

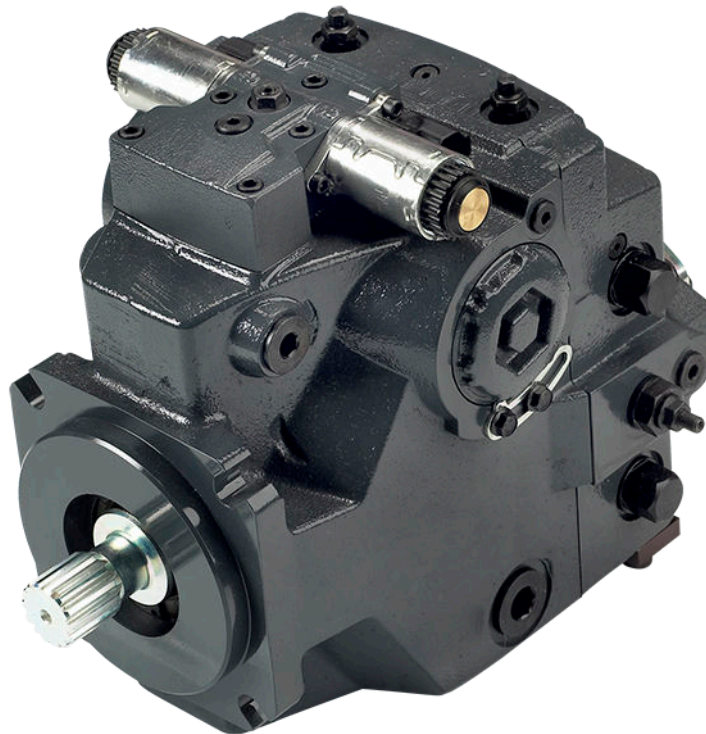
ENGINEERING
TOMORROW



Technical Information

T1P Transit Mixer Axial Piston Pump

Size 069/089



Revision history*Table of revisions*

Date	Changed	Rev
May 2016	Updated to Engineering Tomorrow design.	0201
August 2015	First edition	0101

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Model Code T1P 069/089

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Technical specifications

For definitions of the following specifications, see *H1 Axial Piston Pumps, Basic Information 11062168*, chapter *Operating parameters*.

T1P general specifications

Design	Axial piston pump of cradle swashplate design with variable displacement.
Direction of rotation	Clockwise / counterclockwise
Pipe connections	<i>Main pressure ports:</i> ISO split flange boss <i>Remaining ports:</i> 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 or MDC 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 Power Solutions for nonconformance to these guidelines.
Auxiliary cavity pressure	Will be inlet pressure with internal charge pump, see Operating parameters T1P 069/089 on page 5. Will be case pressure with external charge supply. Please verify mating pump shaft seal capability.

Technical data T1P 069/089

Feature	Size 069	Size 089
Displacement	69.2 cm ³ [4.22 in ³]	89.2 cm ³ [5.44 in ³]
Flow at rated (continuous) speed	243 l/min [53.5 US gal/min]	294 l/min [77.7 US gal/min]
Torque at maximum displacement (theoretical)	1.1 N·m/bar [672 lbf·in/1000 psi]	1.42 N·m/bar [870 lbf·in/1000 psi]
Mass moment of inertia of rotating components	0.0077 kg·m ² [0.0057 slug·ft ²]	0.0116 kg·m ² [0.0086 slug·ft ²]
Mass [weight] dry without charge pump or auxiliary mounting flange	56 kg [123 lb]	62 kg [137 lb]
Oil volume	2 l [0.5 US gal]	2.6 l [0.67 US gal]
Mounting flange	ISO 3019-1 flange 127-4 (SAE C)	
Input spline shaft	21T, pitch = 16/32 per ANSI b92.1b Class 6e, with thread M10 23T, pitch = 16/32 per ANSI b92.1b Class 6e, with thread M10 23T, pitch = 16/32 with thread M10 and flange	
Auxiliary mounting flange with metric fasteners, Shaft outer diameter and splines	ISO 3019-1, flange 82 - 2, outer Ø 16 mm - 4 (SAE A, 9 teeth) ISO 3019-1, flange 82 - 2, outer Ø 19 mm - 4 (SAE A, 11 teeth) ISO 3019-1, flange 101 - 2, outer Ø 22 mm - 4 (SAE B, 13 teeth) ISO 3019-1, flange 101 - 2, outer Ø 25 mm - 4 (SAE B-B, 15 teeth)	
Suction port	Port ISO 11926-1 – 1 5/8 -12 (SAE O-ring boss)	
Main port configuration	Ø25.4 - 450 bar split flange boss per ISO 6162, M12x1.75	
Case drain ports L2, L4	Port ISO 11926-1 – 1 1/16 -12 (SAE O-ring boss)	
Other ports	SAE O-ring boss	
Customer interface threads	Metric fasteners	

