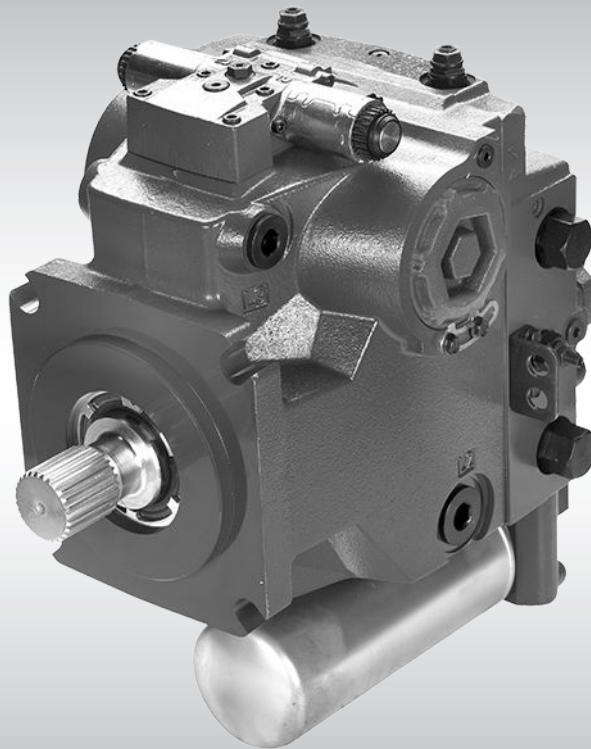




Technical Information

H1 Axial Piston Pump Size 147/165, Single



Technical Information H1 Axial Piston Pump Size 147/165, Single

Revision History*Table of Revisions*

Date	Changed	Rev
Mar 2014	Converted to Danfoss layout - DITA CMS	EA
Apr 2013	FDC option added	DA
Dec 2012	Pressure changed	CA
Jul 2010	New EC directive	BA
Jul 2009	First edition	AA

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Technical specifications

Technical specifications

For definitions of the following specifications, see Basic Information 11062168, Operating parameters.

H1P general specifications

Design	Axial piston pump of cradle swashplate design with variable displacement
Direction of rotation	Clockwise, counterclockwise
Pipe connections	Main pressure ports: ISO split flange boss Remaining ports: SAE straight thread O-ring boss
Recommended installation position	Pump installation position is discretionary, however the recommended control position is on the top or at the side, with the top position preferred. If the pump is installed with the control at the bottom, flushing flow must be provided through port M14 located on the EDC, FNR and NFPE control. Vertical input shaft installation is acceptable. If input shaft is at the top 1 bar case pressure must be maintained during operation. The housing must always be filled with hydraulic fluid. Recommended mounting for a multiple pump stack is to arrange the highest power flow towards the input source. Consult Danfoss for nonconformance to these guidelines.
Auxiliary cavity pressure	Will be inlet pressure with internal charge pump. For reference see operating parameter on next page. Will be case pressure with external charge supply. Please verify mating pump shaft seal capability.

Technical data H1P 147/165

Feature	Unit	Size 147	Size 165
Displacement*	cm ³ [in ³]	147.2 [8.98]	165.1 [10.08]
Flow at rated (continuous) speed*	l/min [US gal/min]	441 [117]	495 [131]
Torque at maximum displacement (theoretical)*	N·m/bar [lbf·in/1000psi]	2.34 [1430]	2.63 [1605]
Mass moment of inertia of rotating components	kg·m ² [slug·ft ²]	0.027 [0.0199]	
Mass [weight] dry (without charge pump or auxiliary mounting flange)	kg [lb]	96.0 [211.0]	
Oil volume	liter [US gal]	3.0 [0.8]	
Mounting flange	ISO 3019-1 flange 152-4 (SAE D)		
Input shaft outer diameter, splines and tapered shafts	ISO 3019-1, outer dia 44 mm - 4 (SAE D, 13 teeth) ISO 3019-1, outer dia 44 mm - 4 (SAE D, 27 teeth) Conical keyed shaft end similar to ISO 3019-1 code 44-3, taper 1:8		
Auxiliary mounting flange with metric fasteners, shaft outer diameter and splines	ISO 3019-1, flange 82 - 2, outer dia 16 mm - 4 (SAE A, 9 teeth) ISO 3019-1, flange 82 - 2, outer dia 19 mm - 4 (SAE A, 11 teeth) ISO 3019-1, flange 101 - 2, outer dia 22 mm - 4 (SAE B, 13 teeth) ISO 3019-1, flange 101 - 2, outer dia 25 mm - 4 (SAE B-B, 15 teeth) ISO 3019-1, flange 127 - 4, outer dia 32 mm - 4 (SAE C, 14 teeth) ISO 3019-1, flange 152 - 4, outer dia 44 mm - 4 (SAE D, 13 teeth)		
Suction port	Port ISO 11926-1 – 1 5/8 -12 (SAE O-ring boss)		
Main port configuration	Ø31.5 - 450 bar split flange boss per ISO 6162, M12x1.75		
Case drain ports L2, L4 (SAE O-ring boss)	Port ISO 11926-1 – 1 5/16 -12 (SAE O-ring boss)		
Other ports	SAE O-ring boss. See installation drawings at the back of this manual.		
Customer interface threads	Metric fasteners		

Technical Information H1 Axial Piston Pump Size 147/165, Single

Technical specifications

Operating parameters H1P 147/165

Feature		Unit	Size 147	Size 165
Input speed	Minimum for <i>internal</i> charge supply at minimum charge pressure. Performance (pressure and displacement) may be limited due to limited control pressure	min ⁻¹ (rpm)	500	
	Minimum for <i>external</i> charge supply at minimum charge pressure. Full performance (pressure and displacement) possible at minimum charge and control pressure supply		500	
	Minimum for full performance (pressure and displacement) for <i>internal</i> charge supply at minimum charge and control pressure		1200	
	Rated		3000	
	Maximum		3100	
System pressure	Maximum working pressure	bar [psi]	450 [6528]	
	Maximum pressure		480 [6960]	
	Maximum low loop		45 [650]	
	Minimum low loop pressure		10 [145]	
Charge pressure	Minimum	bar [psi]	16 [232]	
	Maximum		34 [493]	
Control pressure	Minimum (at corner power for EDC)	bar [psi]	17 [247]	
	Maximum		40 [580]	
Charge pump inlet pressure	Rated	bar (absolute)	0.7 [9]	
	Minimum (cold start)	[in Hg vacuum]	0.2 [24]	
	Maximum	bar [psi]	4.0 [58]	
Case pressure	Rated	bar [psi]	3.0 [44]	
	Maximum		5.0 [73]	
Lip seal external pressure	Maximum	bar [psi]	0.4 [5.8]	

H1P fluid specifications

Feature		Unit	
Viscosity	Intermittent ¹⁾	mm ² /s [SUS]	5 [42]
	Minimum		7 [49]
	Recommended range		12-80 [66-370]
	Maximum		1600 [7500]
Temperature range ²⁾	Minimum (cold start) ³⁾	°C [°F]	-40 [-40]
	Recommended range		60-85 [140-185]
	Rated		104 [220]
	Maximum intermittent ¹⁾		115 [240]
Filtration (recommended minimum)	Cleanliness per ISO 4406		22/18/13
	Efficiency (charge pressure filtration)	β-ratio	β ₁₅₋₂₀ = 75 (β ₁₀ ≥ 10)
	Efficiency (suction and return line filtration)		β ₃₅₋₄₅ = 75 (β ₁₀ ≥ 2)
	Recommended inlet screen mesh size	μm	100 – 125

¹⁾ Intermittent = Short term t < 1min per incident and not exceeding 2 % of duty cycle based load-life
²⁾ At the hottest point, normally case drain port
³⁾ Cold start = Short term t < 3min, p ≤ 50 bar [725 psi], n ≤ 1000 min⁻¹(rpm)

General technical specifications

Shaft loads

External radial shaft loads

H1 pumps are designed with bearings that can accept some external radial loads.

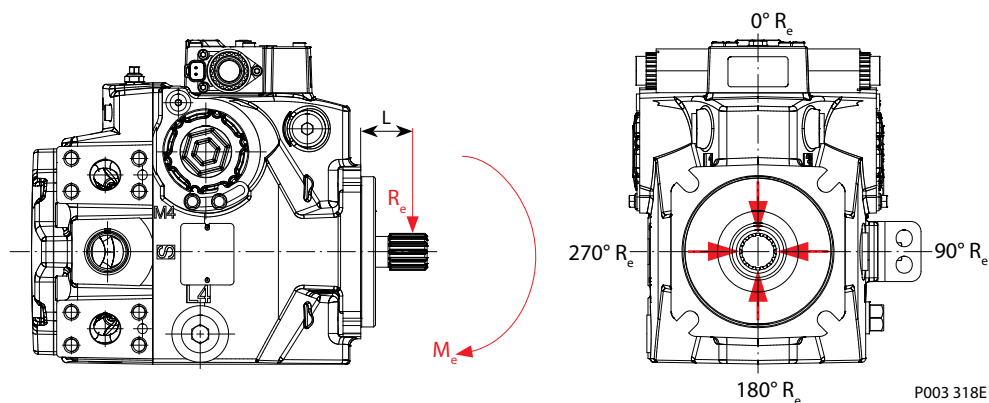
The external radial shaft load limits are a function of the load position and orientation, and the operating conditions of the unit. External radial shaft loads impact lifetime.

For lifetime calculations please contact Danfoss representative.

The *maximum allowable radial load* (R_e) is based on the maximum external moment (M_e) and the distance (L) from the mounting flange to the load. It may be determined using the following table and formula.

$$R_e = M_e / L$$

Radial load position



M_e = Shaft moment

L = Flange distance

R_e = External force to the shaft

Thrust loads should be avoided. Contact factory in the event thrust loads are anticipated.

Technical Information H1 Axial Piston Pump Size 147/165, Single

General technical specifications

Bearing life H1P 147/165

Maximum external shaft load based on shaft deflection

	Unit	Size 147/165
External radial moment – M_e	Nm [lbf·in]	140 [1240]

All external shaft loads affect bearing life. In applications with external shaft loads, minimize the impact by positioning the load at 0° or 180° as shown in the figure.

Danfoss recommends clamp-type couplings for applications with radial shaft loads.

Contact your Danfoss representative for an evaluation of unit bearing life if you have continuously applied external loads exceeding 25 % of the maximum allowable radial load (R_e) or the pump swashplate is positioned on one side of center all or most of the time.

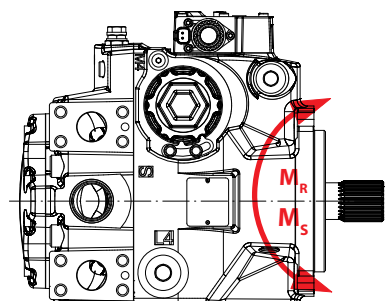
Mounting flange loads H1P 147/165

H1 single pump front flange load

The moments shown below apply for control orientation top or side (see table and figures).

