PVC25-12/24

Parker Ident-No.	Parker Drawing-No.	Producer Ident-No.	Producer Drawing-No.	Voltage	Connector	O-Rings	Manual Override air bleed screw
3768316	3767002	58402	80401-002-F-K-001	12V	AMP	NBR	Yes
3768317	3767002	58401	80401-002-F-K-001	24V	AMP	NBR	Yes
3767646	3767648	61802	80403-009-F-K-001	12V	Deutsch	NBR	No
3767647	3767648	61801	80403-009-F-K-001	24V	Deutsch	NBR	No
3767649	3767002	61302	80403-006-F-K-001	12V	AMP	NBR	No
3767650	3767002	61301	80403-006-F-K-001	24V	AMP	NBR	No
3767729	3767002	61901	80403-010-G4-K-001	24V	AMP	VITON	Yes

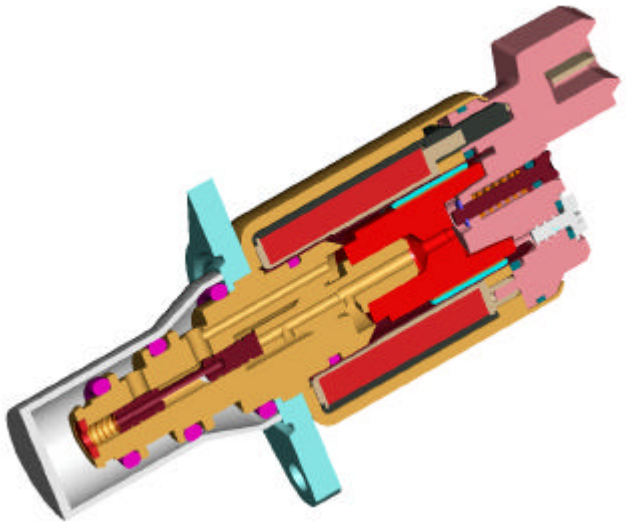


Table of contents

1. General

1.1 Information

This document contains basic requirements for manufacture of proportional cartridge valve PVC25-12/24. Supplementary facts are given on measure specification drawing 3767002/3767648.
The document is divided into 4 parts.

* Part 1 contains general information.
* Part 2 contains the demands.
* Part 3 contains the environment data.
* Part 4 contains test process for the PVC25.

1.2 Documents

Following documents are being referred to:

* Master block 1, drawing 9120 1003 03
* Master block 2, drawing 9120 1003 04
* Standards:
  - ISO: 4406
  - SS-ISO: 9227
  - IEC: 68-2-27 Ea, 68-2-64 Fh
  - DIN: 60529, 51524
  - EN 982 (General principles for the design and construction of hydraulics system and components).
  - Volvo Standard 5060,3

2. Data

2.1 Bleed screw and emergency control

The solenoid 3767729, 3768316 and 3768317 must be fitted with an air bleed screw, and also with an emergency control pin or shaft, see 3767002.
The force to restore the pin from actuated position to neutral position must not give a regulated pressure Ps higher than 2 bar. [3].

2.2 Electrical connection

Electrical connection by two-pole female connector AMP according to drawing 3767002. Valid for solenoid 3767649, 3767650, 3767729, 3768316 and 3768317
Protection code acc. to DIN 60529:

* IP 65 with female connector. [3].

Electrical connection by two-pole female connector Deutsch according to Drawing 3767648 Valid for solenoid 3767646, 3767647
Protection code acc. to DIN 60529:

* IP 67 with female connector. [3].

2.3 Cavity

The proportional cartridge valve will be mounted in a cavity with a pump pressure of max 55 bar (5,5MPa) and a tank pressure of max 20 bar. The tank pressure will surround the solenoid armature.

2.4 Leakage

2.4.1 Internal leakage

Leakage pump to tank. Hydraulic circuit, see 4.2.1.

