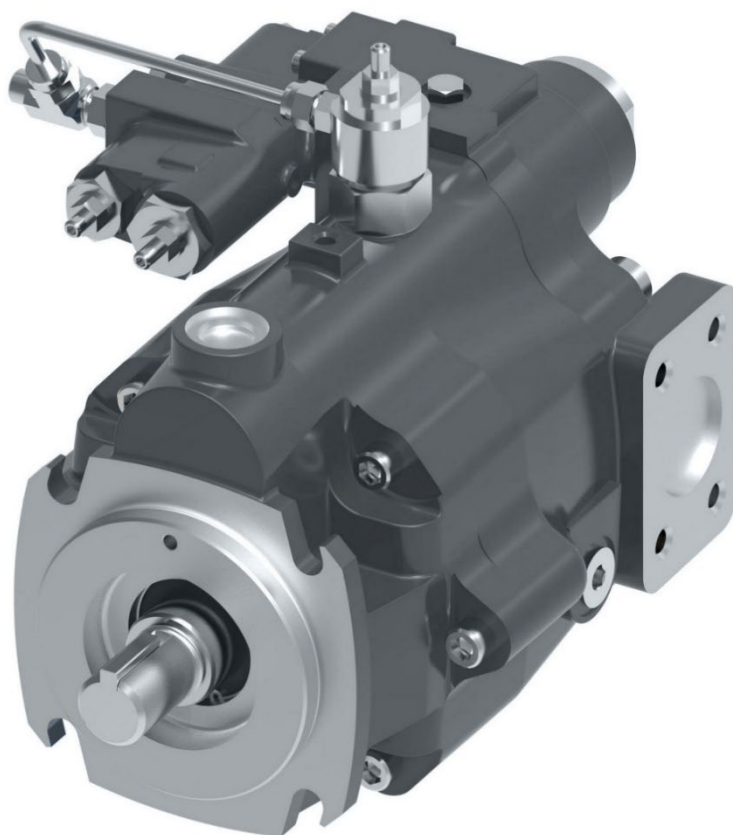


Vickers® by Danfoss **PVM Piston Pump ATEX Technical Information**

ATEX / UKEX Certified
PVM Code A & B, 18 – 141 cc



ATEX Directive 2014/34/EU

UKEX SI 2016 No. 1107

CE  II 2G Ex h IIC T4-T1 Gb X

UK  II 2G Ex h IIC T4-T1 Gb X

VICKERS
by Danfoss



Revision History

Table of Revisions

Date	Changed	Rev
Feb 2024	First edition	0101
Mar 2024	Certification level changed from Zone 2 to Zone 1, minor changes in viscosity/temp. ratings, Added warnings regarding shaft seal lub. & case pressure, removed nameplate, new marking	0102



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General Information

ATEX / UKEX Introduction

The ATEX Directive 2014/34/EU specifies the minimum safety requirements for equipment intended for use in potentially explosive atmospheres in European Union member states. ATEX is derived from the French term **AT**mosphères **EX**plosives.

The Statutory Instruments (abbr. "SI") 2016 No. 1107 are the equivalent health and safety regulations which were transposed by the UK from European ATEX Directive 2014/34/EU after leaving the European Union. They extend to England, Wales and Scotland. Hereafter they will be referred to as "**UKEX**".

PVM Hydraulic pumps are designed for industrial applications. Some pumps are used in related applications, where locations are classified as hazardous areas.

The equipment intended for use in hazardous areas are divided into two groups:

Group I: Equipment intended for use in underground parts of mines (mining equipment).

Group II: Equipment intended for use in other places than mines (non-mining equipment).

The Danfoss hydraulic pumps, type PVM are intended for use in Group II applications.

Explosion Triangle

A "hazardous area" is defined as an area in which the atmosphere contains, or may contain in sufficient quantities, flammable or explosive gases, dusts or vapors. In such an atmosphere a fire or explosion is possible when three basic conditions are met. This is often referred to as the "hazardous area" or "explosion" triangle.

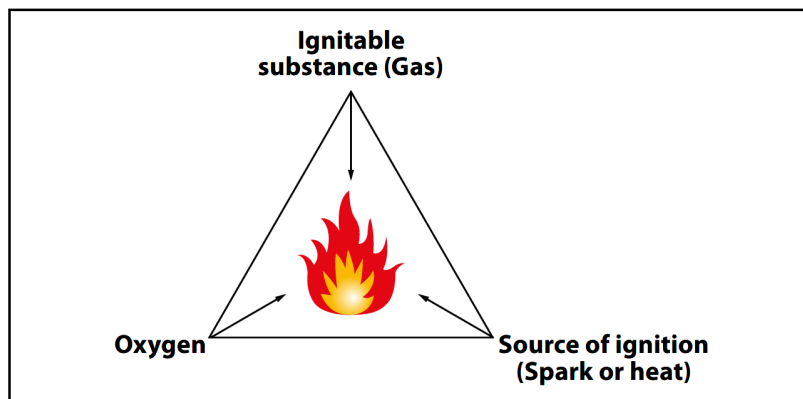


Figure 1: Explosion Triangle

An atmosphere with the potential to become an explosive atmosphere during operating conditions and/or under the influence of the surroundings is defined as a potentially explosive atmosphere. Products covered by directive 2014/34/EU and SI 2016 No. 1107 are defined as intended for use in potentially explosive atmospheres. Removing one of the elements eliminates all risk of explosion.