Mounting flange load

	Unit	Size 147/165
Rated moment – M_R	Nm [lbf·in]	6500 [57 500]
Shock load moment – M_S		16 300 [144 000]



P001 916

For calculation details refer to *H1 Pump Basic Information Manual 11062168*, section Mounting Flange Loads.

Technical Information H1 Axial Piston Pump Size 147/165, Single

Model code

Model code H1P 147/165

	A	B	D	F	E	G	H	J	K	M	N	S	T	V	W	X	Y
H1 P		C					G										

Displacement

147	147.2 cm ³ [8.98 in ³]
165	165.1 cm ³ [10.08 in ³]

A - Rotation

L	Left hand (counter clockwise)
R	Right hand (clockwise)

B - Product version

C	Revision code
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D - Control

A2	Electric Displacement Control (EDC) 12V, Deutsch connector
A3	Electric Displacement Control (EDC) 24V, Deutsch connector
A4	Electric Displacement Control (EDC) 12V, Deutsch connector, Manual override
A5	Electric Displacement Control (EDC) 24V, Deutsch connector, Manual override

F - Orifices

C1	Orifices, 0.8 mm in servo supply 1 and 2, recommended for propel applications
C2	Orifices, 1.3 mm in servo supply 1 and 2 (Standard), recommended for propel applications
C3	No orifice, recommended for non-propel applications
F1	Fan Drive Control (FDC), 12 V, Deutsch connector align with option E: Displacement Limiters, option F: Orifices, option N+M: Overpressure protection type and setting, & option W: Special Hardware)
F2	Fan Drive Control (FDC), 24 V, Deutsch connector (align with option E: Displacement Limiters, option F: Orifices, option N+M: Overpressure protection type and setting, & option W: Special Hardware)

E - Displacement limiters

N	None
B	Adjustable externally (align with option Y: Settings for adjustment, if applicable)

Technical Information H1 Axial Piston Pump Size 147/165, Single

Model code

	A	B	D	F	E	G	H	J	K	M	N	S	T	V	W	X	Y
H1 P																	
		C					G										

G - Endcap options

	Twin port, ISO 6162 Split flange ports					
Match with below options (K)	Auxiliary mounting pad None, ISO 3019-1, flange 82 - 2 (SAE A, 9 and 11 teeth) ISO 3019-1, flange 101 - 2 (SAE B, 13 teeth) ISO 3019-1, flange 101 - 2 (SAE B-B, 15 teeth) ISO 3019-1, flange 127 - 4 (SAE C, 14 teeth)			Auxiliary mounting pad ISO 3019-1, flange 152 - 4 (SAE D, 13 teeth)		
Match with below options (T)	Suction filtration	Integral full charge flow filtration	Remote or external charge supply for full charge flow filtration	Suction filtration	Integral full charge flow filtration	Remote or external charge supply for full charge flow filtration
D3		X				
D5					X	
D6	X					
D7						X
D8			X			
D9				X		

H - Mounting

G	ISO 3019-1, flange 152 - 4 (SAE D)
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J - Input shaft

G3	ISO 3019-1, outer dia 44 mm - 4 (SAE D, 13 teeth splined shaft 8/16 pitch)
G2	ISO 3019-1, outer dia 44 mm - 4 (SAE D, 27 teeth splined shaft 16/32 pitch)
F3	Conical keyed shaft end similar to ISO 3019-1 code 44-3, taper 1:8 (key not supplied with pump)

K - Auxiliary mounting pad (align with option G: Endcap selection)

NN	None	
H2	ISO 3019-1, flange 82 - 2, outer dia 16 mm - 4 (SAE A, 9 teeth 16/32 coupling)	
H1	ISO 3019-1, flange 82 - 2, outer dia 19 mm - 4 (SAE A, 11 teeth 16/32 coupling)	
H3	ISO 3019-1, flange 101 - 2, outer dia 22 mm - 4 (SAE B, 13 teeth 16/32 coupling)	
H5	ISO 3019-1, flange 101 - 2, outer dia 25 mm - 4 (SAE B-B, 15 teeth 16/32 coupling)	
H6	ISO 3019-1, flange 127 - 4, outer dia 32 mm - 4 (SAE C, 14 teeth 12/24 coupling)	
H4	ISO 3019-1, flange 152 - 4, outer dia 44 mm - 4 (SAE D, 13 teeth 8/16 coupling)	

M - Overpressure protection type and setting side "A" **

N - Overpressure protection type and setting side "B" **

** Pressure protection type must be the same for side "A" and "B"

Technical Information H1 Axial Piston Pump Size 147/165, Single

Model code

	A	B	D	F	E	G	H	J	K	M	N	S	T	V	W	X	Y
H1 P							G										

L - Auxiliary mounting pad (align with option G: Endcap selection)

L	High pressure relief valve + pressure limiters with bypass	
	K	High pressure relief valve only with bypass (no pressure limiters)
L20	K20	200 bar [2900 psi]
L23	K23	230 bar [3336 psi]
L25	K25	250 bar [3630 psi]
L28	K28	280 bar [4061 psi]
L30	K30	300 bar [4350 psi]
L33	K33	330 bar [4786 psi]
L35	K35	350 bar [5080 psi]
L38	K38	380 bar [5510 psi]
L40	K40	400 bar [5800 psi]
L42	K42	420 bar [6090 psi]
L43	—	430 bar [6237 psi]
L44	—	440 bar [6382 psi]
L45	K45	450 bar [6960 psi]
Contact factory for pressures not shown or for applied pressure above maximum working pressure (see system pressure page 5)		

Overpressure protection type and setting for FDC-controls

	F01	Pressure setting for FDC: PL: 150 bar [2175 psi]; HPRV: 250 bar [3630 psi]
	F02	Pressure setting for FDC: PL: 150 bar [2175 psi]; HPRV: 300 bar [4350 psi]
	F03	Pressure setting for FDC: PL: 150 bar [2175 psi]; HPRV: 350 bar [5080 psi]
	F04	Pressure setting for FDC: PL: 150 bar [2175 psi]; HPRV: 400 bar [5800 psi]

S - Charge pump

A	26 cm ³ /rev [1.57 in ³ /rev]
L	34 cm ³ /rev [2.07 in ³ /rev]
N	No charge pump, external charge supply, (align with Option T: Filtration Options, option E)

T - Filtration options (align with option G: Endcap selection)

L	Suction filtration (see Basic drawings)
M	Integral full charge flow filtration with bypass and bypass sensor, long filter, order number 11004919
P	Remote full charge flow filtration (see endcap drawings)
E	External charge flow filtration (see endcap drawings), (align with option S: Charge pump, option N)

V - Charge pressure relief setting (contact factory for pressure not shown)

20	20 bar [290 psi]
24	24 bar [348 psi]
30	30 bar [435 psi]

Technical Information H1 Axial Piston Pump Size 147/165, Single

Model code

	A	B	D	F	E	G	H	J	K	M	N	S	T	V	W	X	Y
H1 P																	
		C					G										

W - Special hardware features

PN	None
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X - Paint and nametag

NNN	Black paint and Danfoss nametag
-----	---------------------------------

Y - Special settings

NNN	None
-----	------

Control options

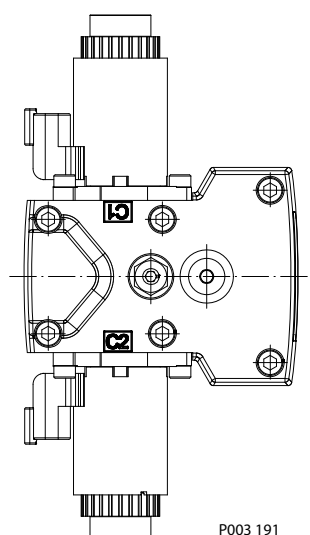
Electrical Displacement Control (EDC) options A2 (12 V)/A3 (24 V)

EDC principle

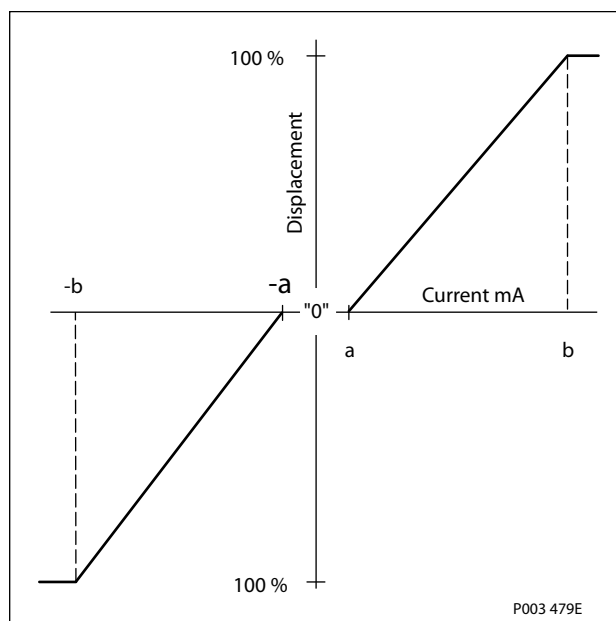
The Electrical Displacement Control (EDC) consists of a pair of proportional solenoids on each side of a three-position, four-way porting spool. The proportional solenoid applies a force input to the spool, which ports hydraulic pressure to either side of a double acting servo piston. Differential pressure across the servo piston rotates the swashplate, changing the pump's displacement from full displacement in one direction to full displacement in the opposite direction.

Under some circumstances, such as contamination, the control spool could stick and cause the pump to stay at some displacement.

A serviceable 125 μm screen is located in the supply line immediately before the control porting spool.

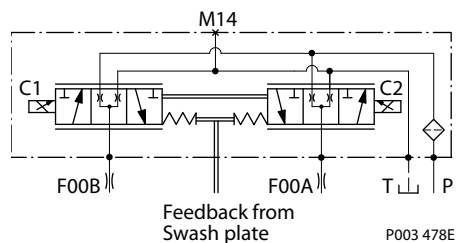


Pump displacement vs. control current



Control options

EDC-schematic diagram



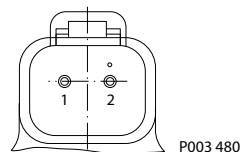
Control signal requirements

Control current

Voltage	a* mA	b mA	Pin connections
12 V	640	1640	any order
24 V	330	820	

* Factory test current, for vehicle movement or application actuation expect higher or lower value.

Connector



Description	Quantity	Ordering number
Mating connector	1	Deutsch® DT06-2S
Wedge lock	1	Deutsch® W2S
Socket contact (16 and 18 AWG)	2	Deutsch® 0462-201-16141
Danfoss mating connector kit	1	K29657

Solenoid data

Voltage	12V	24V
Maximum current	1800 mA	920 mA
Coil resistance @ 20 °C [70 °F]	3.66 Ω	14.20 Ω
Coil resistance @ 80 °C [176 °F]	4.52 Ω	17.52 Ω
PWM Range	70-200 Hz	
PWM Frequency (preferred)*	100 Hz	
Inductance	33 mH	140 mH
IP Rating (IEC 60 529) + DIN 40 050, part 9	IP 67	
IP Rating (IEC 60 529) + DIN 40 050, part 9 with mating connector	IP 69K	
* PWM signal required for optimum control performance.		

