AEC018 280 bar [4060 psi]
AEC028 280 bar [4060 psi]
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Introduction

220 Series Piston Pump

The Eaton® X20 portfolio of open-circuit piston pumps is built to maximize machine performance and productivity. With sophisticated controls that enhance system efficiency and a compact design that delivers incredible power, the X20 portfolio empowers mobile machine operators to do more work in less time using less fuel.

**Sophisticated controls that improve performance while optimizing efficiency.**

**Excellent pressure responsiveness** – The X20 portfolio delivers the fastest response and recovery times in the open-circuit piston segment, helping customers get the job done faster.

**Low standby pressure** – The X20 portfolio can maintain low margin pressure (~150 psi) with exceptional stability, reducing heat generation and helping to eliminate wasted energy.

**Stable fan drive functionality** – Eaton’s fan drive control reaches desired speed more quickly and remains stable once there, reducing energy-wasting oscillation.

**Advanced electronic controls** – The cold start and fan drive controls are Pro-FX Ready, meaning they can be easily configured with pre-programmed development tools and controlled electronically for maximum flexibility and precision.

**Winning load sense combination** – X20 works in conjunction with Eaton’s CLS Load Sense Sectional Mobile Valve, providing OEMs one resource for their machine’s load sense needs.

**Compact design that enables greater flexibility and cost savings.**

**Simplified pump architecture** – The X20 pump has 25% fewer components than traditional pumps, reducing the number of leak points and simplifying maintenance.

**Compact package size** – The X20 portfolio’s small size satisfies Tier 4 requirements and provides more flexibility when designing the engine compartment.

**More horsepower** – The compact rotating group delivers a remarkable amount of horsepower, improving productivity without using more fuel.

**One-piece housing** – Single-piece pump housing removes leak points and makes maintenance faster and easier versus more complicated multi-piece housings.

**Multiple options that make it easy to specify exactly what you need.**

**Variety of control options** – Including pressure control, load sense, cold start, torque control, remote pressure control, inverse proportional pressure control, proportional pressure control, electronic displacement control, and swash sensor feedback, giving you more ways to design more efficient, productive machines.

**Several displacement options** – With seven displacement options, there’s an X20 pump to fit virtually any mobile application need. The 220 series is currently available in 18cc (1.09 cu. inch) & 28cc (1.71 cu. inch) displacement. It is rated for 280 bar & up to 3,600 rpm and is capable of generating up to 52.6 horsepower (39.2kW), making it the ideal pump for an array of different mobile and stationary applications. The combination of high load capacity bearings and a stiff drive shaft help provide a pump B10 bearing life of up to 5,850 hours at rated mobile conditions, reducing operating costs and extending operating life.

**Variety of mounting options** – The X20 portfolio is available with both SAE and ISO mounting flange configurations, can be side- or rear-ported, and offers multiple drain ports to help overcome any installation challenges.

**Exceptional quality that provides remarkable reliability.**

**Unique control piston design** – Single-acting control piston with special coating helps minimize friction, increasing operating life.

**Bronze piston shoes** – Bronze piston shoes are robust against contamination should particles enter the fluid, enhancing system performance and component service life.

**High-load bearings** – Larger, more durable bearings resist wear and deliver industry-leading bearing life.

**3-year manufacturer’s warranty** – Eaton’s warranty terms provide peace of mind for three full years, helping you get through your warranty period with complete confidence.

**Global network of Eaton-certified experts for end-to-end support.**

**More partners in more regions** – Growing network of Eaton distributors around the world ensures there’s local service and support anywhere you need it.

**World-class system design and assembly** – Our expert distribution partners can help with everything from specifying to prototyping and assembly to commissioning, so you can focus on other areas of your business.

**Eaton-standardized practices and processes** – Eaton employs a unique system of tools and processes, known as the Eaton Business System, to ensure quality development and delivery of the X20 product. These tools and process include such known methods as Design for Six Sigma, Lean Manufacturing and ISO certification.
### Pump series

**AEC** – 220 Series open circuit piston pump

### Pump displacement

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Value</th>
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<tbody>
<tr>
<td>018</td>
<td>18.0 cm³/rev [1.09 in³/rev]</td>
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</tr>
<tr>
<td>028</td>
<td>28.0 cm³/rev [1.71 in³/rev]</td>
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### Input shaft rotation

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<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>L</td>
<td>Left hand</td>
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<tr>
<td>R</td>
<td>Right hand</td>
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### Front mount and shaft

