

Pow-R-Quik

Hydraulic Starting Systems



Hydraulic Starting Systems and Components

**Pow-R-Quik
Starting Systems**

Typical Application:

Any application that does NOT need to depend on an existent energy source (electricity, compressed air or natural gas, etc.) or the battery/electricity is not a viable option (flammable environment, unreliable, costly maintenance or theft)

Applications / Industries:

- Oil and Gas
- Marine (i.e. barge applications, hazardous environment)
- Power Generation
- Emergency/standby – dual/redundant starting systems

Product Applications:

- Internal Combustion Engine (Spark or Compression Ignited)
- Turbine (various fuels: gaseous, oil, etc.)

Product Line Overview

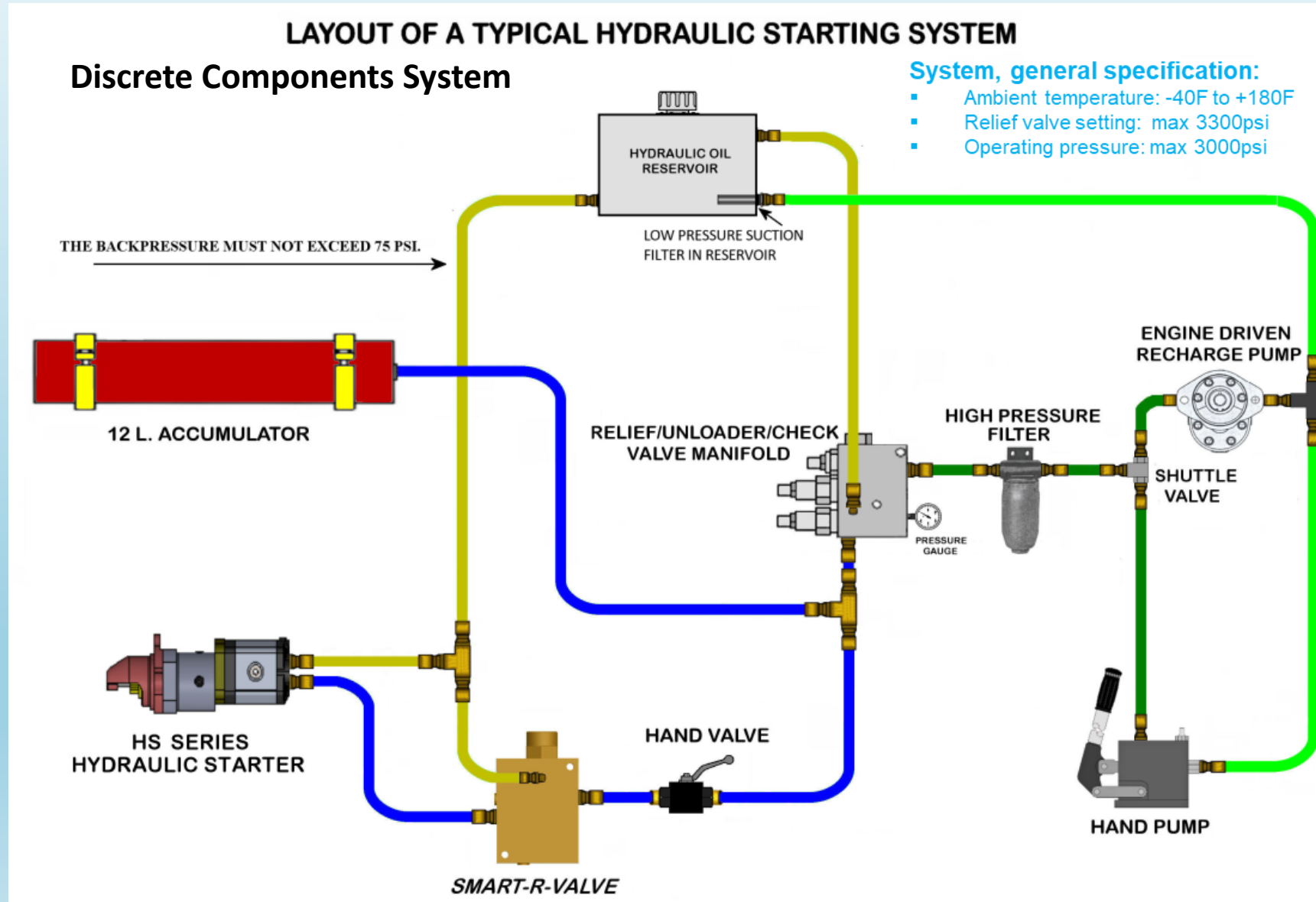
- ✓ **Wide range of engine displacement coverage from 1L to above**
- ✓ **Vast small and large engines OEM fit (Cummins, CAT, Mitsubishi, EMD, MTU, JD, Yanmar, Kubota, etc.)**
- ✓ **Best protection in the industry for the engine and starter during engagement (Smart-R-Valve technology)**
- ✓ **Best durability and reliability in the market (gear type motor, cast iron drive housing, etc.)**
- ✓ **Easy engine match and system sizing**
- ✓ **Could be designed to achieve zero internal system leakage targeting long(months) standby time**