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Control options

Flow table

Shaft rotation	CW		CCW	
Coil energized*	C2	C1	C2	C1
Port A	in	out	out	in
Port B	out	in	in	out
Servo port pressurized	M5	M4	M5	M4
* For coil location see installation drawings.				

Control response

H1 controls are available with optional control passage orifices to assist in matching the rate of swashplate response to the application requirements (e.g. in the event of electrical failure). Software ramp or rate limiting should be used to control vehicle response in normal operation. The time required for the pump output flow to change from zero to full flow (acceleration) or full flow to zero (deceleration) is a net function of spool porting, orifices, and charge pressure. A swashplate response table is available for each frame indicating available swashplate response times. Testing should be conducted to verify the proper software and orifice selection for the desired response.

H1 pumps are limited in mechanical orificing combinations. Software is envisioned as the means to control the swashplate response in normal operating conditions. Mechanical servo orifices are to be used only for fail-safe return to neutral in the event of an electrical failure.

Typical response times shown below at the following conditions:

Δp	= 250 bar	[3626 psi]
Viscosity and temperature	= 30 mm ² /s (50 °C)	[141 SUS (122 °F)]
Charge pressure	= 20 bar	[290 psi]
Speed	= 1800 min ⁻¹ (rpm)	

Response time

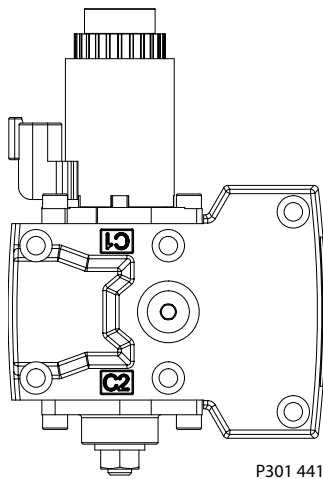
Stroking direction	0.8 mm [0.03 in] Orifice	1.3 mm [0.05 in] Orifice	No orifice
Neutral to full flow	5.8 s	2.1 s	1.3 s
Full flow to neutral	2.4 s	1.6 s	1.2 s

Fan Drive Control (FDC) option F1 (12V)/F2 (24V)

The Fan Drive Control (FDC) is a non-feedback control in which an electrical input signal activates the proportional solenoid that ports charge pressure to either side of the pump servo cylinder. The single proportional solenoid is used to control pump displacement in the forward or reverse direction. The control spool is spring biased to produce maximum forward pump displacement in the absence of an electrical input signal. Based on the spring bias spool default forward flow for a CW rotation pump is out of Port B while default forward flow for a CCW rotation pump is out of Port A.

The pump displacement is proportional to the solenoid signal current, but it also depends upon pump input speed and system pressure. This characteristic also provides a power limiting function by reducing the pump swashplate angle as system pressure increases. The pump should be configured with 0.8 mm control orifices to provide slowest response and maximize system stability. Additionally pressure limiter (PL) valves are used to limit maximum fan trim speed in both (forward and reverse) directions.

Control options



H1 pumps with FDC will be delivered from factory with nominal PL setting of 150 bar [2175 psi]. The PL must be re-adjusted to ensure that the fan reaches the desired fan speed to satisfy the cooling needs of the system. HPRV-setting must be always at least 30 bar [435 psi] higher than PL-setting.

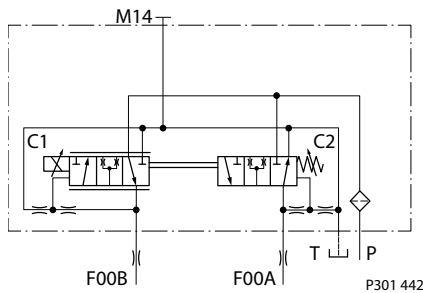
Under some circumstances, such as contamination, the control spool could stick and cause the pump to stay at some displacement.

Refer to Hydraulic Fan Drive Design Guidelines (520L0926) for detailed information necessary to properly size and configure a hydraulic fan drive system.

Warning

The FDC is for Fan Drive systems only! Use in other systems could result in unintended movement of the machine or it's elements. Loss of the input signal to this control will cause the pump to produce maximum flow.

Schematic diagram



Control signal requirements

Control current

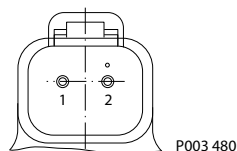
Voltage	a* mA	N mA	b*mA	Pin Config
12 V	780	1100	1300	any order
24 V	400	550	680	

* Factory test current, for fan movement expect higher or lower value.T301 105E

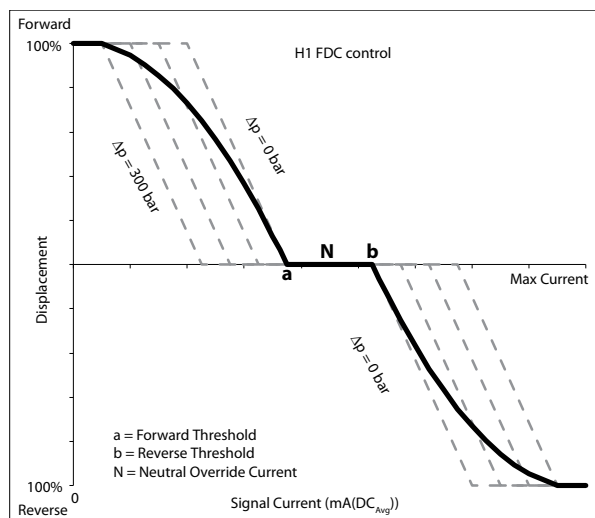
Technical Information H1 Axial Piston Pump Size 147/165, Single

Control options

Connector



Pump displacement vs. control current



P301 443

Description	Quantity	Ordering number
Mating connector	1	Deutsch® DT06-2S
Wedge lock	1	Deutsch® W2S
Socket contact (16 and 18 AWG)	2	Deutsch® 0462-201-16141
Danfoss mating connector kit	1	K29657

Solenoid data

Voltage	12V	24V
Maximum current	1800 mA	920 mA
Coil resistance @ 20 °C [70 °F]	3.66 Ω	14.20 Ω
Coil resistance @ 80 °C [176 °F]	4.52 Ω	17.52 Ω
PWM Range	70-200 Hz	
PWM Frequency (preferred)*	100 Hz	
Inductance	33 mH	140 mH
IP Rating (IEC 60 529) + DIN 40 050, part 9	IP 67	
IP Rating (IEC 60 529) + DIN 40 050, part 9 with mating connector	IP 69K	
* PWM signal required for optimum control performance.		

Control options

Pump output flow direction vs. control signal

Shaft rotation		CW Rotation			CCW Rotation		
Control Logic	12V	C1 (0-780mA)	C1 (1100mA)	C1 (1300-1800mA)	C1 (0-780mA)	C1 (1100mA)	C1 (1300-1800mA)
	24V	C1 (0-400mA)	C1 (550 mA)	C1 (680-920mA)	C1 (0-400mA)	C1 (550mA)	C1 (680-920mA)
Port A flow		in	no flow	out	out	no flow	in
Port B flow		out	no flow	in	in	no flow	out
Servo port pressurized		M5	n/a	M4	M5	n/a	M4
*Warning: Loss of input signal to this control will cause the pump to produce maximum flow.							

Control response

H1 Fan Drive Control is available only with 0.8 mm [0.03 in] control passage orifice to limit the rate of swashplate response (e.g. in the event of electrical failure). Software ramp or rate limiting should be used to control system response in normal operation. The time required for the pump output flow to change from zero to full flow (acceleration) or full flow to zero (deceleration) is a net function of spool porting, orifices, and charge pressure. A swashplate response table is available for each frame indicating available swashplate response times. Testing should be conducted to verify the proper software and orifice selection for the desired response.

H1 pumps are limited in mechanical orificing combinations. Software is envisioned as the means to control the swashplate response in normal operating conditions. Mechanical servo orifices are to be used only for fail-safe return to max. forward in the event of an electrical failure.

Typical response times shown below at the following conditions:

Peak Δp	= 330 bar	[4785 psi]
Viscosity and temperature	= 30 mm ² /s (50 °C)	[141 SUS (122 °F)]
Charge pressure	= 24 bar	[348 psi]
Speed	= 1800 min ⁻¹ (rpm)	

Response time

Stroking direction	0.8 mm [0.03 in] Orifice
Full flow to neutral	5.5 s
Full forward flow to full reverse flow	8.1 s

Manual Over Ride (MOR)

All controls are available with a Manual Over Ride (MOR) either standard or as an option for temporary actuation of the control to aid in diagnostics.

Forward-Neutral-Reverse (FNR) and Non Feedback Proportional Electric (NFPE) controls are always supplied with MOR functionality.

Unintended MOR operation will cause the pump to go into stroke. The vehicle or device must always be in a „safe“ condition (i.e. vehicle lifted off the ground) when using the MOR function. The MOR plunger

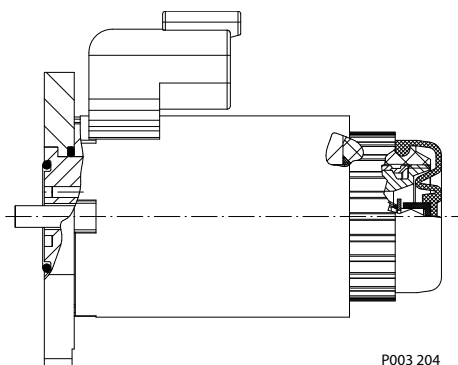
Control options

has a 4 mm diameter and must be manually depressed to be engaged. Depressing the plunger mechanically moves the control spool which allows the pump to go on stroke. The MOR should be engaged anticipating a full stroke response from the pump.

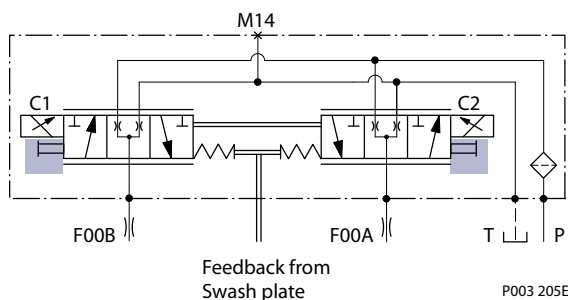
Warning

An o-ring seal is used to seal the MOR plunger where initial actuation of the function will require a force of 45 N to engage the plunger. Additional actuations typically require less force to engage the MOR plunger. Proportional control of the pump using the MOR should not be expected.

Refer to control flowtable for the relationship of solenoid to direction of flow.



MOR-schematic diagram (EDC shown)



Displacement limiter

H1 pumps are designed with optional mechanical displacement (stroke) limiters factory set to max. displacement.