General Zone Classification

Directive 99/92/EC and SI 2002 No. 2776 (DSEAR) divide the Hazardous areas into zones and defines criteria by which products are categorized within these zones; Zone 0 / 20 is the most restrictive and Zones 1 / 21 and 2 / 22 are less restrictive. The following table describes the zones in an installation where there is a potential for explosive atmospheres. The owner of the installation must analyze and assess the area in which the explosive gas/dust mixture may occur, and if necessary must divide it into zones. This process of zoning then allows the correct plant and equipment to be selected for use in the area.

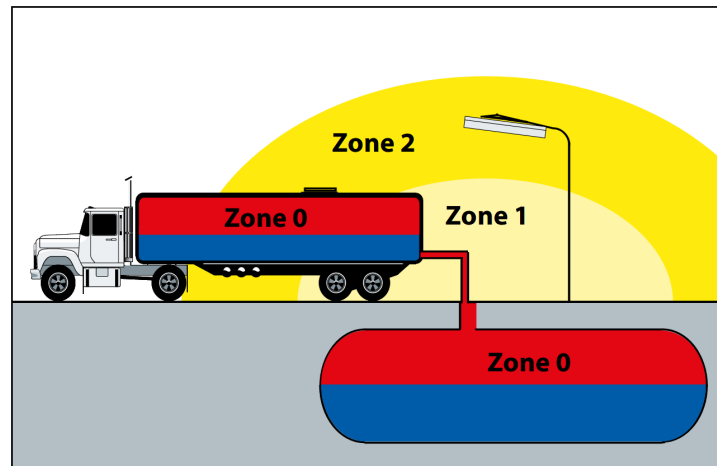


Figure 2: ATEX / UKEX Zones Example

Table 1: Classification of Explosive Atmospheres

Zones		Presence of potentially explosive atmosphere	Type of Risk
Gas (G)	Dust (D)		
0	20	Present continuously or for long periods	Permanent
1	21	Likely to occur in normal operation occasionally	Potential
2	22	Not likely to occur in normal operation but if it does occur will persist for a short period of time	Minimal

Equipment Category and Zones

Mechanical components with potential ignition sources e.g. components containing non-conductive materials or layers or components with hot surface are covered by the ATEX-directive / UKEX SI.

Non-mining equipment for potentially explosive atmosphere is classified as:

Equipment Group II – this group comprises three categories according to the level of safety provided:

- Category 1
- Category 2
- Category 3

Category 1 equipment has the highest degree of protection – see the following below.

Table 2: Equipment Categories

Degree of Protection	Protection	Category
Very high	Two independent protection measures or safe if two errors occur independently	Category 1
High	Safe in normal operation and in anticipated case of commonly occurring errors	Category 2
Normal	Safe in normal operation	Category 3

These products have to fulfill all requirements in the ATEX directive / UKEX SI, and have to be marked with the required “Ex” marking.

Equipment located in zone specified areas must fulfil the following requirements (see also the following figure):

- Category 3 – approved equipment can be installed in hazardous areas zone 2 / 22 and outside zone categorized areas.
- Category 2 – approved equipment can be installed in hazardous areas zone 1 / 21, zone 2 / 22 and outside zone categorized areas.
- Category 1 – approved equipment can be installed in hazardous areas zone 0 / 20, zone 1 / 21, zone 2 / 22 and outside zone categorized areas.

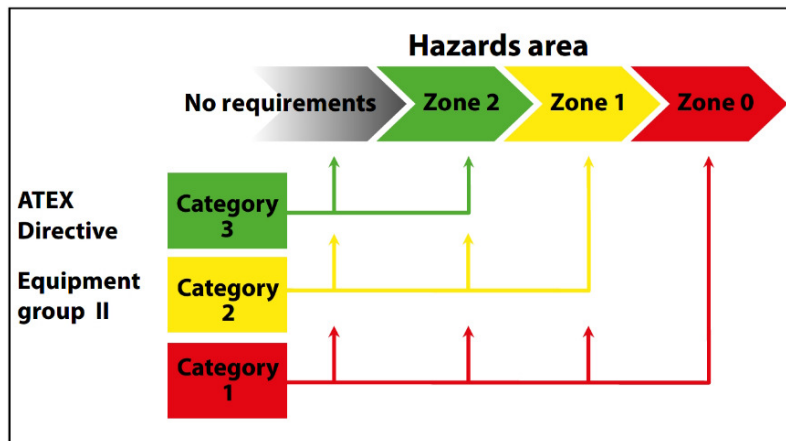


Figure 3: Group II, Category 1, 2, 3: Permissible Hazard Area Zones

Contents of EX Marking

The rules for the marking of systems, equipment and components are uniformly defined in the standards relating to the general technical requirements – (BS) EN ISO 80079-36:2016 for non-electrical equipment.