The leakage Pp - tank, with Qs= 0 l/min:

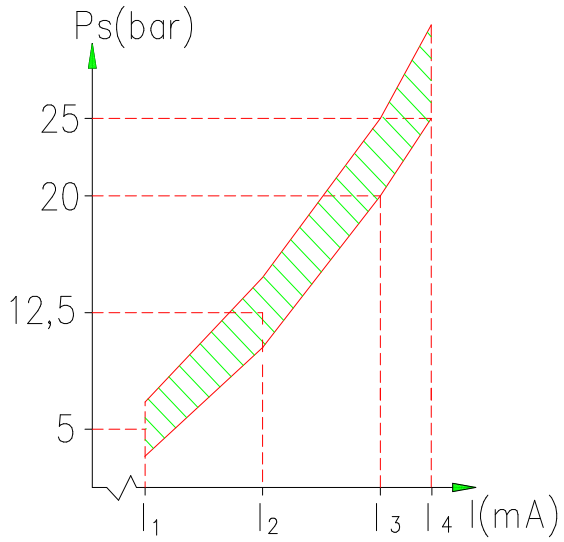
* With inactivated solenoid. Max leakage : 0,02 l/min. [3]
* With actuated solenoid, (any value between Ps_1 and Ps_3), max leakage : 1,0 l/min [4]

2.4.2 External leakage

* Allowed external leakage for the solenoid is max 10 mm^3/s free air at 5 bar pressure. [3]

2.5 Pressure reducing function

Test set up, see 4.2.1.
Pressure levels:



with Qs = max 0,3 l/min
Temp. of the oil: Level 1.

24 V	12V	
I_1 = 290±5 mA	I_1 = 570±12mA	Ps_1 @ I_1 = 5±1,75 bar **[3]**
I_2 = 470±10 mA	I_2 = 920±20 mA	Ps_2 @ I_2 = 12,5±2,25 bar **[3]**
I_3 = 650±15 mA	I_3 = 1250±27 mA	Ps_3 @ I_3 = 20 -0/+5 bar **[3]**
I_4 = 730±20 mA	I_4 = 1450±40 mA	Ps_4 @ I_4 = 25 -0/+6 bar **[3]**

Characteristics:
Temp. of the oil: Level 1.

* With a constant current I_2, the reduced pressure Ps may not drop more than 2,0 bar below Ps_2 when the flow increases from 0,3 l/min to 2,0 l/min. **[3]**

Hysteresis:
Temp. of the oil: Level 1 and 2.

* max 0,5 bar. **[3]**
  Hysteresis is measured as the difference in the pressure (Ps) at increasing and decreasing current, at the same current point. The hysteresis requirement is valid within the flow range 0,3 - 3,5 l/min (Qs), and within the pressure range Ps_1 - Ps_4.

Linearity:
Qs = Max 0,3 l/min
Temp. of the oil: Level 1 and 2.

* At increasing current: The pressure may not decrease at any part of the graph under a gauge length of minimum 2% of the total current range (I_1 - I_4). **[3]**

* At decrease pressure: The pressure may not increase at any part of the graph under a gauge length of minimum 2% of the total current range (I_1 - I_4). **[3]**

2.6 Pressure relief function

Test set-up, see 4.2.2.
Temp. of the oil: Level 1.
Relief pressure Pr = (Ps - Pt):

Test pressure = Ps_2.
Qt_0 : <= 0,3 l/min
Qt_1 : >= 3 l/min.

* **Pr :** max 4 bar pressure increase between Qt_0 and Qt_1. **[3]**

The pressure drop Pr at inactivated solenoid.
Qt : >= 4 l/min.

* **Pr :** max 9,5 bar. **[3]**

2.7 Response time, on and off

Test set-up, see 4.2.3.