Technical specifications

Operating parameters T1P 069/089

Feature		Size 069	Size 089
Input speed (at minimum charge/control pressure)	Min. for internal ¹⁾ and for external ²⁾ charge supply.	500 min ⁻¹ (rpm)	
	Min. for full performance for internal charge supply.	1200 min ⁻¹ (rpm)	
	Rated	3500 min ⁻¹ (rpm)	3300 min ⁻¹ (rpm)
	Maximum	4000 min ⁻¹ (rpm)	3800 min ⁻¹ (rpm)
System pressure	Maximum working pressure	420 bar [6092 psi]	
	Maximum pressure	450 bar [6527 psi]	
	Maximum low loop	45 bar [650 psi]	
	Minimum low loop pressure	10 bar [145 psi]	
Charge pressure	Minimum	16 bar [232 psi]	18 bar [261 psi]
	Maximum	35 bar [508 psi]	34 bar [493 psi]
Control pressure	Minimum (at corner power for EDC, MDC)	14 bar [203 psi]	17 bar [247 psi]
	Maximum	40 bar [580 psi]	
Charge pump inlet pressure	Rated	0.7 bar (absolute) [9 in Hg vacuum]	
	Minimum (cold start)	0.2 bar (absolute) [24 in Hg vacuum]	
	Maximum	4 bar [58 psi]	
Case pressure	Rated	3 bar [44 psi]	
	Maximum	5 bar [73 psi]	
Lip seal external maximum pressure		0.4 [5.8 psi]	

¹⁾ Performance (pressure and displacement) may be limited due to limited control pressure.

²⁾ Full performance (pressure and displacement) possible at minimum charge and control pressure supply.

Fluid specifications T1P

Viscosity and temperature range

Feature	Unit	Data	
Viscosity	mm ² /s [SUS]	Intermittent ¹⁾	5 [42]
		Minimum	7 [49]
		Recommended range	12 – 80 [66 – 370]
		Maximum	1600 [7500]
Temperature range ²⁾	°C [°F]	Minimum ³⁾ (cold start)	-40 [-40]
		Recommended range	60 – 85 [140 – 185]
		Rated	104 [220]
		Maximum intermittent ¹⁾	115 [240]

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)

Technical specifications

Filtration, cleanliness level and β_x -ratio (recommended minimum)

Cleanliness per ISO 4406	22/18/13
Efficiency β_x (charge pressure filtration)	$\beta_{15-20} = 75$ ($\beta_{10} \geq 10$)
Efficiency β_x (suction and return line filtration)	$\beta_{35-45} = 75$ ($\beta_{10} \geq 2$)
Recommended inlet screen mesh size	100 – 125 μ m

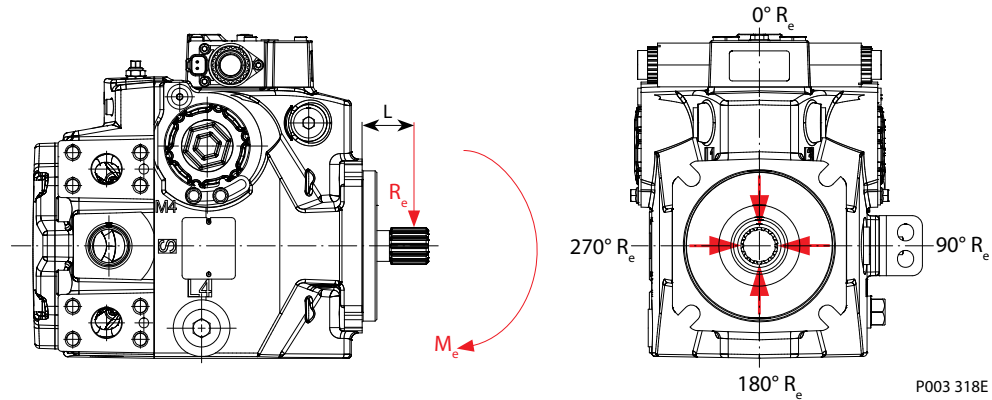
External radial shaft loads

The 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 Power Solutions 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 formula:

$$R_e = \frac{M_e}{L}$$

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.

Bearing life T1P 069/089

Maximum external shaft load based on shaft deflection

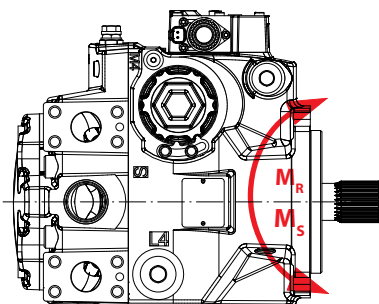
External radial moment	Unit	Size 069	Size 089
M_e	N·m [lbf·in]	109 [965]	118 [1044]

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.