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<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>05</td>
<td>2 Bolt B, 22.2 mm (.88) dia. keyed shaft</td>
</tr>
<tr>
<td>09</td>
<td>2 Bolt B, 13 Tooth 16/32 Spline</td>
</tr>
<tr>
<td>31</td>
<td>2 Bolt B, 25.4 mm(1.00 in) dia. straight keyed</td>
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<tr>
<td>34</td>
<td>2 Bolt B, 15 Tooth 16/32 spline</td>
</tr>
<tr>
<td>48</td>
<td>2 Bolt A, 11 Tooth 16/32 spline, 38 mm [1.5 in] ext. [18cc only]</td>
</tr>
<tr>
<td>49</td>
<td>2 Bolt A, 1.8 Taper 16.66 mm [0.655 in] dia. 39.7 [1.56] ext [for 18cc AG variant only]</td>
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<tr>
<td>50</td>
<td>2 Bolt A, 9 Tooth 16/32 spline [for 18cc only]</td>
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<tr>
<td>51</td>
<td>2 Bolt A, 19.02 mm [.749 in] dia. keyed shaft, 32 mm [1.26 in] ext. [for 18cc only]</td>
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<tr>
<td>52</td>
<td>2 Bolt A, 15.85 mm [.624 in] dia. keyed shaft, 32 mm [1.26 in] ext. [for 18cc only]</td>
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### Main ports size & location

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<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>AA</td>
<td>Rear port Suction - 1.625 - 12 SAE O-Ring Pressure - 1.0625 - 12SAE O-Ring</td>
</tr>
<tr>
<td>AB</td>
<td>Side Port Suction - 1.625 - 12 SAE O-Ring Pressure - 1.0625 - 12 SA O-Ring</td>
</tr>
<tr>
<td>AC</td>
<td>Rear port [for 28cc only] Suction - M42 X 2 Metric O-Ring, Pressure - M27 X 2 Metric O-Ring</td>
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<tr>
<td>AD</td>
<td>Side port Suction - M42 X 2 Metric O-Ring Pressure - M27 X 2 Metric O-Ring</td>
</tr>
<tr>
<td>AE</td>
<td>Rear port [for 28cc only] Suction - 1.25&quot; (code 61) with .4375 - 14 UNC-2B Threads, Pressure - .75&quot; (Code 61) with .375 - 16 UNC-2B Threads</td>
</tr>
<tr>
<td>AF</td>
<td>Side port suction - 1.25&quot; (Code 61) with .4375 - 14 UNC-2B threads Pressure - .75&quot; (Code 61) with .375 - 16 UNC-2B threads</td>
</tr>
<tr>
<td>AG</td>
<td>Rear ports [for 28cc only] Suction - M48 Metric O-Ring, Pressure - M33 Metric O-Ring</td>
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### Case drain ports

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<tr>
<th>Code</th>
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<tbody>
<tr>
<td>A</td>
<td>.875 - 14 SAE O-Ring - top</td>
</tr>
<tr>
<td>B</td>
<td>.875 - 14 SAE O-Ring - bottom</td>
</tr>
<tr>
<td>C</td>
<td>M22 X 1.5 metric o-ring - top</td>
</tr>
<tr>
<td>D</td>
<td>M22 X 1.5 metric o-ring - bottom</td>
</tr>
<tr>
<td>G</td>
<td>.75 - 16 SAE O-Ring - vertical</td>
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<tr>
<td>H</td>
<td>M18 X 1.5 Metric o-ring - vertical</td>
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<tr>
<td>L</td>
<td>.75-16 SAE O-Ring - top</td>
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### Diagnostic pressure ports

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<tbody>
<tr>
<td>1</td>
<td>.4375 - 20 SAE O-ring port - plugged</td>
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<tr>
<td>2</td>
<td>M12 X 1.5 metric O-ring port - plugged</td>
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</tbody>
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### Controller type

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<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>AA</td>
<td>Pressure flow compensator with .4375 - 20 SAE o-ring load sense port#</td>
</tr>
<tr>
<td>AB</td>
<td>Pressure flow compensator with M12 X 1.5 Metric o-ring load sense port</td>
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<tr>
<td>AC</td>
<td>Pressure compensator only</td>
</tr>
<tr>
<td>AP</td>
<td>Remote pressure control M12 metric O-ring port, left side [for 28cc only]</td>
</tr>
<tr>
<td>AT</td>
<td>Pressure and flow compensator with electronic displacement control - EP type [for 28cc only]</td>
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<tr>
<td>AV</td>
<td>EH inverse proportional pressure control (vertical mounting) [for 28cc only]</td>
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<tr>
<td>AW</td>
<td>Remote pressure control with .4375-20 SAE o-ring port, left side#</td>
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<tr>
<td>BB</td>
<td>Remote pressure control with electronic displacement control - EPD type [for 28cc only]</td>
</tr>
<tr>
<td>BH</td>
<td>Remote pressure control w/ M12 x 1.5 metric o-ring port (left side) &amp; electronic displacement control - EP type [for 28cc only]</td>
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### Pressure compensator setting (Tolerance on setting)*