* t1 = max 50 ms. Oil temp.: max +50?C, ambient temp.: max +20?C. **[3]**
  Overshoot = max 50 % of Ps, after 100 ms max 20% of Ps. **[3]**
  t2 = max 50 ms. Oil temp.: max +50?C, ambient temp.: max +20?C . **[3]**

* t1 = max 400 ms. Oil temp: max -10?C, ambient temp: max -10?C. **[3]**
* t2 = max 300 ms. Oil temp: max -10?C, ambient temp: max -10?C. **[3]**

2.8 Response time, on and off

Test set-up, see 4.2.4.
Input ? I = 12.5 mA during 1 s for 24 V
? I = 25.0 mA during 1 s for 12 V
Reduced pressure 8 – 5 bar
Output ? P = 0.568 bar ± 30 % measured as an average value over 0.5 s, valid for decreasing steps. **[3]**

2.9 Endurance specifications

* After 5000 h with constant pressure level, see 4.3 and 4.3.1, the cartridge shall still meet the requirements according to this specification.

* After 5 million cycles between 2 pressure levels, see 4.3 and 4.3.2, the cartridge shall still meet the requirements according to this specification.

* After 5 million cycles between 2 tank-pressure levels and 2 pressure levels, see 4.3 and 4.3.2.3 the cartridge shall still meet the requirements according to this specification.

2.10 Duty time

12V coil:

* min 14 V DC at 100% ED and V_{11} = 85°C. (Min activation time = 12 hours). [3]
* The solenoid must withstand temporary overload to min 16 V DC at 50% ED and V_{11} =85°C. (Min activation time = 0,5 hours). [3]

24V coil:

* min 28 V DC at 100% ED and V_{11} = 85°C. (Min activation time = 12 hours). [3]

* The solenoid must withstand temporary overload to min 32 V DC at 50% ED and V_{11} =85°C. (Min activation time = 0,5 hours). [3]

Definitions:

V_{11} = (ambient temp. + oil temp.) /2

ED (%) = (activation time / cycle time) x 100 %.
Cycle time: 5 minutes.

3. Environment data

3.1 Temperature range

3.1.1 Ambient (air)

* -30°C to +80°C.

3.1.2 Oil

* Function: a) -30°C to +90°C.
* Operate: b) +50°C to +90°C.

a) "Function" implies that the cartridge shall be able to work, but without fulfilling the demands on response time, pressure drops etc. See 2.7

b) "Operate" implies that the cartridge shall fulfil all demands according to this specification. See 4.1.1.

3.1.3 Temperature shock

(Temperature difference between cartridge and oil).

* Operate: b) min 30?C [3]

3.2 Oil viscosity range

* Function: a) 10 to 2000 cSt
* Operate: b) 10 to 30 cSt

3.3 Corrosion resistance

The material / surface treatment used, must give equal or better corrosion resistance than

* Fe/Zn min 12 ?m, yellow cromated, acc. to SS-ISO 9227

The demand applies to the solenoid when mounted in its cavity.

3.4 Shock resistance

External shock resistance acc. to IEC 68-2-27 Ea.

* 50 g.
* 11 ms.
* X+, X-, Y+, Y-, Z+, Z-
* 3 times in each direction.

3.5 Vibration resistance

Vibration resistance acc. to IEC 68-2-64 Fh.

* 10-250 Hz: 0,1 g2/Hz
* X-, Y-, Z- : 90 minutes each

3.6 Pressure medium

* Mineral oil according to DIN 51524.
* Biodegradable hydraulics oil (The solenoid parts should be affected as little as possible by biodegradable hydraulic oils. If Supplier or Parker finds out that the solenoid is affected by specific biodegradable oil either company should be notified about the oil and also which part that's affected.)

3.7 Contamination level of oil

* According to ISO 4406, contamination code 17/14 (or cleaner). [3]

4. Tests

4.1 General test conditions

4.1.1 Hydraulic parameters

Master block 1: All requirements in this specification are valid with the cartridge mounted in a master block according to drawing 9120 1003 03.

All data in this specification **includes** the tolerances of the measurement instruments used.
Basic test parameters:

*	Oil:	Acc. to 3.6 and 3.7
*	Oil viscosity at 40?C:	46 ± 3 mm^2/s (cSt)
*	Viscosity index:	108
*	Temperature of the oil, 2 levels:	Level 1: +50?C ±3?C Level 2: +90?C ±3?C
*	Pump pressure Pp:	35 - 36 bar
*	Tank pressure:	0 bar (atmosphere)

4.1.2 Electrical Drive

The electrical drive consists of a Pulse Width Modulated (PWM) generator, type VOAC IPS302.