Advantages over electric or air starters

- ✓ The Hydraulic System is engineered to deliver a number of engine starts and durations per customer specification
- ✓ Unconditioned and consistent starting performance (torque and speed) every starting attempt
(electric battery age and status, ambient temperature greatly affect engine starting capability)
- ✓ Fail-proof System even when the hydraulic accumulator is depleted (via manual recharge pump)
- ✓ Faster re-charging time when the battery is depleted (hydraulic hand pump versus battery charge)
- ✓ Better power density compared to electric starters
- ✓ Burst resistant hydraulic accumulator versus electric battery explosion
- ✓ Virtually no maintenance costs System (except hydraulic filters)
- ✓ Environmentally friendly System

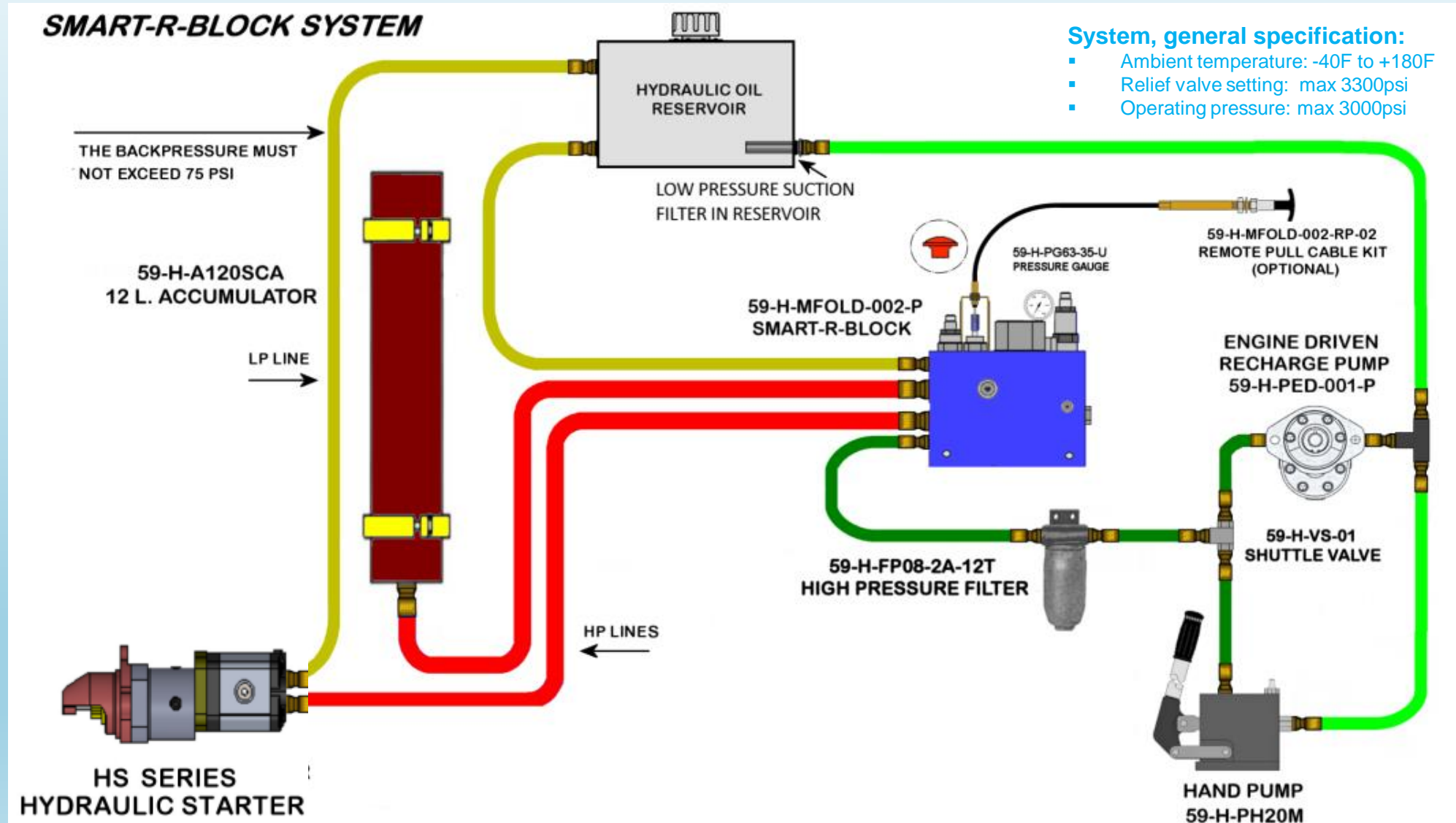
Hydraulic Starting System

Pow-R-Quik Starting Systems



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Product Line Overview

Four major product series - based on the torque output (breakaway torque)