A priority for all Ex equipment and protective systems is that the marking should show the areas of their designated use. Components covered within the scope of the ATEX directive have to be CE-marked, and marked with the specific "Ex"-sign. Respectively, components covered within the scope of UKEX SI have to be marked with the UK marking (UKCA-Logo)

Principle

The marking must indicate the following:

- The manufacturer who has put the item of equipment on the market
- Manufacturer's type identification
- A serial number
- Symbol Ex, Letter "h" (non-electrical Equipment)

And further the ignition protection marking

- Symbol of the equipment group and category (M1 or M2 for group I mining equipment, or 1 or 2 or 3 for Group II non-mining equipment).

Additionally for Group II equipment only:

1. The letter "G" where explosive atmospheres caused by gases, vapors or mists are concerned; and/or
 2. The letter "D" where explosive atmospheres caused by dusts are concerned.
- Where appropriate, symbol of explosion group of the equipment.
 - EPL (Equipment Protection Level) "Ma", "Mb", "Ga", "Gb", "Gc", "Da", "Db" or "Dc"
 - For Group II equipment, the symbol indicating the temperature class or the maximum surface temperature in °C, or both.
 - Where appropriate, special conditions "X"

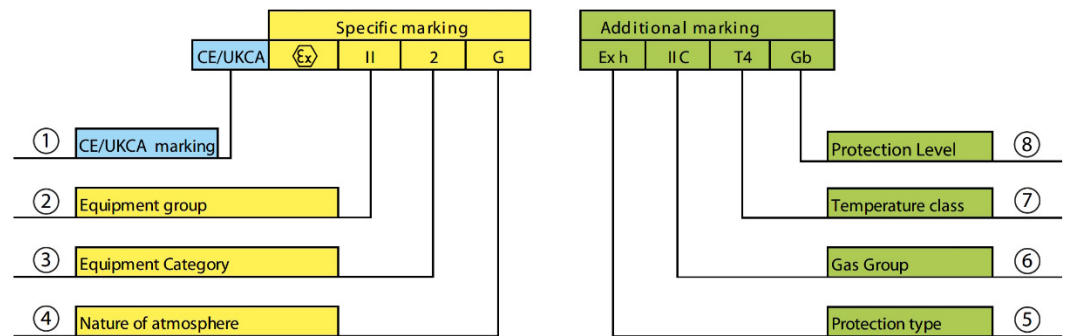


Figure 4: Explanation of ATEX / UKEX Marking, see table below for descriptions

Callout	Description	
1	Marking	CE
		UKCA
Specific Marking		
2	Equipment group	I – Mining
		II – Non-mining
3	Equipment category	1 (zone 0/20)
		2 (zone 1/21)
		3 (zone 2/22)
4	Nature of atmosphere	G – Gas
		D – Dust
Additional Marking		
5	Protection type	Ex h – Protection by constructional safety
		Ex h – Protection by control of ignition source
		Ex h – Protection by liquid immersion
		Ex h – Protection by enclosure (Dusts)
		Ex h – Flame-proof enclosure
		fr – Protection by flow restricting enclosure
6	Gas group	IIA (e.g. Hydrogen, Acetylene)
		IIB (e.g. Town Gas, Ehylene)
		IIC (e.g. Ammonia, Methane, Propane)
7	Temperature class	T1 to T6 (Gas)
		T*** °C (Dust)
		Where the maximum Surface Temperature depends not on the equipment itself, but mainly on operating conditions (like heated fluid) the relevant information shall be given in the instruction for use in order to inform the user about this special situation. An “X” should be added to the end of the marking.
8	Equipment Protection Level (EPL)	Ga (Gas) / Da (Dust)
		Gb (Gas) / Db (Dust)
		Gc (Gas) / Dc (Dust)
		Ma / Mb (Methane, Carbon dust)
Add.	Ambient Temperature	Example: -30≤Ta≤60°C
Add.	Specific conditions	X – Special Conditions of use acc. to equipment instructions (User Manual)
		U – Uncompleted component certificate (conformity is certified when used in an overall equipment)

Marking of Vickers by Danfoss PVM Pumps

The Vickers by Danfoss PVM pumps are marked as equipment for Group II, category 2 for gas environment and with ignition protection **constructional safety** and **liquid immersion**.

Temperature class/ Maximum surface temperature depends on the operating conditions (ambient and fluid temperature). The operating conditions to which each temperature class applies must be always upheld.

Table 3: ATEX/UKEX Marking Options

Marking	For model code option
Ex II 2G Ex h IIC T4-T1 Gb X	G (see Table 5 , page 9 for requirements)

See [Model Code](#) for position of order letter and additional options information.

See ["Fluid Viscosity and Temperature for ATEX / UKEX PVM Pumps"](#) on page 9 for more information about temperature classes. For detailed information on selecting the appropriate class and application requirements, please see [Table 5](#), page 9 and [PVM ATEX / UKEX User Manual BC479055194216en](#)

The ATEX certification of the units are done under the scope of:

"Directive 2014/34/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres."