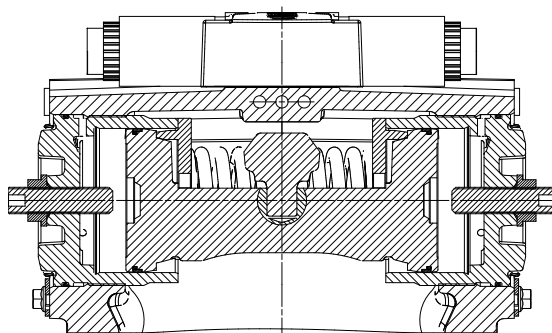
The maximum displacement of the pump can be set independently for forward and reverse using the two adjustment screws to mechanically limit the travel of the servo piston down to 50 % displacement. Adjustment procedures are found in the H1 pumps Service Manual.

Adjustments under operating conditions may cause leakage. The adjustment screw can be completely removed from the threaded bore if backed out to far.

Technical Information H1 Axial Piston Pump Size 147/165, Single

Control options

Displacement limiter



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Displacement change (approximately) H1P 147/165

Size	1 Turn of displacement limiter screw	Internal wrench size	External wrench size	Torque for external hex seal lock nut
147	12.4 cm ³ [0.76 in ³]	6 mm	22 mm	80 Nm [708 lbf·in]
165	13.9 cm ³ [0.85 in ³]			

For more information refer to H1 pumps Service Manual 520L0848, section Displacement Limiter Adjustment.

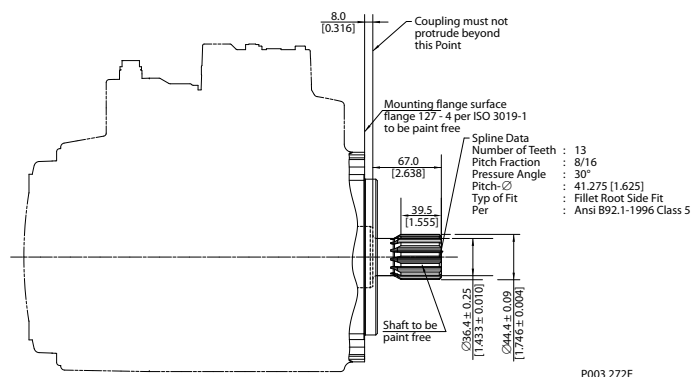
Technical Information H1 Axial Piston Pump Size 147/165, Single

Dimensions

Input shafts

H1P input shaft - Option G3 (SAE D, 13 teeth)

Option G3, ISO 3019-1, outer dia 44 mm-4 (SAE D, 13 teeth)



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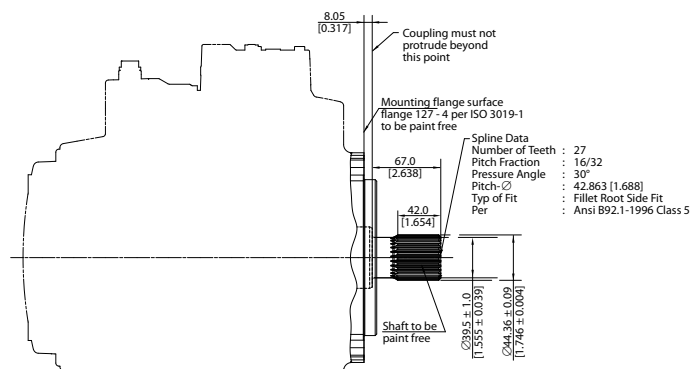
Specifications

Option	Spline	Min active spline length ² mm [in]	Torque rating ¹	
			Rated torque Nm [lbf·in]	Maximum torque Nm [lbf·in]
G3	13 teeth, 8/16 pitch	39.5 [1.555]	1442 [12 800]	2206 [19 500]

¹) For definitions of maximum and rated torque values, refer to: Basic Information Manual 11062168, section Shaft Torque Ratings and Spline Lubrication.
²) Minimum active spline length for the specified torque ratings.

H1P input shaft - Option G2 (SAE D, 27 teeth)

Option G2, ISO 3019-1, outer dia 44 mm-4 (SAE D, 27 teeth)



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Specifications

Option	Spline	Min active spline length ² mm [in]	Torque rating ¹	
			Rated torque Nm [lbf·in]	Maximum torque Nm [lbf·in]
G2	27 teeth, 16/32 pitch	42.0 [1.654]	1615 [14 300]	3000 [26 550]

Technical Information H1 Axial Piston Pump Size 147/165, Single

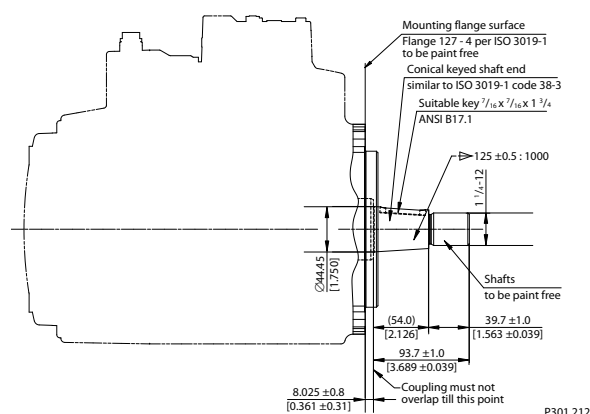
Dimensions

Specifications (continued)

Option	Spline	Min active spline length ² mm [in]	Torque rating ¹	
			Rated torque Nm [lbf•in]	Maximum torque Nm [lbf•in]
¹⁾ For definitions of maximum and rated torque values, refer to: Basic Information Manual 11062168, section Shaft Torque Ratings and Spline Lubrication.				
²⁾ Minimum active spline length for the specified torque ratings.				

H1P input shaft - Option F3, Code 44-3

ISO 3019-1, Code 44-3, Diameter 44.5 taper 1:8, without key and no through-hole in the end of the shaft



Specifications

Option	Tapered shaft	Torque rating ¹	
		Rated torque Nm [lbf·in]	Maximum torque Nm [lbf·in]
F3	44-3 taper without key ²⁾	1766 [15 630]	2354 [20 830]
¹⁾ For definitions of maximum and rated torque values, refer to: Basic Information Manual 11062168, section Shaft Torque Ratings and Spline Lubrication. ²⁾ Mating part must maintain a minimum gap width of 1.0 mm with the shaft shoulder after installation of the part. Transmittable torque will be reduced if the minimum gap requirement is not met. * Rated torque includes just the capability of the press-fit in accordance with an assumed fastener grade 5.			

Tapered shaft customer acknowledgement

The Danfoss H1 tapered shaft has been designed using the industry standard ISO 3019-1, minus the through-hole in the end of the shaft. Danfoss recommends a self-locking nut instead of a castle nut and pin. The nut and mating square-cut key are customer supplied.

The specified torque rating of the tapered shaft documented above is based on the cross-sectional diameter of the shaft, through the keyway, and assumes the proper clamp and fit between shaft and coupling. Danfoss guarantees the design and manufactured quality of the tapered shaft. The customer is responsible for the design and manufactured quality of the mating female coupling and key and applied torque on the nut.

Danfoss has made provisions for the key in accordance to the ISO specification with the understanding that the key is solely to assist in the installation of the mating coupling.

Technical Information H1 Axial Piston Pump Size 147/165, Single

Dimensions

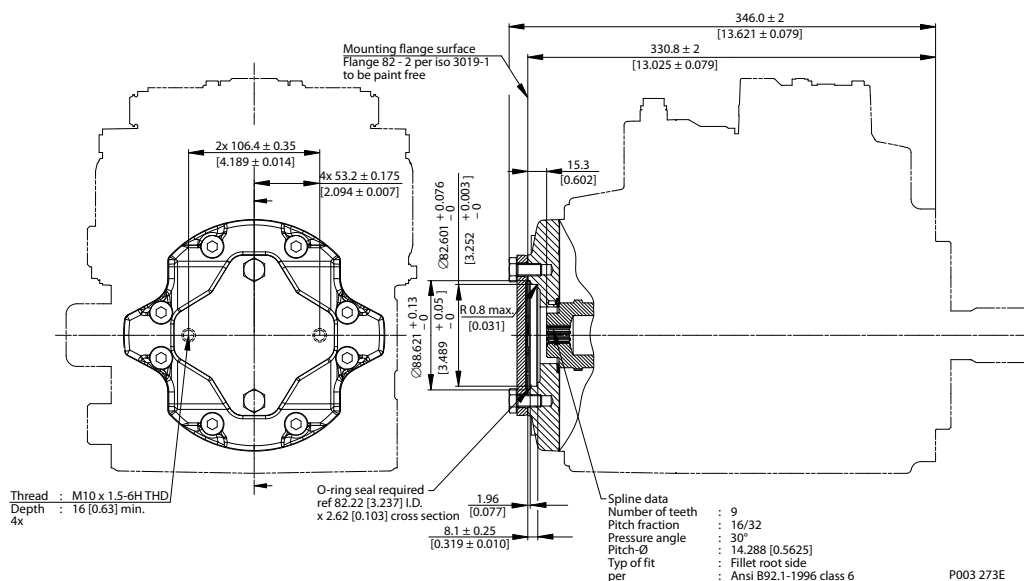
⚠ Caution

Torque must be transmitted by the taper fit between the shaft and it's mating coupling, not the key. Torque or loading inadvertently transmitted by the customer supplied key may lead to premature shaft failure.

Auxiliary mounting pads

H1P 147/165 Auxiliary mounting - Option H2 (SAE A, 9 teeth)

Option H2, ISO 3019-1, flange 82-2 (SAE A, 9 teeth)



Specifications

Option	Spline	Torque rating ¹ maximum torque Nm [lbf·in]
H2	9 teeth, 16/32 pitch	162 [1430]
¹⁾ For definitions of maximum torque values, refer to: Basic Information Manual 11062168, section Shaft Torque Ratings and Spline Lubrication.		

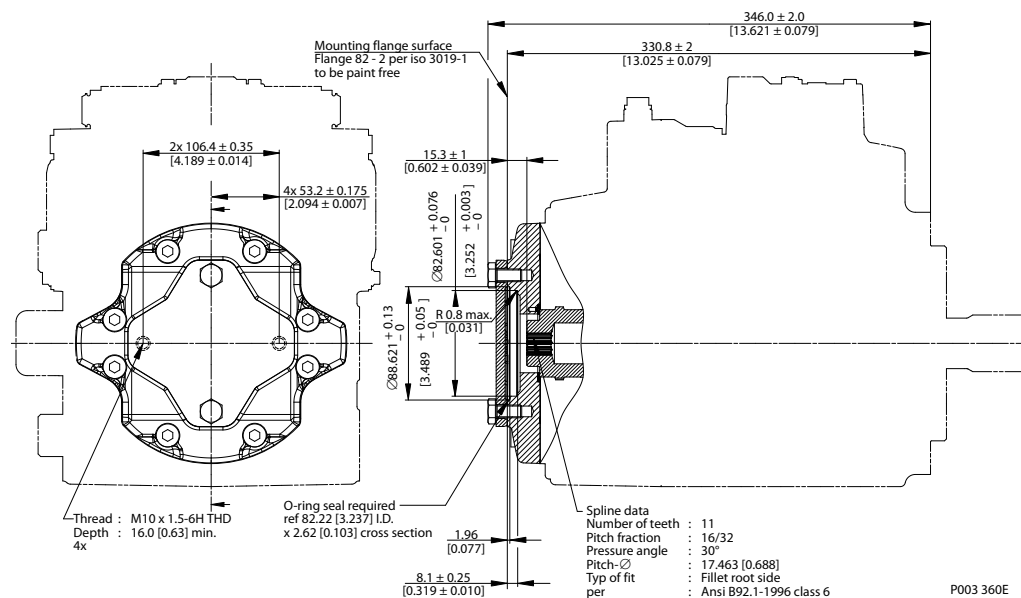
⚠ Caution

Standard pad cover is installed only to retain coupling during shipping. Do not operate pump without an auxiliary pump or running cover installed.