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<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>02</td>
<td>76 - 83 bar (1100-1200 lb/in²)</td>
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<tr>
<td>26</td>
<td>197 - 203 bar (2850-2950 lb/in²)</td>
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<tr>
<td>34</td>
<td>234 - 241 bar (3400-3500 lb/in²)</td>
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<tr>
<td>43</td>
<td>276 - 283 bar(4000-4100 lb/in²)</td>
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</table>

### Flow compensator / remote pressure control setting (tolerance on setting)

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<tr>
<th>Code</th>
<th>Description</th>
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<tr>
<td>00</td>
<td>No flow compensator setting</td>
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<tr>
<td>14</td>
<td>12 - 15 bar (180-220 lbf/in²)</td>
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<tr>
<td>20</td>
<td>17 - 20 bar (250-290 lbf/in²)</td>
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### Torque control setting

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<td>00</td>
<td>No torque control</td>
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### Control special features

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<tr>
<td>00</td>
<td>No control special features</td>
</tr>
<tr>
<td>0A</td>
<td>Bleed down orifice</td>
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<tr>
<td>0B</td>
<td>24V Cold start valve</td>
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<tr>
<td>0S</td>
<td>12V DC Solenoid AMP Jr connector (used with EH inverse proportional pressure control)</td>
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<tr>
<td>0P</td>
<td>Load sense steel tube connected to integrated shuttle valve [for 18cc AG pump only]</td>
</tr>
<tr>
<td>0T</td>
<td>24V DC Solenoid AMP Jr connector (used with EH inverse proportional pressure control)</td>
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<tr>
<td>0U</td>
<td>12V DC solenoid deutsch connector (used with EH inverse proportional pressure control)</td>
</tr>
<tr>
<td>0V</td>
<td>24V DC solenoid deutsch connector (used with EH inverse proportional pressure control)</td>
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### Model codes

220 Series Mobile Piston Pump

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<tr>
<th>AEC</th>
<th>028</th>
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<th>05</th>
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</tr>
</tbody>
</table>

#### Maximum displacement option*

- **01**: Standard displacement (as given in code title)
- **02**: External manual stroke adjustment set at max

#### Auxiliary (rear) mount & output shaft [for 28cc only]

- **00**: No auxiliary mounting features
- **AA**: SAE A-2 Bolt, 9T 16/32 spline
- **AB**: SAE A-2 Bolt, 11T 16/32 spline
- **AC**: SAE B-2 Bolt, 13T 16/32 spline
- **AG**: Auxiliary mount ready with cover plate

#### Shaft seal

- **1**: Standard viton shaft seal
- **2**: Nitrile shaft seal

#### Pump special features

- **00**: No special features
- **AB**: Swash position sensor
- **AE**: Rear port end cover with integrated priority and shuttle valve [for 18cc AG pump only]

#### Paint

- **00**: No paint
- **0B**: Black
- **CD**: Blue primer

#### Identification/packaging

- **01**: Standard Eaton identification box packaging

#### Design level

- **B**: Second design

---

1. *Additional Settings Available by Request, including fixed displacement stops.
2. # - Recommend RPC pressure settings 10-21 bar (140-350 psi)
## Specifications and performance