And UKEX Statutory Instruments:

"2016 No. 1107 HEALTH AND SAFETY The Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 2016"

With following parameters:

- Equipment group: II, non-mining equipment
- Equipment Category: 2G
- Temperature class: T4...T1
- Gas Group: IIC
- Equipment protection level (EPL): Gb
- Resulting Zone: 1 (Gas Environment)

The Conformity Assessment Procedure must be executed according to:

- /1/ Directive 2014/34/EU, annex VIII, Modul A: Internal Production Control (see article 13, section 1 (c))
- /2/ UKEX SI 2016 No. 1107 Schedule 3A, Part 6: Internal Production control (see Part 3, article 39 (1)(c))

The EU declaration of conformity has to be prepared and issued with regard to annex X of /1/. The "Essential Health and Safety Requirements" defined by /1/, annex II, have to be considered.

The UK declaration of conformity has to be prepared and issued with regard to schedule 6 of /2/. The "Essential Health and Safety Requirements" defined by /2/, schedule 1, have to be considered.

Maximum Surface Temperature

Fluid Viscosity and Temperature for ATEX / UKEX PVM Pumps

Table 4: Fluid Viscosity and Temperature Rating of PVM ATEX / UKEX Units

Features		Data
Viscosity	Minimum Intermittent ¹⁾	10 mm ² /s [59 SUS]
	Recommended Range	16 – 40 mm ² /s [83 – 187 SUS]
	Maximum (Cold Start) ²⁾	1000 mm ² /s [4550 SUS]
Inlet Temperature	Minimum (Cold Start) ²⁾	-28 °C [-18 °F]
	Maximum Rated	80 °C [176 °F]
	Maximum Intermittent ¹⁾	104 °C [219 °F]
Case Drain Temperature	Maximum Rated	94 °C [201 °F] ³⁾
	Maximum Intermittent ¹⁾	110 °C [230 °F] ³⁾

¹⁾ Intermittent = Short term $t < 3$ min per incident.

²⁾ Cold start = Short term $t < 3$ min; $p \geq 50$ bar; $n \leq 1000$ min⁻¹ (rpm); please contact Danfoss Power Solutions especially when the temperature is below -25 °C [-13 °F].

³⁾ Must not be exceeded locally either (e.g. in the bearing area). The temperature in the bearing area is (depending on pressure and speed) up to 5 °C [41 °F] higher than the average case drain temperature.

Below maximum surface temperatures are without any deposited dust on the product. The possible insulation effect of a dust layer on the surface has to be taken into account by the safety margin to the minimum ignition temperature of the dust concerned. For up to 5 mm [1.97 in] layer thickness the safety margin is 75 °C [167 °F]. For further information please see IEC 60079-14.

Warning

The required operating temperatures (ambient and oil) of the pump must be guaranteed by the end user at all times.

Warning

It is compulsory to use oils whose inflammable degree is at least 50K above the maximum surface temperature of the pump. See also *Oil Types / Operating Fluids* on page 14.

Table 5: Temperature Classes at Maximum Ambient and Oil Temperatures

Maximum Oil Temperature (at Inlet)	Max. Ambient Temperature	
	≤ 40 °C ≤ 104 °F	≤ 60 °C ≤ 140 °F
≤ 20 °C [68 °F]	T4	T4
≤ 40 °C [104 °F]	T4	T4
≤ 60 °C [140 °F]	T4	T4
≤ 80 °C [176 °F]	T4	T3

Table 6: T-Codes with respective Maximum Surface Temperature

T-Code / Temperature Class	Maximum Surface Temperature	
	°C	°F
T3	200	392
T4	135	275

Model Code

PVM “Code A” Model Code

The below illustration and the following sections describe how to identify parts of the model code and availability of certain part options based on frame size. There are currently no limitations to the standard PVM Code A Technical catalog, therefore also refer to the Catalog *AF436067900311en*. Remote Control (E) is supplied without external valve.

PVM	045	E	R	01	A	E	01	AA	A	28	00	00	0	0	A	G	A
																	
1,2,3	4,5,6	7	8	9,10	11	12	13,14	15,16	17	18,19	20,21	22,23	24	25	26	27	28

1,2,3 Product Series

PVM – M Series Variable Piston Pump

4,5,6 Displacement

Twelve displacements available 230 bar and 315 bar continuous ratings
See page 6

7 Valve Plate

E - Quiet version, optimized for 1000-1800 rpm

M - Higher speed version. ref speed performance data for individual displacements

8 Input Rotation

R – Clockwise (Right hand)
L¹ – Counter-clockwise (Lefthand)

See page 6

9,10 Input Shaft

Standard SAE and ISO splined versions (Other configurations optional)

11 Mounting Flange

Thirteen options in SAE and ISO mounts
See page 6

12 Main Port Location

E² – End Ported
S⁴ – Side Ported

13,14 Main Port Type

SAE & ISO tube ports and 4-bolt flange (Other configurations optional)
See page 7

15,16 Pump Special Features

00 – None
AA – Adjustable Maximum Displacement Stop and single shaft (standard)
AB – Double Shaft Seal, Two Way

17 Control

0 – None
A – Pressure Compensator
B – Pressure and Flow Compensator with Bleed Orifice
C – Pressure and Flow Compensator with Plugged Orifice
E – Industrial/Remote (57cc through 141 cc only)
L – Power Control with Load Sense and Pressure compensator with plugged orifice.
W – Remote pressure control (018-050 size only) with - 4 SAE O-ring port, left side