* V_{in} = 28 ± 0,5 V for 24 V, V_{in} = 14 ± 0,5 V for 12 V
* Freq.: = 100 ± 10Hz

V_{in} = Input voltage to the IPS302.

All current measurements must be performed with a true RMS current measurement instrument, type Fluke 87.

4.2 Hydraulics tests

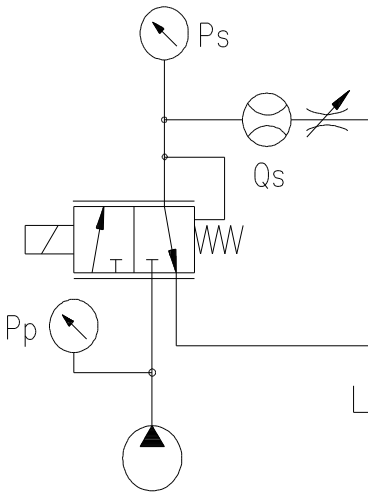
4.2.1 Test set up for reducing function

* Leakage Pp to tank
* Pressure reducing function
  Ps_1 - Ps_4 are measured at increasing flow.
* Hysteresis
  Cycle-time: 30 ± 5 s/graph

General test conditions acc. to 4.1

Hydraulic circuit:

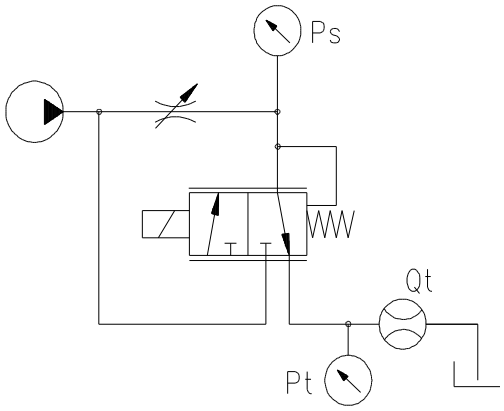
Fig. 3



4.2.2 Test set-up for pressure relief function

General test conditions acc. to 4.1
Hydraulic circuit:

Fig. 4



4.2.3 Dynamic Response

Test set-up:

Hydraulic circuit acc. to 4.2.1
When verifying the dynamic response requirements, the Ps-signal shall be connected to a **Master block 2**, including a cylinder with spring return, acc. to drawing 9120 1003 04. (Piston diameter 16 mm and with spring pre-set to a force that will give a start movement at 5 bar pressure from the cartridge, and a movement of 6 mm at 17 bar).

Electrical power source: IQAN XP2

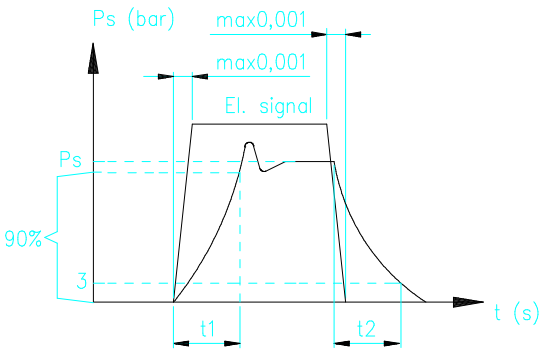
Basic test parameters:

* Regulated pressure (Ps) = 10 ± 1 bar
* Qs = 0
* Start from 0 bar
* Parameters not stated, see 4.1.1

Solenoid vented before start.

Test shall be made with cartridge mounted with centreline in **vertical direction.**

Fig. 5



4.2.4 Dynamic Hysterises Response

Test set up:

Hydraulic circuit acc. to 4.2.1
When verifying the dynamic response requirements, the Ps-signal shall be connected to a **Master block 1**, acc. to drawing 9120 1003 04
Electrical power source:
Parker's XP2 unit 24 V: 93Hz 100 mA, 12 V: 93Hz 200 mA or corresponding current from a general electrical power source.