### 220 Series Mobile Piston Pump

#### General performance specifications

<table>
<thead>
<tr>
<th>Units</th>
<th>AEC018</th>
<th>AEC028</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Displacement</strong></td>
<td>cc/r (in³/r)</td>
<td>18.0 (1.09)</td>
</tr>
<tr>
<td><strong>Mounting (SAE)</strong></td>
<td></td>
<td>2 Bolt A</td>
</tr>
<tr>
<td><strong>Pressure</strong></td>
<td>bar (psi)</td>
<td>280 (4060)</td>
</tr>
<tr>
<td>Continuous</td>
<td></td>
<td>320 (4600)</td>
</tr>
<tr>
<td>Intermittent¹</td>
<td></td>
<td>350 (5000)</td>
</tr>
<tr>
<td>Peak²</td>
<td></td>
<td>3000</td>
</tr>
<tr>
<td><strong>Speed³</strong></td>
<td>rpm</td>
<td>3600</td>
</tr>
<tr>
<td>At 1 bar abs (0 psig)</td>
<td></td>
<td>3000</td>
</tr>
<tr>
<td>At .85 bar abs (5 in.Hg)</td>
<td></td>
<td>3900</td>
</tr>
<tr>
<td>Min</td>
<td></td>
<td>500</td>
</tr>
<tr>
<td><strong>Power</strong></td>
<td>kW (hp)</td>
<td>30.15 (40.43)</td>
</tr>
<tr>
<td>Max (theoretical)</td>
<td></td>
<td>1.62 (2.17)</td>
</tr>
<tr>
<td>Standby</td>
<td></td>
<td>80 (55)</td>
</tr>
<tr>
<td>Torque³</td>
<td>Nm (lb-ft)</td>
<td>13.2 (23.1)</td>
</tr>
<tr>
<td>Max (theoretical)</td>
<td></td>
<td>16,222</td>
</tr>
<tr>
<td>Weight⁴</td>
<td>kg (lbm)</td>
<td>4,200</td>
</tr>
<tr>
<td>Bearing life⁵</td>
<td>810 Hours</td>
<td>1,610</td>
</tr>
<tr>
<td>Mass moment</td>
<td>Kg·m² (lbm·ft²)</td>
<td>0.003 (0.075)</td>
</tr>
<tr>
<td>of inertia</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Less than 10% of duty cycle.
2. Momentary system pressure spikes only.
3. Ratings based on flange ports.
4. Standard non-through drive pump.
5. Bearing life ratings at rated speed – 1 bar abs (0 psig) inlet.
   Will vary based on thrust and side loads.

#### Inlet pressure, case pressure, and operating temperature requirements

<table>
<thead>
<tr>
<th>Inlet pressure</th>
<th>Case pressure</th>
<th>Operating temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Minimum</td>
<td>Maximum Maximum Maximum intermittent Peak Rated Minimum intermittent</td>
<td></td>
</tr>
<tr>
<td>bar abs (psig)</td>
<td>bar abs (in. Hg)</td>
<td>bar abs (psig)</td>
</tr>
<tr>
<td>1.0 (0)</td>
<td>0.85 (5)</td>
<td>4.4 (50)</td>
</tr>
</tbody>
</table>

#### Hydraulic fluids

<table>
<thead>
<tr>
<th>Fluid</th>
<th>Recommended operating viscosity range cSt (SUS)</th>
<th>Maximum continuous cSt (SUS)</th>
<th>Maximum viscosity at startup cSt (SUS)</th>
<th>Minimum viscosity @ max. Temperature of 93°C (200°F) cSt (SUS)</th>
<th>Minimum intermittent cSt (SUS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use antwear hydraulic oil, or automotive type crankcase oil (designations SC, SD, SE or SF) per SAE J183 FEB80</td>
<td>16 to 40 (80 to 188)</td>
<td>430 (1192)</td>
<td>2100 (9720)</td>
<td>10 (59)</td>
<td>6 (46)</td>
</tr>
</tbody>
</table>

For more information, see Eaton publication 579. For operation on other alternative or environmentally friendly fluids, please contact your Eaton Representative.
Control options

Pressure & Flow (Load Sense) Compensator for AEC018 AG variant only

The Agricultural tractor variant of 220 pump has a shuttle valve integral into pump end cover which senses the highest load of the two-work circuit and a priority valve to set the flow priority. For tractor application steering is given priority over other auxiliary functions like hitch circuit for implements.

Fluid output from the pump end cover enters into the priority valve before reaching to system. Integrated priority valve gives the pump flow priority to Steering system over the Hitch valve of the tractor. The shuttle valve senses highest of the two load pressures (Steering load or Hitch system load) and gives the load sense signal to flow control of the pump to adjust the pump flow as per the load requirement. The load signal is carried through steel pipe from end cover to pump controller.

These features make this pump suitable for other platforms where shuttle and priority valve are required.
The pump will provide flow & pressure matching of pump output to system load demand, maximizing efficiency and improving load metering characteristics of any directional control valve installed between the pump and the load. Load sensing ensures that the pump always provides only the amount of flow needed by the load. The pump operating pressure adjusts to the load pressure plus a pressure differential required for the load sense margin. When the system is not demanding flow, the load sense control will operate in low pressure zero flow, energy saving stand-by mode. The differential pressure is the difference between the pressure inlet and service port of a proportionally controlled directional valve, or a load sensing directional control valve. See the model code for differential pressure settings for load sensing. If the load pressure exceeds the system pressure setting, the pressure compensator reduces pump displacement. The load sensing line must be as short as possible and can also be used for remote pressure control or unloading of the pump pressure. For remote pressure control purposes, it is recommended that you contact your Eaton Representative for the correct configuration of the control.