18,19 Pressure Compensator Setting

00 – None
07 – 70 bar (Adjustable between 40 bar and 130 bar)
23 – 230 bar (Adjustable between 130 bar and 320 bar)
28 – 280 bar (Adjustable between 130 bar and 320 bar)

20,21 Flow Compensator Setting

00 – None
10 – Standard for W control
11 – 11 bar setting
20 – 20-20 bar setting
24 – 24-24 bar setting

22,23 Power control Torque Limiter Setting

00 – None
50-50% of rated torque*
(Adjustable from 20-90% of rated torque,*for any other values specify % of rated torque)

24 Compensator Special Features

0 – None

25 Auxiliary Mounting Pad

0³ – None
(Auxiliary mounting available on all frame sizes)
See page 7

26 Paint

0 – No Paint
A – Standard Blue Paint

27 Customer Identification

G – ATEX / UKEX Version
(Contact Danfoss for options)

28 Design Code

A – A (Initial Release)

1 Not available on 074, 081, 098 and 106 End Port

2 Not available on 074, 081, 098 and 106 displacement with CCW rotation (“L” in position 8)

3 Through drive not available on the CCW rotation (“L” in position 8) on 074, 081, 098 and displacement

4 Not available on 018

4,5,6 Maximum Geometric Displacement

Displacement Code	018	020	045	050	057	063	074	081	098	106	131	141
cm ³ /r	18,0	21,1	45,1	50,0	57,4	63,1	73,7	81,0	98,3	106,5	131,1	141,0
in ³ /r	1.1	1.29	2.75	3.05	3.50	3.85	4.50	4.94	6.00	6.50	8.00	8.60

9,10 Shaft-End Type at Electric Motor End

Description	Shaft Code					
	PVM018/020	PVM045/050	PVM057/063	PVM074/081	PVM098/106	PVM131/141
SAE, SAE A, Straight Keyed	01	–	–	–	–	–
SAE, SAE 19-1, Straight Keyed	02	–	–	–	–	–
SAE, SAE A, 9T Spline	03	–	–	–	–	–
SAE, SAE A, 11T Spline	04	–	–	–	–	–
SAE, SAE B, Straight Keyed	05	05	–	–	–	–
SAE, SAE B-B, Straight Keyed	06	06	06	–	–	–
SAE, SAE B, 13T Spline	07	07	07	–	–	–
SAE, SAE B-B, 15T Spline	08	08	08	–	–	–
SAE, SAE C, Straight Keyed	–	–	09	09	09	09
SAE, SAE C-C, Straight Keyed	–	–	–	10	10	10
SAE, SAE C, 14T Spline	–	–	11	11	11	11
SAE, SAE C-C, 17T Spline	–	–	–	12	12	12
SAE, SAE D, Straight Keyed	–	–	–	–	–	13
SAE, SAE D, 13T Spline	–	–	–	–	–	14
ISO E20N, Straight Keyed	15	–	–	–	–	–
ISO E25N, Straight Keyed, Short Spigot	16	–	–	–	–	–
ISO E25N, Straight Keyed	17	17	17	–	–	–
ISO E32N, Straight Keyed, Short Spigot	–	–	18	18	18	18
ISO E40N, Straight Keyed, Short Spigot	–	–	–	19	19	19

11 Mounting Flange Specifications

Code	Description	PVM018/020	PVM045/050	PVM057/063	PVM074/081	PVM098/106	PVM131/141
A	SAE A, 2-bolt	●	○	○	○	○	○
B	ISO 80A2HW	●	○	○	○	○	○
C	SAE B, 2-bolt	●	●	●	○	○	○
D	ISO 100A2HW	●	●	●	○	○	○
E	SAE C, 2-bolt	○	○	●	●	●	●
F	ISO 125-A2HW	○	○	●	●	●	●
G	SAE C, 4-bolt	○	○	●	●	●	●
H	ISO 125B4HW	○	○	●	●	●	●
J	SAE D, 4-bolt	○	○	○	○	○	●
K	ISO 160B4HW	○	○	○	○	○	●

● = Available

○ = Not Available

13,14 Main Port Options

Code	Description	Inlet Outlet	PVM018/020	PVM045/050	PVM057/063	PVM074/081	PVM098/106	PVM131/141
01	SAE J1926 Tube Ports	Inlet	–20	–24	–24 (End ports only)	–	–	–
		Outlet	–12	–16	–16 (End ports only)	–	–	–
02	SAE J518 Flange Ports	Inlet	1.25 inch	2.0 inch	2.0 inch	2.0 inch	2.5 inch	2.5 inch
		Outlet	0.75 inch	1.0 inch	1.0 inch	1.0 inch	1.0 inch	1.25 inch*
03	ISO 6149-1 Tube Ports	Inlet	M42	M48	M48 (End ports only)	–	–	–
		Outlet	M27	M33	M33 (End ports only)	–	–	–
04	ISO 6162 Flange Ports	Inlet	32mm	51mm	51mm	51mm	64mm	64mm
		Outlet	19mm	25mm	25mm	25mm	25mm	32mm*
05	British Standard Parallel Pipe – Tube Ports	Inlet	G 1-1/4	G 1-1/2	–	–	–	–
		Outlet	G 3/4	G 1	–	–	–	–

