
<td>Flow 100 L/min</td>
<td>FC100</td>
</tr>
<tr>
<td>Hand wheel</td>
<td>K</td>
</tr>
<tr>
<td>Screw adjust</td>
<td>S</td>
</tr>
<tr>
<td>Standard metering</td>
<td>-</td>
</tr>
<tr>
<td>Fine metering</td>
<td>F</td>
</tr>
<tr>
<td>1 Turn metering</td>
<td>L</td>
</tr>
<tr>
<td>Setting</td>
<td>RXXX*</td>
</tr>
</tbody>
</table>

*XXX = Relief valve setting in Bar

**Flow**
- FC60: 0-60 L/min
- FC100: 0-100 L/min

**Range**
- FC60: 20-250 bar
- FC100: 25 bar

**Inlet to service**
- 6.9 bar

**Max pressure**
- 250 bar

**Max back pressure bar**
- 25

**Pressure port**
- G3/4

**Service ports FC60**
- G1/2

**Service ports FC100**
- G3/4

**Weight**
- 1.5kg

---

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The adjustable priority flow is unaffected by variable pump delivery or pressure changes in either priority or secondary circuits. Control is via a proportional driver plug and 10KΩ Potentiometer. A manually controlled version is also available.

<table>
<thead>
<tr>
<th>Option</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportional 12 VDC</td>
<td>12</td>
</tr>
<tr>
<td>Proportional 24 VDC</td>
<td>24</td>
</tr>
<tr>
<td>Manual handwheel</td>
<td>K</td>
</tr>
<tr>
<td>Manual Screw Adjuste</td>
<td>S</td>
</tr>
</tbody>
</table>

Priority flow 0-60 L/min
Secondary flow 0-60 L/min
\( \Delta P \) inlet to tank 40 lpm 2.0 bar
\( \Delta P \) inlet to priority service 40 L/min 1.6 bar
\( \Delta P \) inlet to secondary service 40 L/min 2.0 bar
Maximum pressure 210 bar
Coil Power 28 Watts
Coil Max Current 3.4 Amps @ 20°C
Body Aluminium
Weight 1.5 Kg
Width 70mm
**Performance**

- **Ports**: G3/8
- **Rated flow**: 27 l/min
- **ΔP at rated flow**: 1.7 bar
- **Maximum pressure**: 210 bar

**Weights**

- **Three port**: 1.14 kg
- **Four port**: 1.03 kg

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**G3/8 ROTARY DIVERTER VALVES**

- **V1660 C**: 3 Port closed centre - red knob
- **V1660 O**: 3 Port open centre - black knob
- **V1860 C**: 4 Port closed centre - blue knob
- **V1860 O**: 4 Port open centre - black knob
- **V1860 D**: 4 Port diverter - blue knob

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**Typical Pressure Drop P-A/B**

<table>
<thead>
<tr>
<th>FLOW L/MIN</th>
<th>PRESSURE DROP BAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>10</td>
<td>0.5</td>
</tr>
<tr>
<td>20</td>
<td>1.0</td>
</tr>
<tr>
<td>30</td>
<td>1.5</td>
</tr>
<tr>
<td>30</td>
<td>2.0</td>
</tr>
</tbody>
</table>
MOTOR REVERSING VALVE

Designed to fit the Danfoss OMP, OMH and OMR motors.

**Option**
- Reversing Valve: V2660
- Sub-Plate: OMP OMH OMR V2661

**Performance**
- Ports: G3/8
- Maximum pressure: 210 bar

**Weights**
- Including sub plate: 1.85kg
G1/2 6 PORT DIVERTER VALVE

Option                  Code
Spring centred          C
Detent                  L
Lever                    H
No lever                X
Marinisation            M
Microswitch             MS

Performance
Rated flow              60 L/min
Maximum pressure        250 bar
Ports                   G1/2
Spool Leakage 25°C      <10cc/min at 210bar
Weight                  2.1 kg

Hy-Pro
motion and control solutions

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The 6 port diverter valve is available with either solenoid or manual control. The manual version is available with either detent or spring-centred spool control. A further option is the fitment of a micro-switch.

Both versions can be fitted with a pilot operated check valve acting on the E and F ports. Please contact us for details.

**Performance**
- Rated flow: 60 l/min
- Maximum pressure: 210 bar
- Ports: G1/2
- Spool Leakage @25°C: <10cc/min at 210 bar

**Coil**
- Voltage: 12 or 24 VDC
- Power: 60 Watts
- Voltage: 12 or 24 VDC ±10%
- Connection: DIN43650
- Protection: IP54
- **Weight**: 3.5 kg
The V1836 cross-line relief valve incorporates a special cartridge which can relieve pressure in 2 directions i.e. pressure can be applied to both the nose and shoulder of the cartridge. This allows its manifold to be very compact. The setting is adjusted and set by means of the hex cap and locknut. They are commonly used with motors and balanced cylinders to prevent shock loads.

**Performance**
- Rated flow: 40 l/min
- Max pressure: 250 bar
- Manifold ports: G3/8
- Relief re-seat: 80% of setting
- Range: 30-210 bar

**Installation Torque**
- Cartridge: 27 Nm
- Lock Nut: 8 Nm

**Weight**
- V1836: 0.33 kg

'XXX' = relief valve setting in bar (Supplied at 140 unless stated)
About Hy-Pro

Our in-house design and technical teams offer the expertise and support expected of an established world-class manufacturer. Our customers, ranging from the agricultural, transport, rail, fishing, construction and industrial sectors, expect named personal support, excellent quality and a rapid service with full back-up... ....we aim to deliver in full.

Call us today to discuss a bespoke solution from our extensive range or simply for competitively priced spares.

Full technical details of our entire range are available to download from our website

www.hypro.co.uk

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