**Warning:**

- When adjusting the pressure limiter, install a 0 to 350 bar (0 to 5000 psi) gage in the outlet gage port and limit the pressure setting to the continuous rated pressure for the pump displacement. It is possible to adjust the pressure compensator beyond the rated pressure of the pump. Doing so, may void the warranty of the pump.
- EATON recommends use of relief valve in all systems.

**Pressure limit settings**

The pressure compensator uses two springs to cover the full pressure range of the X20 pumps.

Spring 1 = < 140 bar (2050 psi)

Spring 2 = 145 - 280 bar (2100 - 4060 psi)

**Flow Compensator (Load Sense) settings**

There are two springs used to cover the load sense adjustment range of this control. Available load sense range is

Spring 1 = < 20 bar (290 psi)

Spring 2 = 21 - 42 bar (300-609 psi)

**Dynamic response per SAE J745 (using swash plate position)**

<table>
<thead>
<tr>
<th>Model Code</th>
<th>Response (off stroke)</th>
<th>Recovery (on stroke)</th>
<th>Load sense recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEC018</td>
<td>25</td>
<td>50</td>
<td>40</td>
</tr>
<tr>
<td>AEC028</td>
<td>14</td>
<td>49</td>
<td>49</td>
</tr>
</tbody>
</table>

**Typical operating curve**
Control options

Pressure Compensator

The pump will provide a continuously modulated flow to meet changing load demands at a pre-adjusted compensator pressure. At pressures below the compensator setting, the pump will operate at maximum displacement. See model code position #16, 17 for compensator pressure ranges.

Warning:

- When adjusting the pressure limiter, install a 0 to 350 bar (0 to 5000 psi) gage in the outlet gage port and limit the pressure setting to the continuous rated pressure for the pump displacement. It is possible to adjust the pressure compensator beyond the rated pressure of the pump. Doing so, may void the warranty of the pump.
- EATON recommends use of relief valve in all systems.

Pressure limit settings

The pressure compensator uses two springs to cover the full pressure range of the X20 pumps.

Spring 1 = < 140 bar (2050 psi)

Spring 2 = 145 - 280 bar (2100 - 4060 psi)

310 bar (4496 psi for 74 cc pump)

Pressure cut-off characteristics of pressure compensator control @ 49°C (120°F), static conditions.

Dynamic response per SAE J745 (using swash plate position)

<table>
<thead>
<tr>
<th>Response (off stroke)</th>
<th>Recovery (on stroke)</th>
</tr>
</thead>
<tbody>
<tr>
<td>msec</td>
<td>msec</td>
</tr>
<tr>
<td>AEC018 25</td>
<td>50</td>
</tr>
<tr>
<td>AEC028 20</td>
<td>65</td>
</tr>
</tbody>
</table>
Remote relief valve is to be connected to pilot port “J” through necessary external piping. Standard differential pressure of 20 bar is set at RPC spool. The required outlet pressure (below 280 bar) can be set by adjusting remote relief valve setting. Once pressure reaches preset value, flow across remote relief valve starts, this results in RPC spool movement due to pressure imbalance. This will de-stroke the pump to maintain the set pressure.

Secondary fixed pressure compensator is provided to limit the max pressure setting as a fail safe measure.

**Note**

- Flow Compensator is not available with RPC.
- When selecting this option in the model code, a pressure setting value must be identified in the flow compensator field. Select a range of 10-24 bar (140-350 psi), default is 20.
- The setting selected is the RPC differential pressure.
- Remote relief valve is not included in supply scope of the pump.

![Diagram](image)

- Delta pressure setting at control valve - bar (psi) 14 - 24 (200 - 350)
- Control fluid consumption - lpm (gpm) 4.5 (1.2) max.
- Recommended flow rating of remote relief valve- lpm (gpm) 3 – 5 (0.8 – 1.32)
- Recommended Eaton Relief Valve part number RVS-10-S-0-50
Control options

Electronic Displacement Control (EDC) for ACE028

Pump displacement can be controlled infinitely, as per the current signal provided to the solenoid control valve. The integrated pump control makes use of an external current signal to vary the pump displacement. This control has a proportional characteristic i.e. with increasing current signal, the displacement increases proportionately.

This control is with manual override. Based on fail safe condition there are two types:

Min type (EP): Return to min displacement in case of power loss.
Max type (EPD): Return to max displacement in case of power loss

**Warning:**

- When adjusting the pressure limiter, install a 0 to 350 bar (0 to 5000 psi) gage in the outlet gage port and limit the pressure setting to the continuous rated pressure for the pump displacement. It is possible to adjust the pressure compensator beyond the rated pressure of the pump. Doing so, may void the warranty of the pump.
- EATON recommends use of relief valve in all systems.