*SAE Code 62, high pressure series, or ISO 400 bar. Other flange ports are SAE Code 61, standard pressure series, or ISO 25-350 bar

25 Thru-Drive Options

Code	Description	PVM018/020	PVM045/050	PVM057/063	PVM074/081*	PVM098/106	PVM131/141
O	Single pump, non-thru-drive	●	●	●	●	●	●
A	SAE A, 2-bolt, 9T spline	●	●	●	●	●	●
B	SAE A, 2-bolt, 11T spline	●	●	○	●	●	●
C	SAE B, 2-1/4-bolt, 13T spline	○	●	●	●	●	●
D	SAE B-B, 2-1/4-bolt, 15T spline	○	●	●	●	●	●
E	SAE C, 2-1/4-bolt, 14T spline	○	○	●	●	●	●
F	SAE C-C, 2-1/4-bolt, 17T spline	○	○	○	●	●	●
G	ISO 80-A2HW, 9T SAE spline	●	●	●	●	●	●
H	ISO 80-A2HW, 11T SAE spline	●	●	○	●	●	●
J	ISO 100-A2/B4HW, 13T SAE spline	○	●	●	●	●	●
K	ISO 100-A2/B4HW, 15T SAE spline	○	○	●	●	●	●
L	ISO 125-A2/B4HW, 14T SAE spline	○	○	●	●	●	●
M	ISO 125-A2/B4HW, 17T SAE spline	○	○	○	●	●	●

● = Available

○ = Not Available

* Not available on the 074/081 LH

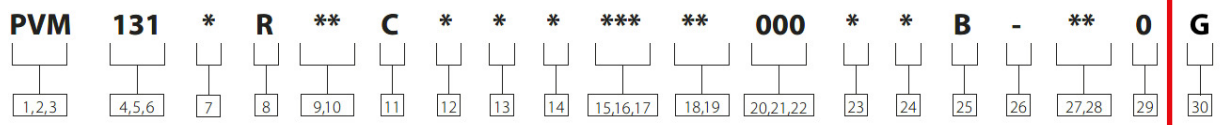
PVM “Code B” Model Code

The below illustration and the following sections describe how to identify parts of the model code and availability of certain part options based on frame size. There are no limitations to the standard PVM Code B Technical catalogs. However, since more PVM Code B Frame sizes are currently being released, **the following illustration is an incomplete example only applicable to 131/141 cc**. Limitations of offering regarding main ports, end cap, mounting flanges, shaft ends may differ. Position of “ATEX/UKEX Order Letter G” is the same for all Code B units.

For general information on Code B release highlights, consult *AI437354377253en*.

Please consult the catalogs for the respectively selected size and actual offering options:

- 18/20 cc/rev: *BC474967339987en*
- 45 cc/rev: *BC448302546603en*
- 131/141 cc/rev: *BC468270675805en*



1,2,3 Product Series

PVM – M Series Variable Piston Pump

4,5,6 Displacement

131 131.1 cm³/r [8.00 in³/r]
(315 bar max.)
141 141.0 cm³/r [8.60 in³/r]
(230 bar max.)

7 Valve Plate

E - Industrial -1800 rpm max
M - Higher speed version.

8 Input Rotation

R – Clockwise (Right hand)
L – Counter-clockwise (Left hand)

9,10 Input Shaft

09 - SAE J744-32-1 SAE C Straight Keyed
10 - SAE J744-38-1 SAE C-C Straight Keyed
11 - SAE J744-32-4 SAE C 14T Spline
13 - SAE J744-44-1 SAE D Straight Keyed
14 - SAE J744-44-4 SAE D 13T Spline
25 - SAE J744-127-4 C 4-BOLT with 38.1 [1.50] dia. Straight Woodruff Keyed

11 Mounting Flange

G – SAE J744-127-4 C 4-Bolt
J – SAE J744-152-4 D 4-Bolt

12 Main Port Location

S – Side Ported

13 Main Port Type

2 - SAE J518 Flange Ports SAE Auxiliary Ports
4 - Flange W/ M33x2 Case Drain Port

14 Control

0 - None
A - Pressure Compensator
B - Pressure and Flow Compensator with Bleed Down Orifice
C - Pressure and Flow Compensator with Plugged Orifice
E - Industrial Control (Pressure and flow compensated)
F - Industrial Control (Pressure compensated)
L - Power Control/Torque Limiter

15,16,17 Pressure Compensator Setting

000 - None
070 - 070±4 bar [1015±58 lbf/in²] [Default]
230 - 230±4 bar [3335±58 lbf/in²] [Default for 141 cc/r]
315 - 315 bar [4567 lbf/in²] [Default for 131cc/r]

18,19 Flow Compensator Setting

00 – None
11 – 11 bar setting
20 – 20 bar setting

20,21,22 Power control Torque Limiter Setting

000 – None
050 – Limited to 50 kW*
(Adjustable From 20-90 % Of Rated Torque, * For Any Other Values Specify Power in kW, Available in Increments Of 5 kW)