4.3 Endurance tests

The cartridge shall be driven from the PWM generator, according to 4.1.2, and mounted in the Master block 1, according to drawing 9120 1003 03.

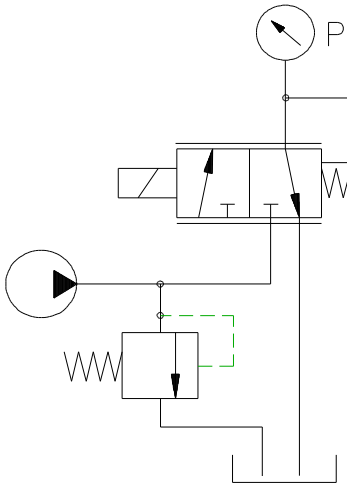
Basic test parameters:

* Feeding pressure (Pp): 50 ± 5 bar
* Temperature of the oil: 50?C±3?C
* Parameters not stated, see 4.1.

* **Note:** Contamination level during endurance tests **shall not be lower (=cleaner) than 17/14** to avoid unrealistic conditions.

Solenoid vented before start.
Test shall be made with converter valves mounted with centreline in **horizontal direction**.

Fig. 7
Above figure showing test circuit for endurance tests.



4.3.1 Constant pressure level

The waveform of the PWM-generator is according to fig.7 and the amplitude (V_p) is adjusted to achieve a regulated pressure (Ps) of 20 ± 2 bar.

* Test freq: 1/t1 = 100Hz
* Duty cycle t2/t1 = max 75%

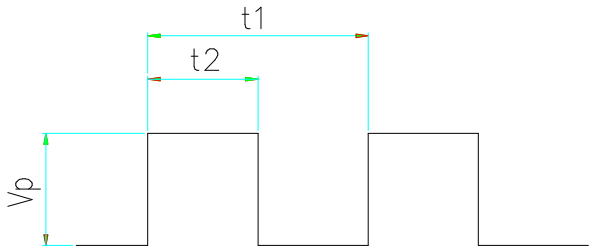


Fig. 8

4.3.2 2 pressure levels

PWM-generator according to 4.1.2.

Test set-up: Regulated pressure (Ps) connected to Master block 2 (including a cylinder with spring return), according to drawing 9120 1003 04.

Three different tests shall be made, see below.

Test cycle:

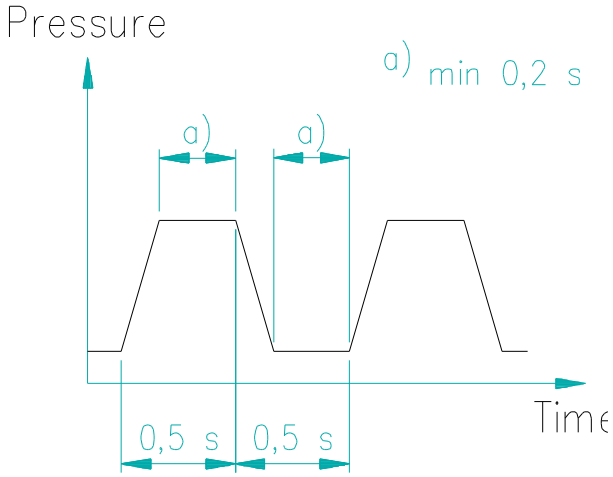


Fig. 9

4.3.2.1 Test 1

* Lower pressure level: 0
* Upper pressure level: Ps_4

4.3.2.2 Test 2

* Lower pressure level: Ps_1
* Upper pressure level: Ps_4

4.3.2.3 Test 3

The cartridge shall be mounted in the Master block 1, according to drawing 9120 1003 03.

Pp = min 55 bar.

* Lower tank-pressure level: 0 bar
* Upper tank-pressure level: 20 bar
* Lower pressure level: 0
* Upper pressure level: Ps_4

5. Quality aspects

5.1 Internal cleanliness

* The valve should be tested and flushed in test rigs having an oil cleanliness level of 16/13 or better, acc. to ISO 4406.

5.2 Labelling

Labelling acc. to drawing 3767002/3767648