**Pressure limit settings**

The EDC can operate between 20 bar (290 psi) and 280 bar (4060 psi).

**Electrical data**

<table>
<thead>
<tr>
<th>Control type</th>
<th>Supply current (mA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EP</td>
<td>12V</td>
</tr>
<tr>
<td>EPD</td>
<td>24V</td>
</tr>
<tr>
<td>EP</td>
<td>0</td>
</tr>
<tr>
<td>EPD</td>
<td>480</td>
</tr>
</tbody>
</table>

**Control options**

Electronic Displacement Control (EDC) for ACE028
The EH Inverse Proportional Pressure control allows for stepless variation of the max pump output pressure, as per the current signal provided to the control valve solenoid.

The integrated pump control makes use of an external current signal to vary the pump output pressure.

This control has an inverse proportional characteristic i.e. with increasing current signal, the max output pressure is proportionately reduced.

**Warning:**
- When adjusting the pressure limiter, install a 0 to 350 bar (0 to 5000 psi) gage in the outlet gage port and limit the pressure setting to the continuous rated pressure for the pump displacement. It is possible to adjust the pressure compensator beyond the rated pressure of the pump. Doing so, may void the warranty of the pump.
- EATON recommends use of relief valve in all systems.

**Pressure limit settings**

The minimum is 110 bar and max pressure can be set from 140 bar (2050 psi) to 280 bar (4060 psi).

### Electrical data

<table>
<thead>
<tr>
<th>Voltage</th>
<th>12 V</th>
<th>24 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Current</td>
<td>1500 mA</td>
<td>750 mA</td>
</tr>
<tr>
<td>R20, Resistance (ohm)</td>
<td>5.3 +/- 5%</td>
<td>21.2 +/- 5%</td>
</tr>
<tr>
<td>Type of Control</td>
<td>Current</td>
<td>Current</td>
</tr>
<tr>
<td>Recommended PWM</td>
<td>100 Hz</td>
<td>100 Hz</td>
</tr>
<tr>
<td>Duty Cycle</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Insulation material</td>
<td>Class H, 180 deg C</td>
<td>Class H, 180 deg C</td>
</tr>
<tr>
<td>Protection Class</td>
<td>IP6K5/IP69K</td>
<td>IP6K5/IP69K</td>
</tr>
<tr>
<td>Connector</td>
<td>AMP Junior Power</td>
<td>AMP Junior Power</td>
</tr>
<tr>
<td>Timer/ Deutsch</td>
<td>Timer/ Deutsch</td>
<td></td>
</tr>
<tr>
<td>Connector DT04-2P</td>
<td>Connector DT04-2P</td>
<td></td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-30 deg C, 105 deg C</td>
<td>-30 deg C, 105 deg C</td>
</tr>
</tbody>
</table>

**Typ. Current vs pressure characteristics of IPPC at 1800 rpm at various max pressure settings at 49 deg C (120 deg F), static conditions.**
**Control options**

**Electronic Destroke (Cold Start) Valve**

The Electronic Destroke Valve reduces pump start-up torque by directing outlet pressure to the control piston.

It is primarily used in cold weather applications and includes a 12 or 24 VDC directional control valve mounted between the pump housing and compensator.

Refer model code position 22,23 - control special features for available connector options.
Overall efficiency versus speed @ 49°C (120°F, full flow, and 1.0 bar (0 psi) Inlet

![Graph showing efficiency versus speed](image1.png)

Input power versus speed @ 49°C (120°F), full flow, and 1.0 bar (0 psi) Inlet

![Graph showing input power versus speed](image2.png)
Performance

AEC018

Input Torque Versus Speed @ 49°C (120°F), Full Flow, and 1.0 bar (0 psi) Inlet

![Input Torque Graph]

Delivery & Case Flow Versus Speed @ 49°C (120°F), Full Flow, and 1.0 bar (0 psi) Inlet

![Delivery & Case Flow Graph]
Overall efficiency versus speed @ 49°C (120°F), full flow, and 1.0 bar (0 psi) Inlet

Input power versus speed @ 49°C (120°F), full flow, and 1.0 bar (0 psi) Inlet
Performance

AEC028

Input torque versus speed @ 49°C (120°F), full flow, and 1.0 bar (0 psi) Inlet

![Graph of Input torque versus speed at 49°C (120°F), full flow, and 1.0 bar (0 psi) Inlet](image)