23 Auxiliary Mounting Pad

0 - None (Non-Through Drive)
1 - Auxiliary SAE A-Mount with Cover Plate and No Coupler
A - SAE A 2-Bolt 9T Spline
B - SAE A 2-Bolt 11T Spline
C - SAE B 2-1/4-Bolt 13T Spline
D - SAE B-B 2-1/4-Bolt 15T Spline
E - SAE C 2-1/4-Bolt 14T Spline
F - SAE C-C 2-1/4-Bolt 17T Spline

24 Paint

0 – No paint
A – Standard black paint

25 Design Code

B – B

Differentiator

26 –

27,28 Pump Special Features

00 – Adjustable Max Displacement Stop

29 Compensator Special Features

0 – None
(Contact Danfoss for options)

30 Customer Identification

G – ATEX / UKEX Version
(Contact Danfoss for options)

Technical Specifications

Ambient Temperature

Maximum ambient temperature depends on the requested temperature class needed. Refer to [Fluid Viscosity and Temperature for ATEX/UKEX PVM Pumps](#) on page 9 and ATEX/UKEX User Manual BC479055194216en.

In general, the ambient temperature should lie between -30° C [-22° F] and +60° C [140 °F] to ensure that the shaft seal retains its sealing capacity.

Oil Types / Operating Fluids

In a hydraulic system the most important task of the oil is to transfer energy. At the same time the oil must lubricate moving parts in hydraulic components, protect them from corrosion, and transport dirt particles and heat out of the system. To ensure that hydraulic components operate without problems and have long operating life it is therefore vital to select the correct oil type with the necessary additives.

Ratings and performance data are based on operating with hydraulic fluids containing oxidation, rust and foam inhibitors. These fluids must possess good thermal and hydrolytic stability to prevent wear, erosion and corrosion of pump components.

Mineral Oils

For systems containing Vickers by Danfoss hydraulic pumps, type PVM, mineral hydraulic oil with anti-wear additives, type HLP [DIN 51524] or HM (ISO 11158), or automotive type crankcase oil (SC, SD, SE, SF per SAE J183 FEB80) shall be used. For more information, see Danfoss publication 579. For operation on other alternative or environmentally friendly fluids, please contact your Danfoss Representative.

A guide for alternate fluids and application restriction is shown below in [Table 7: PVM Alternate Fluids Guide](#).



It is compulsory to use oils whose inflammable degree is at least 50K above the maximum surface temperature of the pump. See [Table 6: T-Codes with respective Maximum Surface Temperature](#) on page 9.

Oil Temperature

Maximum oil temperature depends on the requested ATEX class needed. See [Table 5](#) on page 9 and PVM ATEX/ UKEX User Manual BC479055194216en for limitations.

Under normal operating conditions it is recommended to keep the temperature in the range of 30 °C [86°F] and 60 °C [140 °F].

Fluid temperature affects the viscosity of the fluid and resulting lubricity and film thickness. High temperatures can also limit seal life, at most non-metallic materials are adversely affected by use at elevated temperatures.

Fluids may break down or oxidize at high temperature, reducing their lubricity and resulting in reduced life of the unit. Oil life is greatly reduced if its temperature exceeds +60 °C [+140 °F]. As a general rule, oil life is halved for each 8 °C [46 °F] its temperature exceeds +60 °C [+140 °F].

Viscosity

Maintain fluid viscosity within the recommended range for maximum efficiency and bearing life. Minimum viscosity should only occur during brief occasions of maximum ambient temperature and severe duty cycle operation. Maximum viscosity should only occur at cold start. Limit speeds until the system warms up.

See page 9 for viscosity rating and limitations. We recommend the use of an oil type having a viscosity of 16 – 40 mm²/s [83 – 187 SUS] at the actual operating temperature.