1. HS 08 series

Below 1L to 4.5L engine displacement / 9.6cc hydraulic motor displacement
(Max 28 ft-lbs)

- Fits small engines applications (Kubota, JD, Deutz, Perkins, Yanmar, Lamborghini, etc.)
- Smart R Valve is included to minimize the impact pinion-ring gear extending useful life

2. HS 16 series

4.5-8L engine displacement / 23cc hydraulic motor displacement
(Max 55 ft-lbs)

Smart-R-Valve is recommended for ensuring long starter and ring gear life

Both starters are integrated and offered in a complete system by Pow-R-Quik

The System is sized by us for the engine and for the number of starts and durations per customer request

Maradyne Corporation

Hydraulic Starting Systems and Components

Pow-R-Quik Starting Systems

HS 16 series (Inline)

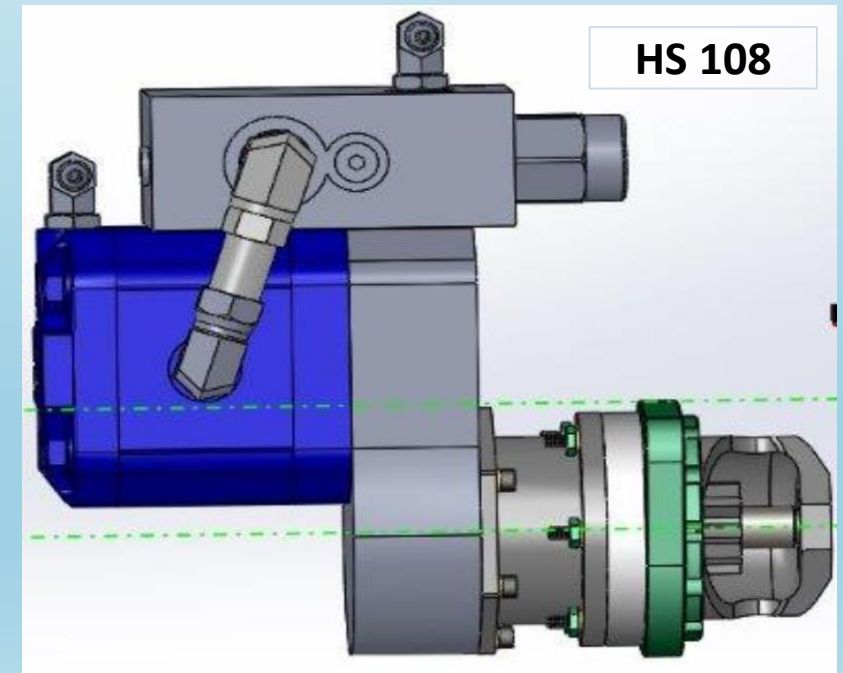
- Overall length: 10.4"
- Side and rear ports
- Case drain
- Universal mounting flange
- SAE ports (in/out differentiable)

HS 116



HS 08 series (Offset Gear Box)

- Overall length: 9.13"
- Offset axis by 1.8"
- Universal flange, with 12 indexable positions
- Side and rear ports
- SAE ports (in/out differentiable)



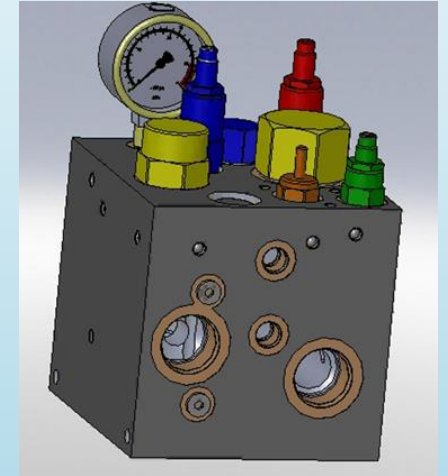
Components Hydraulic Starting Systems

Pow-R-Quik Starting Systems

Smart Block (unique in the industry, patent pending)

Combines and centralizes the controls and components in one package:

- ✓ Relief valve (prevents system overpressure, max. 3300psi)
- ✓ Smart-R-Valve (manages pinion/ring gear engagement)
- ✓ Recharge system unloading valve (sets the system operating pressure)
- ✓ Manual bypass (discharges the system)
- ✓ System start (initiates engine start, via local pull button or remote cable)
- ✓ Pressure gauge port



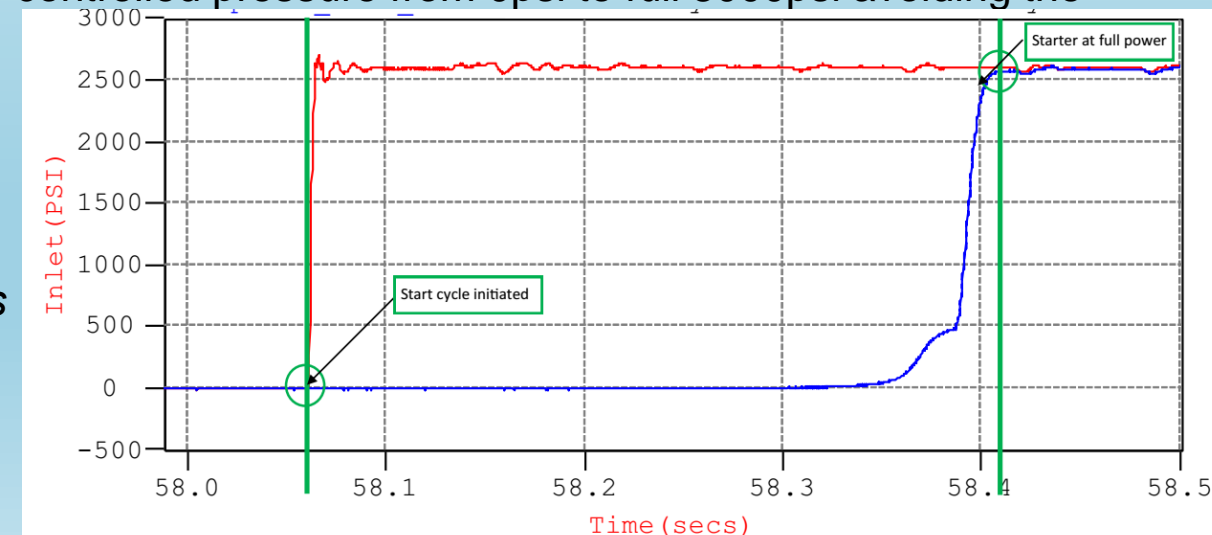
Smart-R-Valve (patented design)

Manages the engagement of the pinion by supplying wisely controlled pressure from 0psi to full 3000psi avoiding the common competitor's pitfalls:

- ✓ Teeth and components damage
- ✓ Unnecessarily waste of hydraulic fluid energy

The chart shows side by side competitor' operations (red) with no softs start versus PRQ's same duration, approx. 0.35 sec.

The engagement steps are totally different, ensuring 'damage free' operation for PRQ's



Components

Hydraulic Starting Systems (continued)

**Pow-R-Quik
Starting Systems**

Hand Pump

- 20cc double action piston, built in bypass valve
- Designed for harsh environment (chrome plated piston)
- SAE inlet/outlet ports (NPT adapter fittings supplied just in case)
- Improved piston motion preventing seal damage (known failure mode with competitors')
- Interchangeable mounting pattern with competitor product
- Reparable using a repair kit

Hydraulic filtration

3 microns filters offer superior protection and extended life for the System (i.e. accumulator seals)

Accumulators

Built in protection to prevent:

- Over pressurization (never burst)
- Accidental disassembly if accumulator is pressurized (during maintenance)

Advantages over competition

1. Starter Gear motor (versus piston) offers the best durability and longevity

- **Less sensitive to hydraulic oil variation related to:**
 - Ambient temperature
 - Oil properties (viscosity, lubricity, etc.)
 - Oil contamination
- **Better starter design**
 - Impossible to leak inside of flywheel housing or transmission (large starters via weep hole, and pressure relief via case drain port)
 - Fits in tight spaces given shorter overall length
 - Simplified maintenance with a modular design (drive and hydraulic motor)

Advantages over competition (continued)

3. PRQ's Smart-R-Valve offers the best protection in the market for the starter and flywheel ring gear
4. Most compact and integrated starter available (patented design for large starters)
5. Re-designed charging hand pump (avoids rocking the piston and causing seal failure)
 - Higher reliability/durability
 - Repairable hand pump using a PRQ kit
6. Pre-conditioned and Pre-tested accumulators prevent costly field repairs
7. Smart-R-Block integrates all the control components in the system: 'all in one'

Pow-R-Quik Starting Systems



Thank you

Pow-R-Quik Team

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