Delivery and case flow versus speed @ 49°C (120°F)

![Graph of Delivery and case flow versus speed at 49°C (120°F)](image)
Pump installation

AEC018 A-Mount standard - side-ported

RH Rotation

For shaft configuration see separate shaft installation drawing

Top case drain

Pressure diagnostic port

Suction diagnostic port

Pressure port

For compensator configuration see separate compensator installation drawing

Suction port

Case drain vertical

Top case drain

2xØ11.2 [1.44]

Ø82.5 [3.25]

6.4 [.25]

76 [2.99]

21.4 [.84]

60 [2.36]

72.4 [2.85]

135.9 [5.35]

77.4 [3.06]

149.4 [5.88]

37.8 [1.49]

60 [2.36]

63 [2.48]

60 [2.36]

60 [2.36]

151.4 [5.96]
Pump installation

AEC018 A-Mount AG version - rear ported

RH Rotation
Pump installation

AEC028 B-Mount - rear-ported

RH Rotation

For compensator configuration see separate compensator installation drawing

Suction diagnostic port
Top case drain
Vertical case drain

Pressure port
Pressure diagnostic port
Bottom case drain

View A-A

LH Rotation

Right side case drain

Pressure port
Suction port
Pump installation

AEC028 B-Mount - side-ported

**RH Rotation**

Suction diagnostic port
Top case drain
Vertical case drain

For compensator configuration see separate compensator installation drawing

Pressure port
Pressure diagnostic port

For shaft configuration see separate shaft installation drawing

View A-A

**LH Rotation**

Right side case drain
Suction port
Pressure port
Suction port
**SAE-A mount**

2-Bolt A mounting flange per SAE J744-82-2

Groove to accept an AS 568A size 152 O-ring

For output shaft configuration see separate shaft installation drawing

8X .375-16 UNC - 2B ⊥ 15.0

**Output shaft installation AA- 9T spline**

Max Torque 91 Nm (805 lbf-in)

Ø16.54 [.651] 9 tooth 30° flat root side fit 16/32 class 6 per ANSI B92.1-1996

Accepts 9 tooth 16/32 pitch flat root side fit involute spline per SAE J744-16-4

Additional unit driven by this spline must not require more than 91 Nm (805 lbf-in) of Torque

**Output shaft installation AB- 11T spline**

Max Torque 172 Nm (1522 lbf-in)

Ø19.71 [.776] 11 tooth 30° flat root side fit 16/32 class 6 per ANSI B92.1-1996

Accepts 11 tooth 16/32 pitch flat root side fit involute spline per SAE J744-16-4.

Additional unit driven by this spline must not require more than 172 Nm (1522 lbf-in) of Torque
Pump installation

AEC028 Thru drive SAE-B

AC - 13T spline
Max Torque 252 Nm (2230 lbf-in)

Thru drive cover plate information
AG - Auxiliary mount ready with cover plate

Cover plate
Fits on 220-SAE "A" type auxiliary mounting end cover
Cover Plate Kit # 9901110-000; includes
O-ring, Cover Plate, Cap Screws (2)
Control Installation

AEC018- Pressure & Flow (Load Sense) Compensator

Load sense port
7/16-20 UNF-2B O-ring port
Control Installation

AEC-028 Pressure & Flow (Load Sense) Compensator
Control Installation

ACE028 - Electronic Displacement Control (EDC)

EH Inverse Proportional Pressure Control (IPPC)

Amp connector option

Deutsch connector option
External Manual Stroke Adjustment

AEC018 Maximum Stroke Limiter

Max displacement is reduced by approximately 6% to 7% per clockwise turn.

Torque 27±2.7 NM
After adjusting displacement

Compensator/Control not shown for clarity

Max Displacement is reduced by approximately 7 to 8% per clockwise turn.

Compensator/Control not shown for clarity

AEC028 Maximum Stroke Limiter

Max Displacement

6.4 [0.26]
60% of Max Displacement

20°

90.0 [3.54]
Cold start valve

AEC018 Cold start valve

AEC028 Cold start valve

Deutsch option  Metri - pack 280 option  Metri - pack 150 option  DIN 43650 - A option

Flying lead coil shown see below for options
**05 Code**
Maximum Torque
209.3 Nm [1852 in-lbf]

**09 Code**
Maximum Torque
209.3 Nm [1852 in-lbf]

**31 Code**
Maximum Torque
337.5 Nm [2987 in-lbf]

**34 Code**
Maximum Torque
337.5 Nm [2987 in-lbf]
48 Code
Maximum Torque
134 N·m [1186 in-lbf]

Ø 19.05 (0.75) 11 tooth 30°
Flat root side fit
16/32 Class 5 Spline
per ANSI B92.1 (Modified)
Fits 11 tooth 30° Flat Root
Side Fit 16/32 Internal
Splines Per SAE J498B
Class 1 or ANSI B92.1 Class 5 Splines