Dimensions

H1P 1471/165 Auxiliary mounting - Option H1 (SAE A, 11 teeth)

Option H1, ISO 3019-1, flange 82-2 (SAE A, 11 teeth)



Specifications

Option	Spline	Torque rating ¹ maximum torque Nm [lbf·in]
H1	11 teeth, 16/32 pitch	296 [2620]
¹⁾ For definitions of maximum torque values, refer to: Basic Information Manual 11062168, section Shaft Torque Ratings and Spline Lubrication.		

! Caution

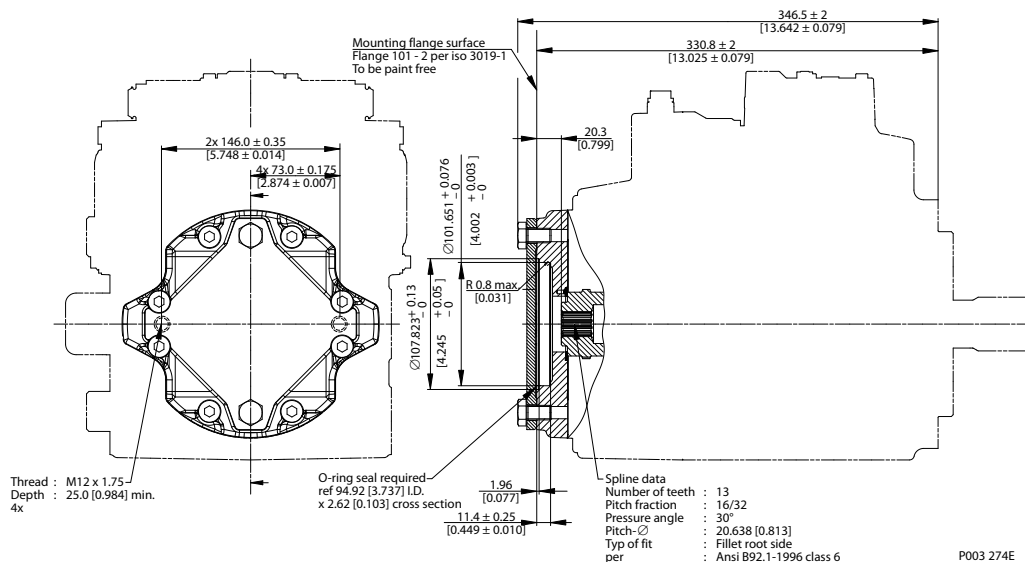
Standard pad cover is installed only to retain coupling during shipping. Do not operate pump without an auxiliary pump or running cover installed.

Technical Information H1 Axial Piston Pump Size 147/165, Single

Dimensions

H1P 147/165 Auxiliary mounting - Option H3 (SAE B, 13 teeth)

Option H3, ISO 3019-1, flange 101-2 (SAE B, 13 teeth)



Specifications

Option	Spline	Torque rating ¹ maximum torque Nm [lbf·in]
H3	13 teeth, 16/32 pitch	395 [3500]
¹⁾ For definitions of maximum torque values, refer to: Basic Information Manual 11062168, section Shaft Torque Ratings and Spline Lubrication.		

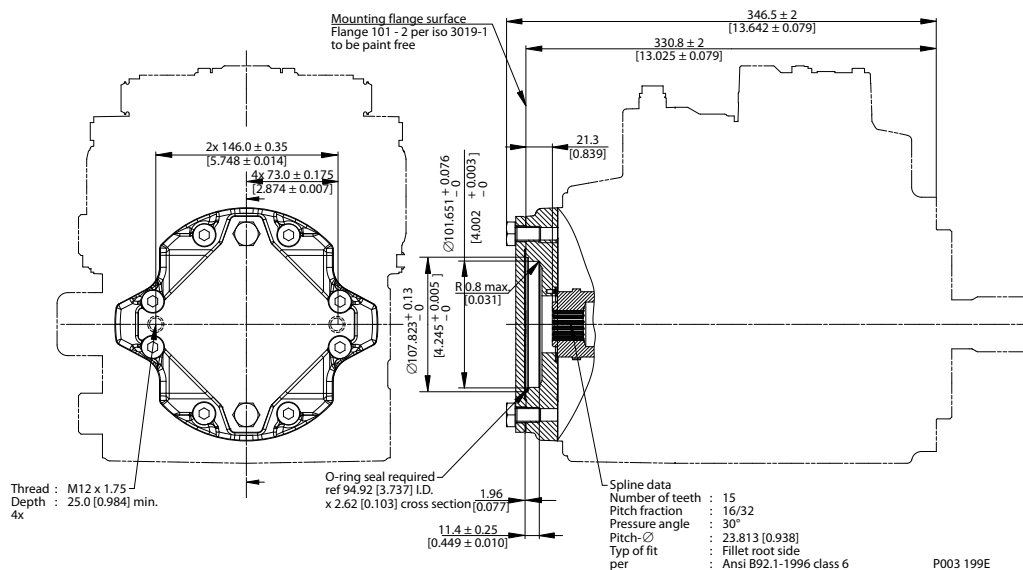
! Caution

Standard pad cover is installed only to retain coupling during shipping. Do not operate pump without an auxiliary pump or running cover installed.

Dimensions

H1P 147/165 Auxiliary mounting - Option H5 (SAE B-B, 15 teeth)

Option H5, ISO 3019-1, flange 101-2 (SAE B-B, 15 teeth)



Specifications

Option	Spline	Torque rating ¹ maximum torque Nm [lbf·in]
H5	15 teeth, 16/32 pitch	693 [6130]

¹⁾ For definitions of maximum torque values, refer to: Basic Information Manual 11062168, section Shaft Torque Ratings and Spline Lubrication.

Caution

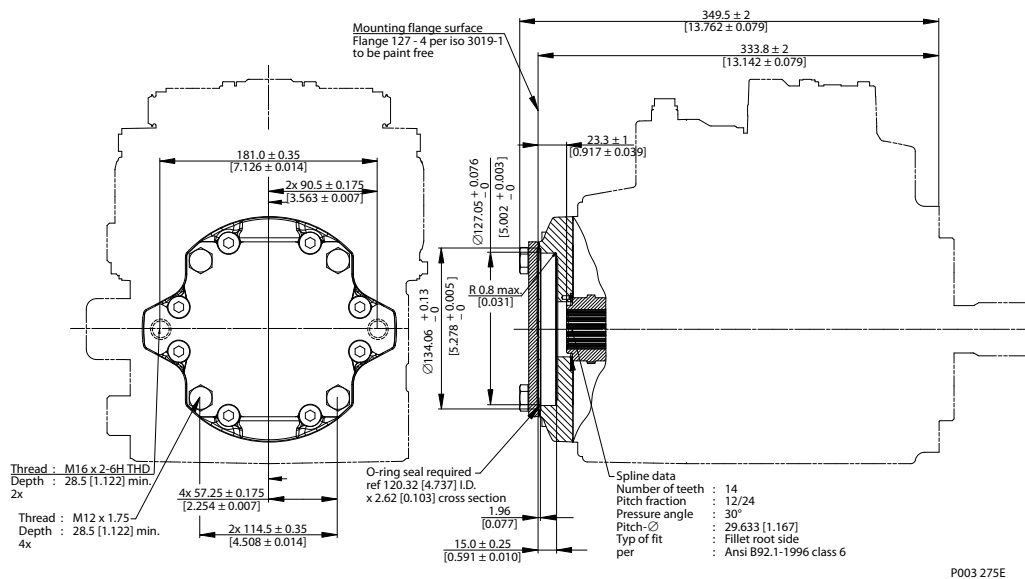
Standard pad cover is installed only to retain coupling during shipping. Do not operate pump without an auxiliary pump or running cover installed.

Technical Information H1 Axial Piston Pump Size 147/165, Single

Dimensions

H1P 147/165 Auxiliary mounting - Option H6 (SAE C, 14 teeth)

Option H6, ISO 3019-1, flange 127-4 (SAE C, 14 teeth)



Specifications

Option	Spline	Torque rating ¹ maximum torque Nm [lbf·in]
H6	14 teeth, 12/24 pitch	816 [7220]
¹⁾ For definitions of maximum torque values, refer to: Basic Information Manual 11062168, section Shaft Torque Ratings and Spline Lubrication.		

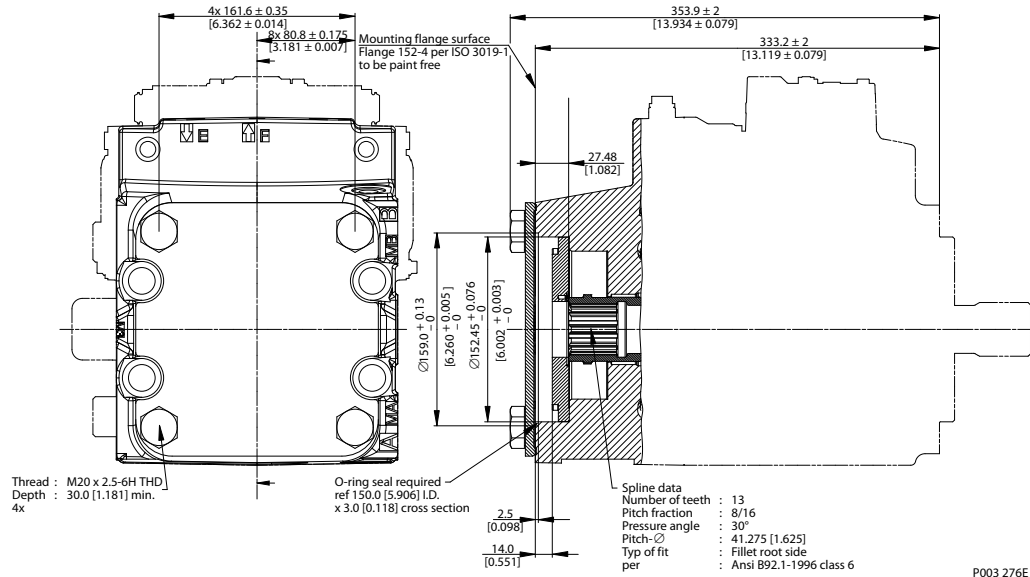
! Caution

Standard pad cover is installed only to retain coupling during shipping. Do not operate pump without an auxiliary pump or running cover installed.