Table 7: PVM Alternate Fluids Guide

Fluid Type/ Model Series	Petroleum Base	Petroleum Base	Motor Oil	Universal	Automatic Transmission Fluid	Mil Spec Fluids	Environmentally Acceptable Fluids		Fire Resistant Fluids					Specialty Fluids	Food Grade Fluid
	ZDDP	AW (HM)	Zinc Free	Tractor	UTTO	ATF	Vegetable Base	HEES	Synthetic Base			Water Containing		Cutting Fluids H1 - approved	
									Phosphate ester HFDR	Polyester- HFDU	Polyether polyol- HFDU	WaterGlycol- HF C	Invert Emulsion - HF B		
1	Model series Quiet version "E" @ 1800 RPM Unless Noted														
		4060 PSI	NR	3625 PSI **	3625 PSI **	NR	3625 PSI **	3625 PSI 1800 RP M	3300 PSI **	3300 PSI **	NR	2500 PSI **	2250 PSI **	NR	3625 PSI **
		3335 PSI	NR	3250 PSI **	3250 PSI **	NR	3250 PSI **	3250 PSI 1800 RP M	3000 PSI **	3000 PSI **	NR	2250 PSI **	2000 PSI **	NR	3250 PSI **
		4060 PSI	NR	3625 PSI **	3625 PSI **	NR	3625 PSI **	3625 PSI 1500 RP M	3300 PSI **1500 rpm	3300 PSI **1500 rpm	NR	2500 PSI **1500 rpm	2250 PSI **1500 rpm	NR	3625 PSI **
		3335 PSI	NR	3250 PSI **	3250 PSI **	NR	3250 PSI **	3250 PSI 1500 RP M	3000 PSI **1500 rpm	3000 PSI **1500 rpm	NR	2250 PSI **1500 rpm	2000 PSI **1500 rpm	NR	3250 PSI **
2	Model Series Higher Speed Version(M)														
		4060 PSI 2800 RP M	NR	3625 PSI ** 2800 RP M	3625 PSI ** 2800 RP M	NR	3625 PSI ** 2800 RP M	3625 PSI 1800 RP M	3300 PSI ** 1800 RP M	3300 PSI ** 1800 RP M	NR	2500 PSI ** 1800 RP M	2250 PSI ** 1800 RP M	NR	NR
		3335 PSI 2800 RP M	NR	3250 PSI**2800 RP M	3250 PSI**2800 RP M	NR	3250 PSI**2800 RP M	3250 PSI 1800 RPM	3000 PSI ** 1800 RP M	3000 PSI ** 1800 RP M	NR	2250 PSI ** 1800 RP M	2000 PSI ** 1800 RP M	NR	NR
		4060 PSI 2600 RP M	NR	3625 PSI ** 2600 RP M	3625 PSI ** 2600 RP M	NR	3625 PSI ** 2600 RP M	3625 PSI 1800 RP M	3300 PSI ** 1800 RP M	3300 PSI ** 1800 RP M	NR	2500 PSI ** 1800 RP M	2250 PSI ** 1800 RP M	NR	NR
		3335 PSI 2600 RP M	NR	3250 PSI ** 2600 RP M	3250 PSI ** 2600 RP M	NR	3250 PSI ** 2600 RP M	3250 PSI 1800 RPM	3000 PSI ** 1800 RP M	3000 PSI ** 1800 RP M	NR	2250 PSI ** 1800 RP M	2000 PSI ** 1800 RP M	NR	NR
		4060 PSI 2500 RP M	NR	3625 PSI ** 2500 RP M	3625 PSI ** 2500 RP M	NR	3625 PSI ** 2500 RP M	3625 PSI 1800 RP M	3300 PSI ** 1800 RP M	3300 PSI ** 1800 RP M	NR	2500 PSI ** 1800 RP M	2250 PSI ** 1800 RP M	NR	NR
		3335 PSI 2500 RPM	NR	3250 PSI ** 2500 RP M	3250 PSI ** 2500 RP M	NR	3250 PSI ** 2500 RP M	3250 PSI 1800 RP M	3000 PSI ** 1800 RP M	3000 PSI ** 1800 RP M	NR	2250 PSI ** 1800 RP M	2000 PSI ** 1800 RP M	NR	NR
		4060 PSI 2400 RP M	NR	3625 PSI ** 2400 RP M	3625 PSI ** 2400 RP M	NR	3625 PSI ** 2400 RP M	3625 PSI 1800 RP M	3300 PSI ** 1800 RP M	3300 PSI ** 1800 RP M	NR	2500 PSI ** 1800 RP M	2250 PSI ** 1800 RP M	NR	NR
		3335 PSI 2400 RPM	NR	3250 PSI ** 2400 RP M	3250 PSI ** 2400 RP M	NR	3250 PSI ** 2400 RP M	3250 PSI 1800 RP M	3000 PSI ** 1800 RP M	3000 PSI ** 1800 RP M	NR	2250 PSI ** 1800 RP M	2000 PSI ** 1800 RP M	NR	NR
		4060 PSI 2200 RP M	NR	3625 PSI ** 2200 RP M	3625 PSI ** 2200 RP M	NR	3625 PSI ** 2200 RP M	3625 PSI 1800 RP M	3300 PSI ** 1800 RP M	3300 PSI ** 1800 RP M	NR	2500 PSI ** 1800 RP M	2250 PSI ** 1800 RP M	NR	NR
		3335 PSI 2200 RPM	NR	3250 PSI ** 2200 RP M	3250 PSI ** 2200 RP M	NR	3250 PSI ** 2200 RP M	3250 PSI 1800 RP M	3000 PSI ** 1800 RP M	3000 PSI ** 1800 RP M	NR (PSI) 1800 RPM	2250 PSI ** 1800 RP M	2000 PSI ** 1800 RP M	NR	NR
		4060 PSI 2000 RPM	NR	3625 PSI ** 2000 RP M	3625 PSI ** 2000 RP M	NR	3625 PSI ** 2000 RP M	3625 PSI 1500 RP M	3300 PSI ** 1800 RP M	3300 PSI ** 1800 RP M	NR	2500 PSI ** 1500 RP M	2250 PSI ** 1500 RP M	NR	NR
		3335 PSI 2000 RP M	NR	3250 PSI ** 2000 RP M	3250 PSI ** 2000 RP M	NR	3250 PSI ** 2000 RP M	3250 PSI 1500 RP M	3000 PSI ** 1800 RP M	3000 PSI**1800 RP M	NR	2250 PSI ** 1500 RP M	2000 PSI ** 1500 RP M	NR	NR

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