49 Code (for AG Variant only)
Maximum Torque
100 N·m [885 in-lbf]

Ø 16.002±0.12
[.6300±.004]
11.27
[.444]

22.2
[.87]
.437-20 UNF -2A THD'S
Min. Full THD'S - .334
Leave THD'S Soft Rc 35 to 42

Taper 1:8 On DIA.
INC. Angle 7.116/7.1833

50 Code
Maximum Torque
100 N·m [885 in-lbf]

Ø 15.8 (0.62) 9 tooth 30°
Flat Root Side Fit
16/32 Class 5 Spline
per ANSI B92.1 (Modified)
Fits 9 Tooth 30° Flat Root
Side Fit 16/32 Internal
Splines per SAE J498B
Class 1 or ANSI B92.1 Class 5 splines

51 Code
Maximum Torque
134 N·m [1186 in-lbf]

Square key x 4.76±0.03
[.188±.001]
2.08
[.08]

Ø 19.035±0.015
[.7494±.0005]

14.27±0.25
[.562±.009]

52 Code
Maximum Torque
100 N·m [885 in-lbf]

Square key x 3.962±0.03
[.1560±.001]
2
[.08]

Ø 15.865±0.015
[.6246±.0005]

17.5
[.69]

21.5
[.85]

32
[1.26]
Installation and start-up

**Warning:** Care should be taken that mechanical and hydraulic resonances are avoided in the application of the pump. Such resonances can seriously compromise the life and/or safe operation of the pump.

**Drive data**
Mounting attitude should be horizontal (shaft parallel to the ground) using the appropriate case drain port (furthest from the ground) to ensure that the case remains full of fluid at all times. If mounted with shaft upward (shaft perpendicular to the ground), the shaft end case drain (option G or H) must be used.

In those cases where geometric tolerances of mounting are critical, or where specific tolerance ranges are required and not specified, consult Eaton Engineering for specific limits.

Direction of shaft rotation, viewed from the prime mover end, must be as indicated in the model designation on the pump—either right hand (clockwise) or left hand (counterclockwise).

Direct coaxial drive through a flexible coupling is recommended. If drives imposing radial shaft loads are considered, please consult your Eaton Representative.

**Start-up procedure**
Make sure the reservoir and circuit are clean and free of dirt/debris prior to filling with hydraulic fluid.

Fill the reservoir with filtered oil and fill to a level sufficient enough to prevent vortexing at the suction connection to pump inlet. It is good practice to clean the system by flushing and filtering, using an external slave pump.

**Caution:** Before the pump is started, fill the case through the uppermost drain port with hydraulic fluid of the type to be used. The case drain line must be connected directly to the reservoir and must terminate below the oil level.

Once the pump is started, it should prime within a few seconds. If the pump does not prime, check to make sure that there are no restrictions between the reservoir and the inlet to the pump, and that the pump is being rotated in the proper direction, and that there are no air leaks in the inlet line and connections. Also check to make sure that trapped air can escape at the pump outlet.

After the pump is primed, tighten the loose outlet connections, then operate for five to ten minutes (unloaded) to remove all trapped air from the circuit.

If the reservoir has a sight gage, make sure the fluid is clear—not milky.

**Fluid cleanliness**
The X20 Series pumps are rated in anti-wear petroleum fluids with a contamination level of 21/18/13 per ISO 4406. Operation in fluids with levels more contaminated than this is not recommended. Fluids other than petroleum, severe service cycles, or temperature extremes are cause for adjustment of these codes. Please contact your Eaton Representative for specific duty cycle recommendation.

Eaton X20 Series pumps, as with any variable displacement piston pumps, will operate with apparent satisfaction in fluids up to the rating specified here. Experience has shown however, that pump and hydraulic system life is not optimized with high fluid contamination levels (high ISO cleanliness codes).

Proper fluid condition is essential for long and satisfactory life of hydraulic components and systems. Hydraulic fluid must have the correct balance of cleanliness, materials, and additives for protection against wear of components, elevated viscosity and inclusion of air.

Essential information on the correct methods for treating hydraulic fluid is included in Eaton publication 561 – “Eaton Guide to Systemic Contamination Control” – available from your local Eaton distributor. In this publication, filtration and cleanliness levels for extending the life of axial piston pumps and other system components are listed. Included is an excellent discussion of the selection of products needed to control fluid condition.