Dimensions

H1P 147/165 Auxiliary mounting - Option H4 (SAE D, 13 teeth)

Option H4, ISO 3019-1, flange 152-4 (SAE D, 13 teeth)



Specifications

Option	Spline	Torque rating ¹ maximum torque Nm [lbf·in]
H4	13 teeth, 8/16 pitch	2206 [19 525]

¹⁾ For definitions of maximum torque values, refer to: Basic Information Manual 11062168, section Shaft Torque Ratings and Spline Lubrication.

Caution

Standard pad cover is installed only to retain coupling during shipping. Do not operate pump without an auxiliary pump or running cover installed.

Charge pump

Charge pump sizing/selection

In most applications a general guideline is that the charge pump displacement should be at least 10 % of the total displacement of all components in the system. Unusual application conditions may require a more detailed review of charge flow requirements. Please refer to BLN-9885, Selection of Drive line Components, for a detailed procedure.

System features and conditions which may invalidate the 10 % guideline include (but are not limited to):

- Continuous operation at low input speeds (< 1500 min⁻¹ (rpm))
- High shock loading and/or long loop lines
- High flushing flow requirements
- Multiple Low Speed High Torque motors
- High input shaft speeds

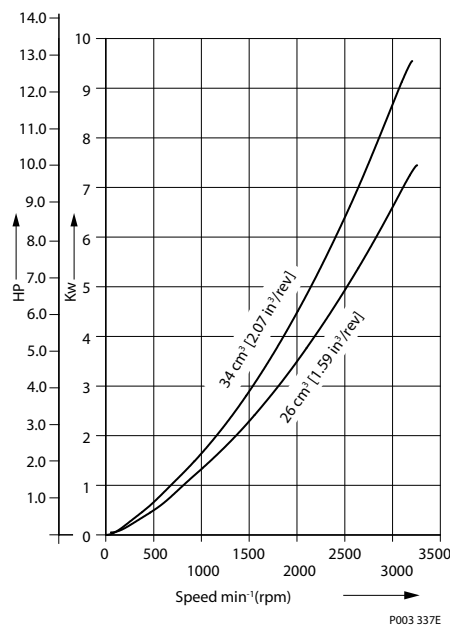
Contact your Danfoss representative for application assistance if your application includes any of these conditions.

Charge pump flow and power curves 26 cm³ and 34 cm³

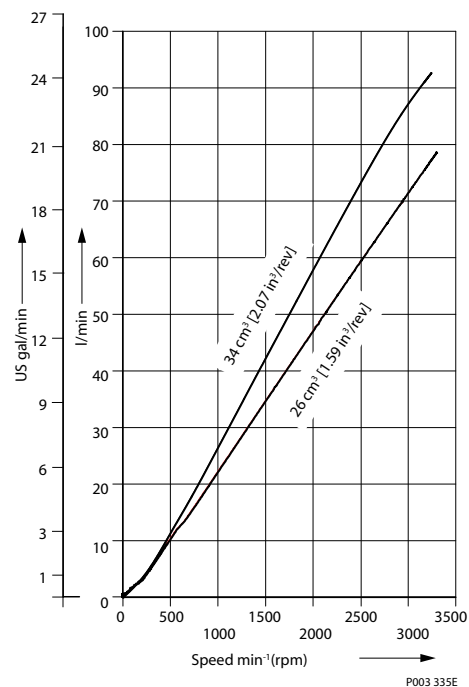
Charge pressure: 20 bar [290 psi]

Viscosity and temperature: 11 mm²/s [63 SUS] 80 °C [180 °F]

Charge pump power requirements



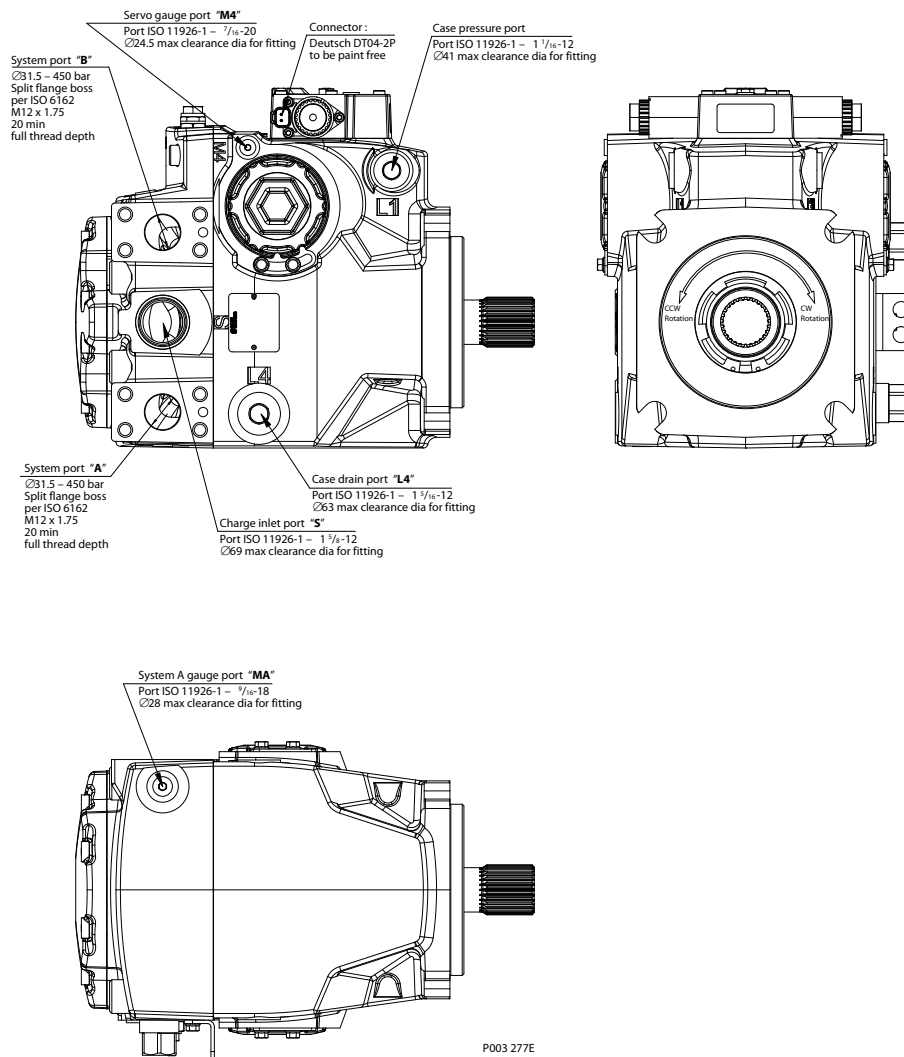
Charge pump flow



Technical Information H1 Axial Piston Pump Size 147/165, Single

Installation drawings

Port description H1P 147/165



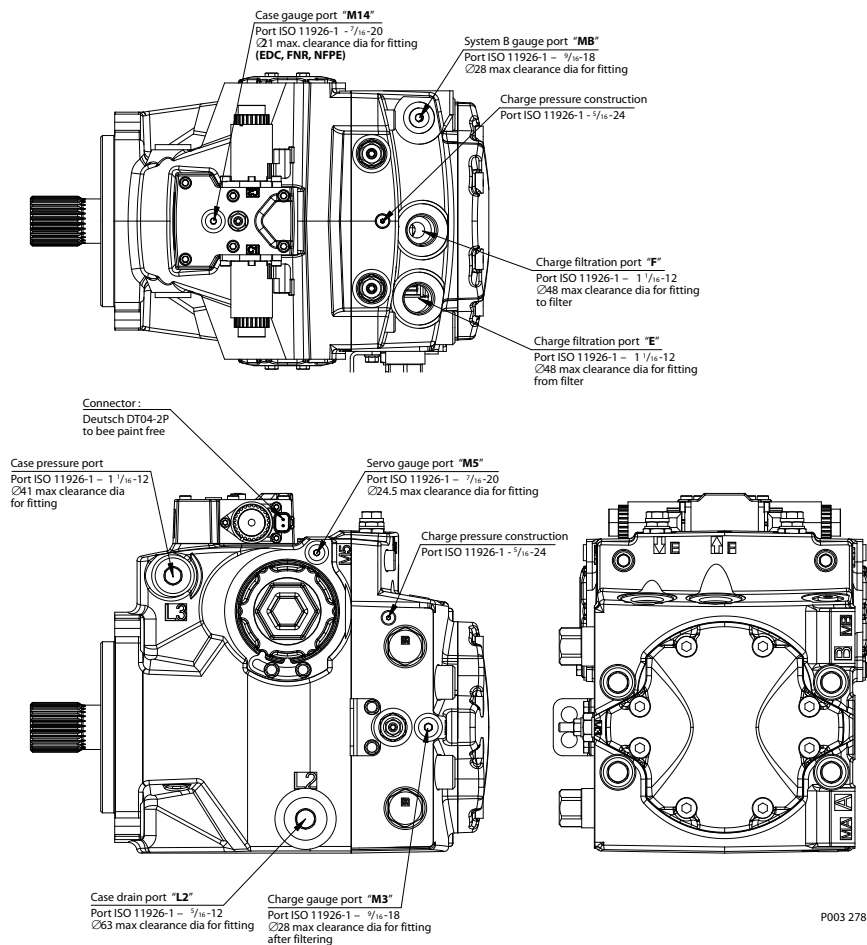
Port description

Port	Description	Sizes	Port	Description	Sizes
A	System port "A"	Ø 31.5	B	System port "B"	Ø 31.5
E	Charge filtration port, from filter	1 1/16 -12	F	Charge filtration port, to filter	1 1/16 -12
L2	Case drain port	1 5/16 -12	L4	Case drain port	1 5/16 -12
MA	System "A" gauge port	9/16 -18	MB	System "B" gauge port	9/16 -18
M3	Charge gauge port, after filtering	9/16 -18	M4	Servo gauge port	7/16 -20
M5	Servo gauge port	7/16 -20	M14	Case gauge port	7/16 -20
S	Charge inlet port	1 5/8 -12			

Please contact Danfoss for specific installation drawings

Technical Information H1 Axial Piston Pump Size 147/165, Single

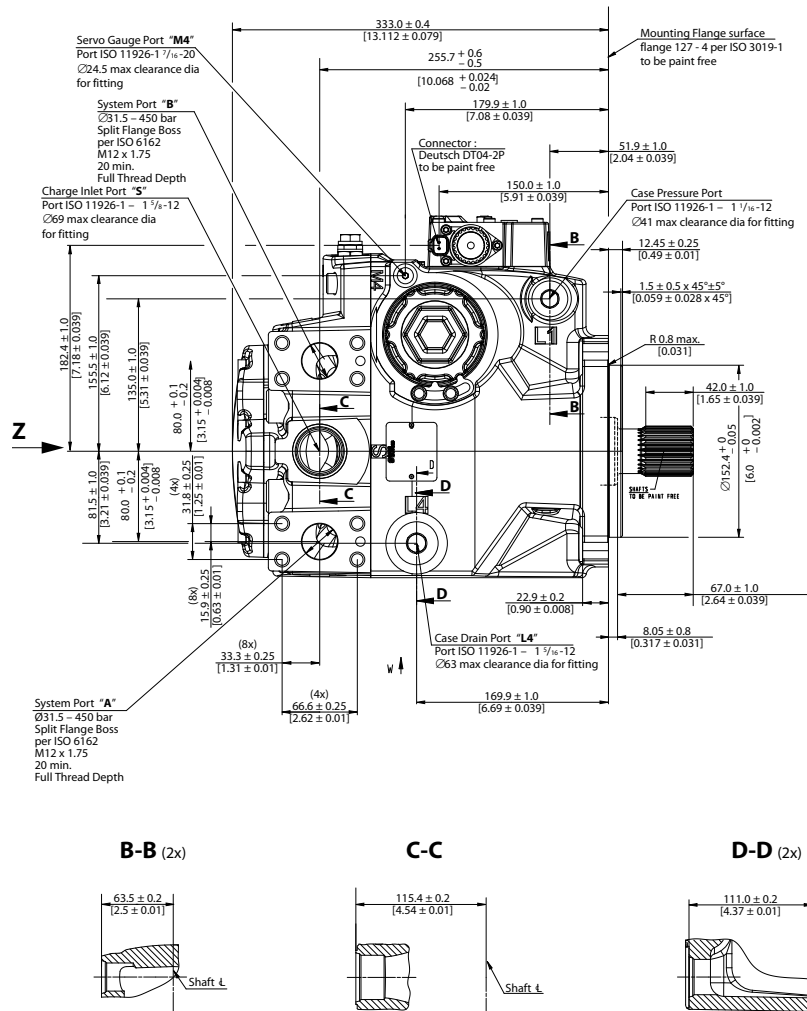
Installation drawings



Please contact Danfoss for specific installation drawings

Installation drawings

Dimensions H1P 147/165

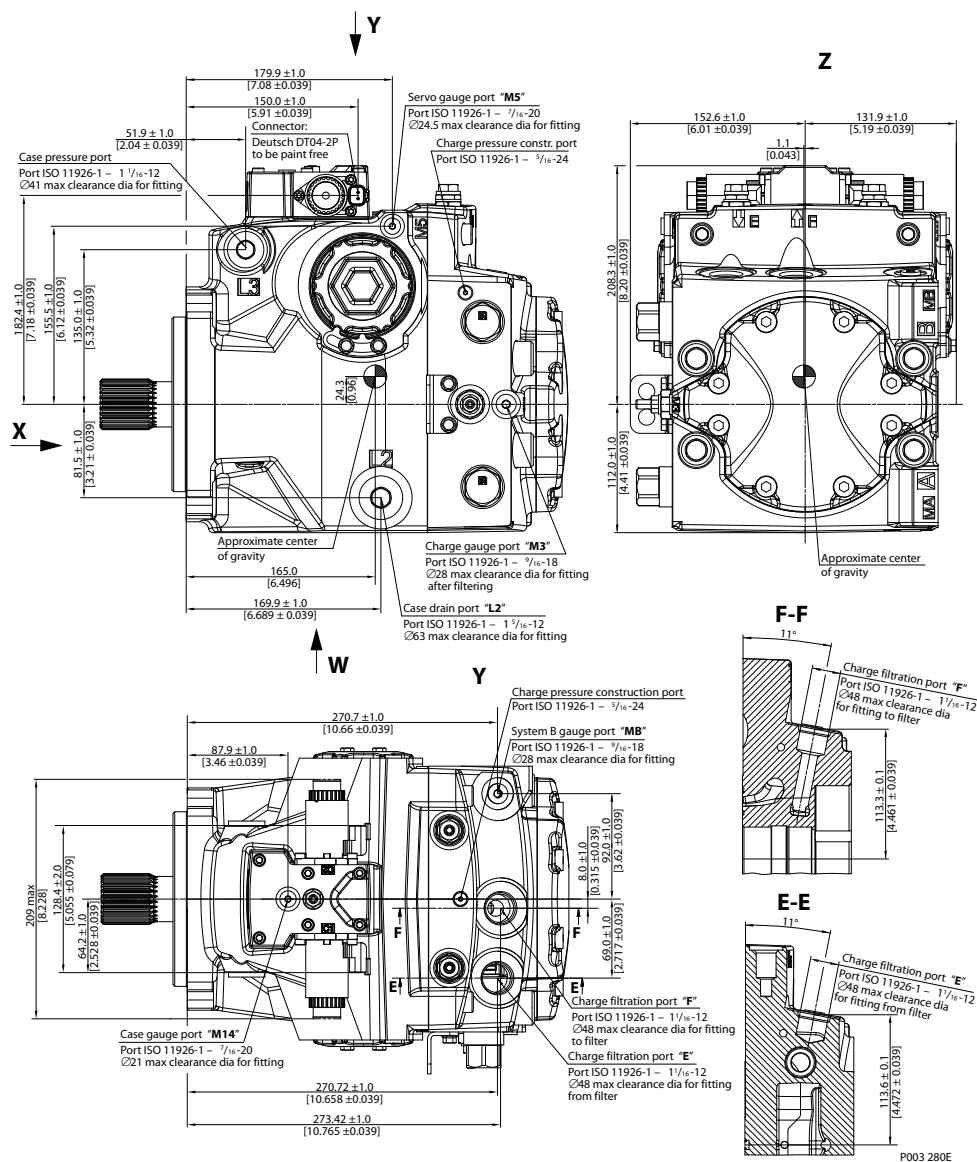


P003 279E

Please contact Danfoss for specific installation drawings

Technical Information H1 Axial Piston Pump Size 147/165, Single

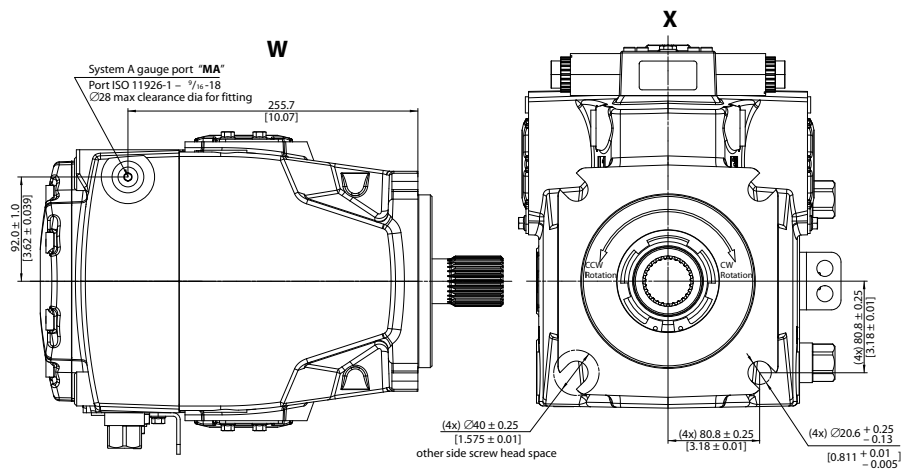
Installation drawings



Please contact Danfoss for specific installation drawings

Technical Information H1 Axial Piston Pump Size 147/165, Single

Installation drawings



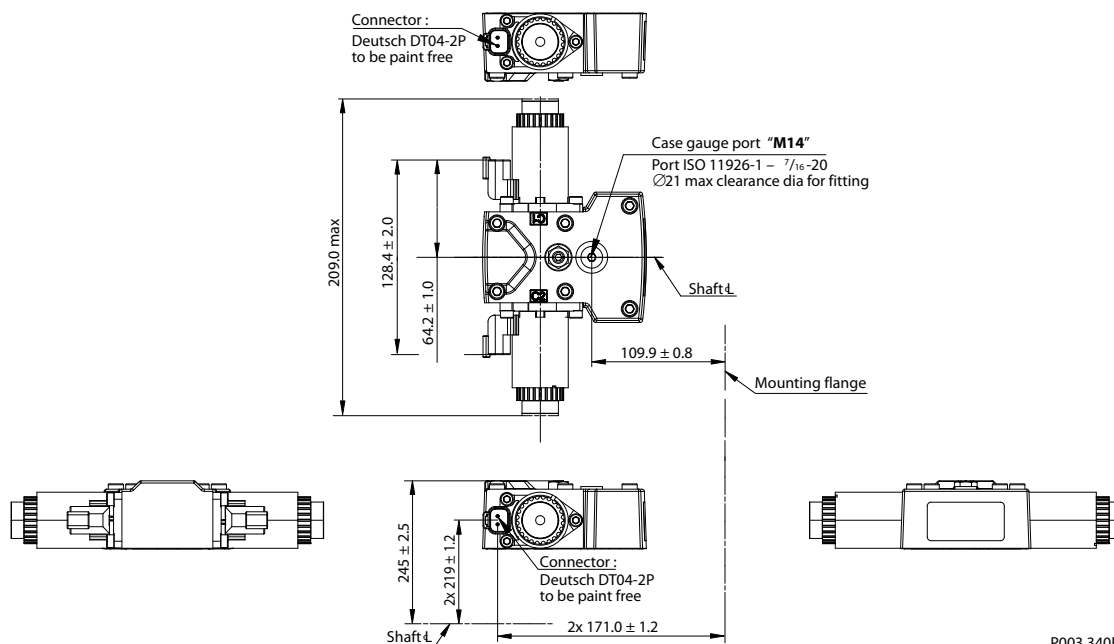
P003 281E

Please contact Danfoss for specific installation drawings

Technical Information H1 Axial Piston Pump Size 147/165, Single

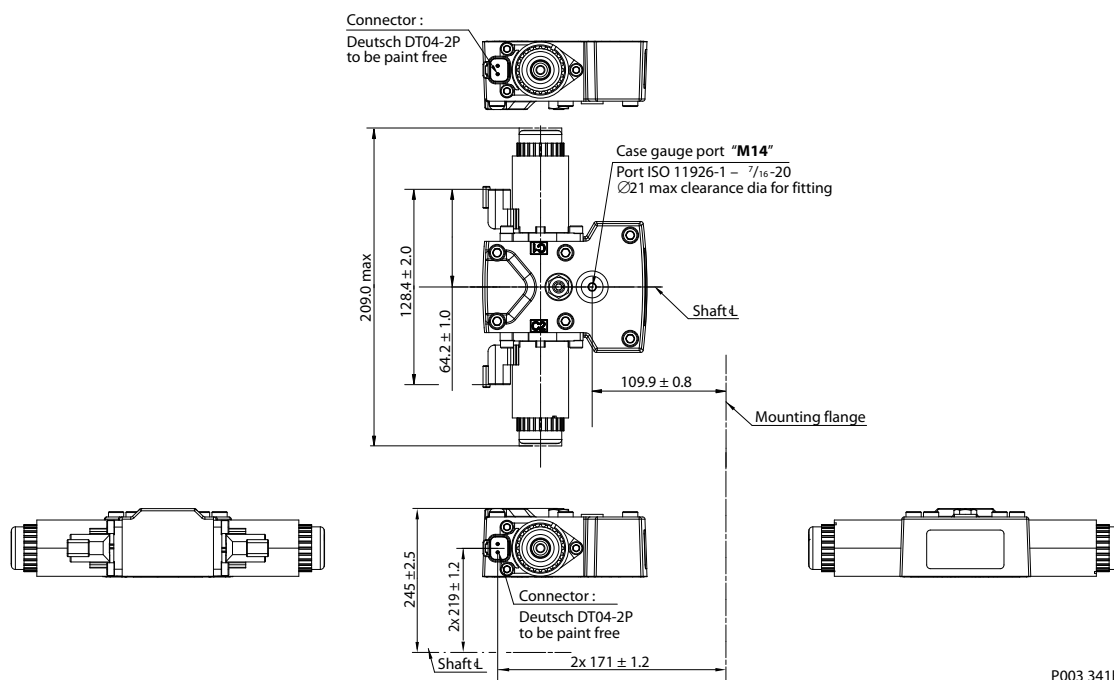
Controls

Electric Displacement Control (EDC), option A2 (12 V) / A3 (24 V)



Please contact Danfoss for specific installation drawings

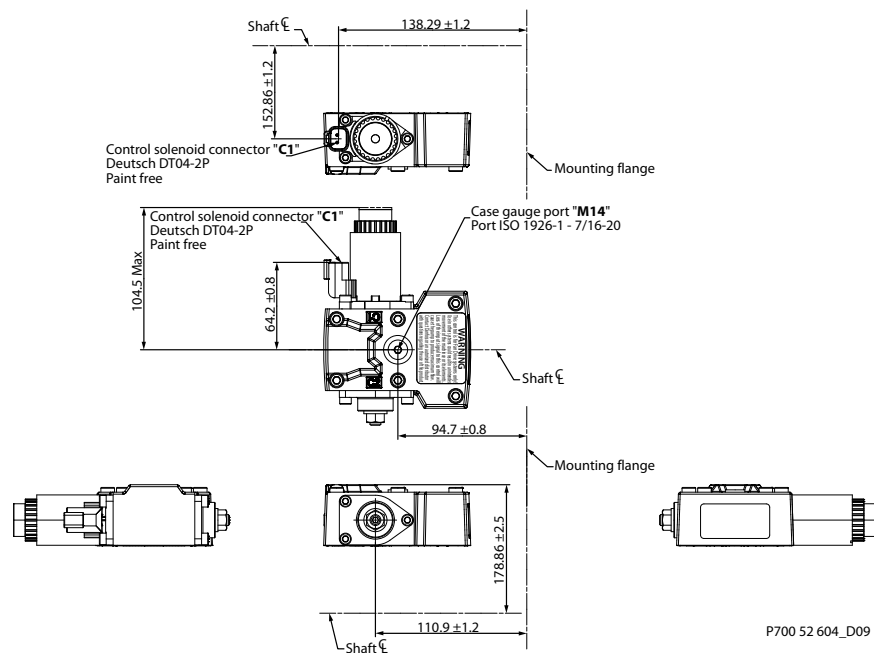
Electric Displacement Control (EDC) with manual override, option A4 (12 V) / A5 (24 V)



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Controls

Fan Drive Control (FDC), option F1 (12 V)/F2 (24 V)



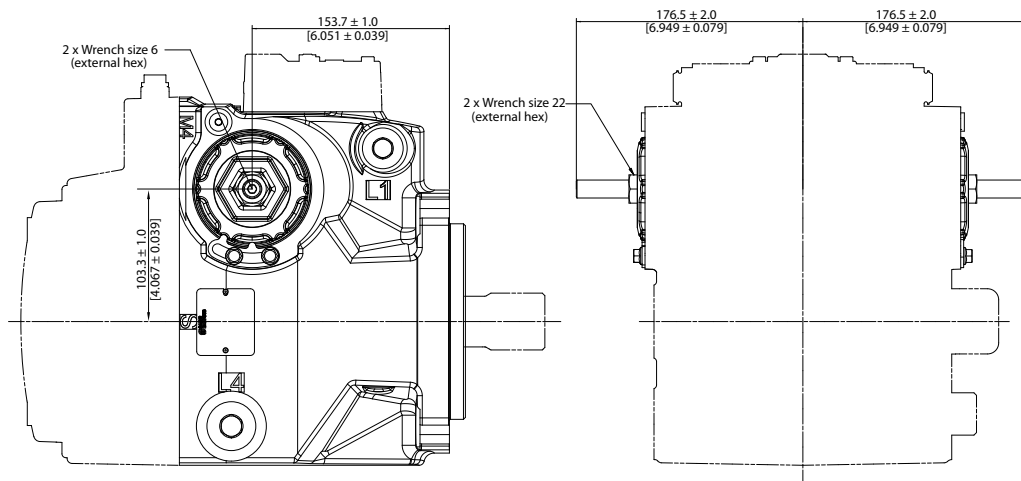
Control solenoid Connector "C1" & "C2"				
Pin	Assignment	OR	Pin	Assignment
1	Supply		1	Ground
2	Ground		2	Supply

Please contact Danfoss for specific installation drawings

Technical Information H1 Axial Piston Pump Size 147/165, Single

Displacement limiters

H1P 147/165 displacement limiters, option B



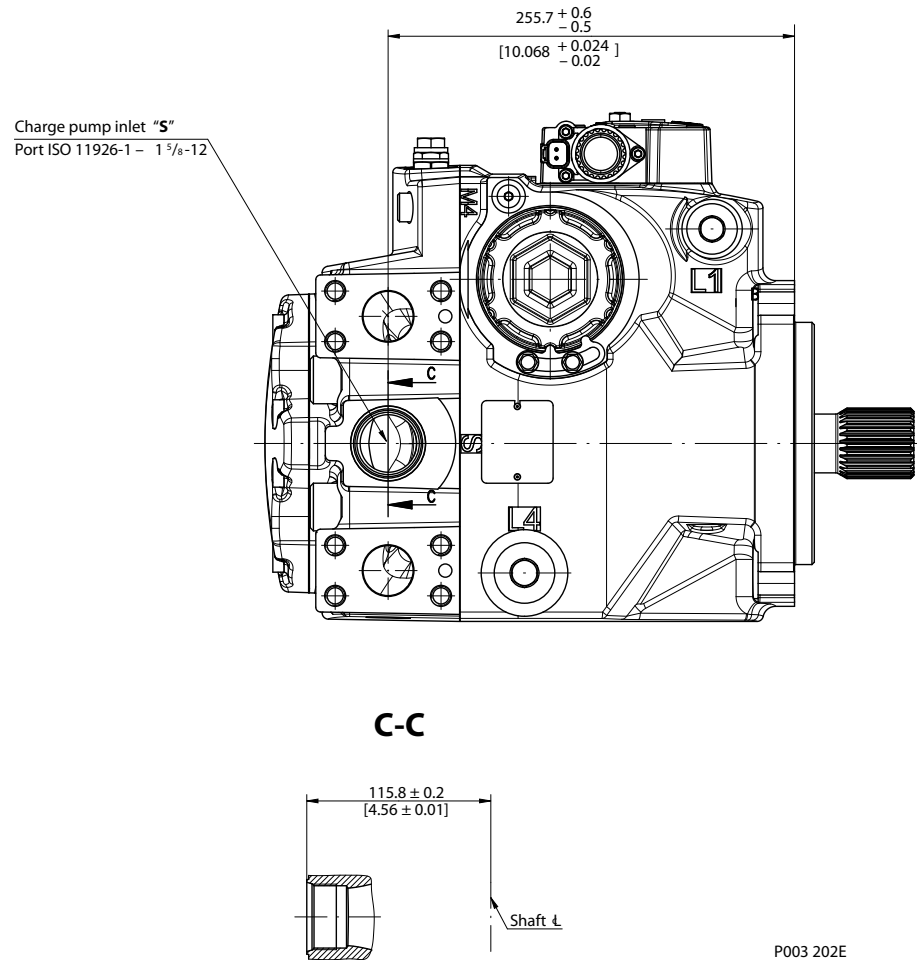
P003 344E

Please contact Danfoss for specific installation drawings

Technical Information H1 Axial Piston Pump Size 147/165, Single

Displacement limiters

H1P 147/165 suction filtration, option L

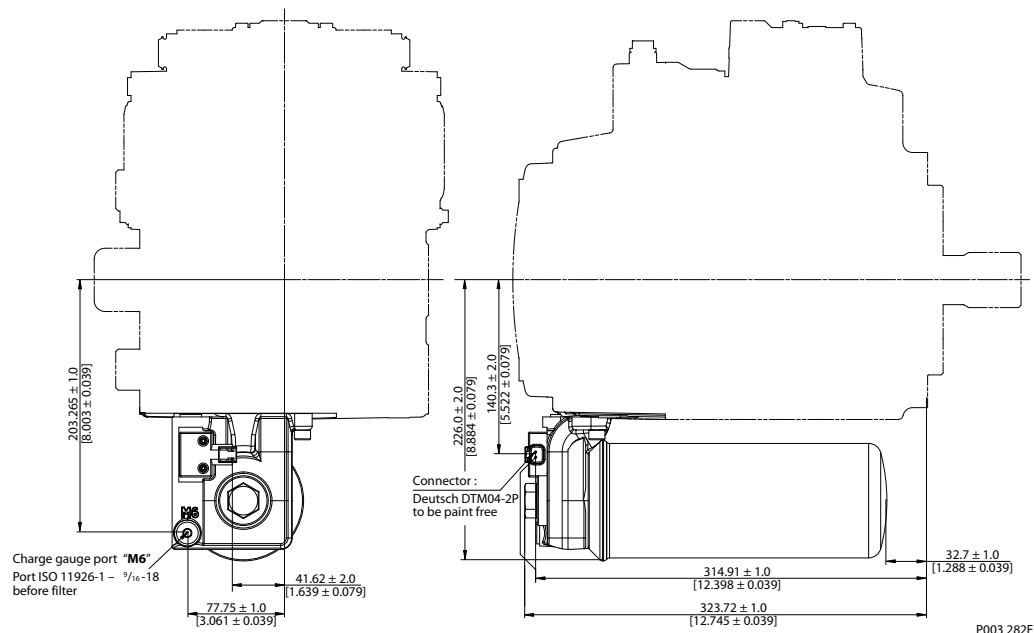


Please contact Danfoss for specific installation drawings

Filtration

H1P 147/165 filtration, option M

Integral full flow charge pressure filtration with filter bypass sensor, option M





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