Technical specifications

Mounting flange loads T1P 069/089



P001 916

Mounting flange load	Size 069	Size 089
Rated moment M_R	3700 N·m [32 750 lbf·in]	5630 N·m [49 830 lbf·in]
Shock load moment M_S	7900 N·m [69 920 lbf·in]	12 190 N·m [107 900 lbf·in]

The moments shown above can be applied for top or side control orientation.

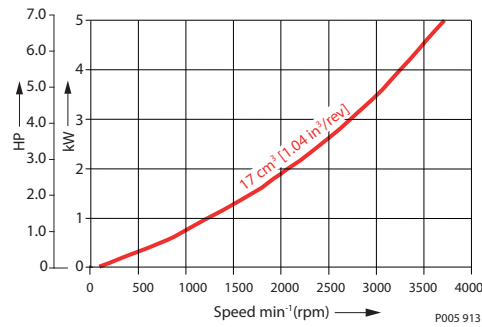
Technical specifications

Charge pump

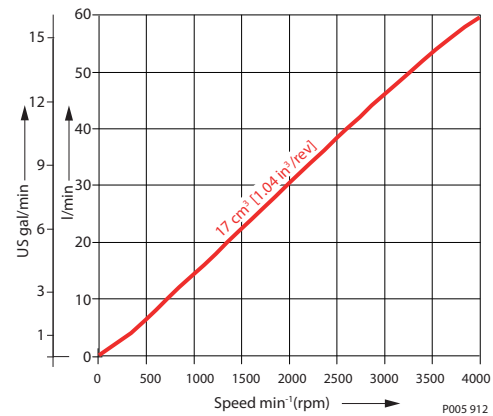
Charge pump flow and power curves, 17 cm³

Charge pressure: 20 bar [290 psi] / Viscosity: 11 mm²/s [63 SUS] / Temperature: 80°C [176°F]

Charge pump 17 cm³ power requirements



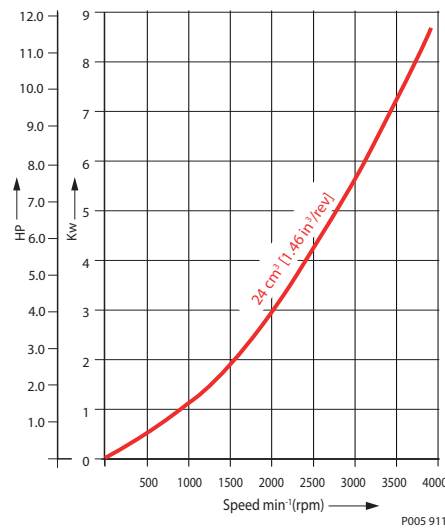
Charge pump 17 cm³ flow



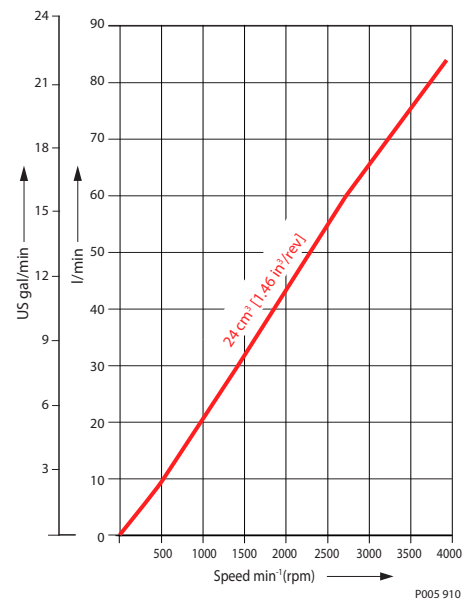
Charge pump flow and power curves 24 cm³

Charge pressure: 20 bar [290 psi] / Viscosity: 11 mm²/s [63 SUS] / Temperature: 80°C [176°F]

Charge pump 24 cm³ power requirements



Charge pump 24 cm³ flow



For transit mixer application use the biggest charge pump which is available for particular size or contact your Danfoss representative for application assistance if your application includes any of these conditions.

Model Code T1P 069/089

T1 P **A** **B** **D** **F** **C** **3** **E** **G** **D** **3** **H** **A** **K** **M** **K** **4** **2** **N** **K** **4** **2** **S** **T** **V** **L** **2** **4** **W** **X** **N** **N** **N** **Y**

Displacement

069	69.2 cm ³ [4.22 in ³]
089	89.2 cm ³ [5.44 in ³]

A – Rotation

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

B – Product version

A	Revision code
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D – Control

A5	Electric Displacement Control (EDC), 24V, Deutsch connector, with Manual override (MOR)
M1	Manual Displacement Control (MDC)
M6	Manual Displacement Control (MDC) with 24V, CCO and Neutral Start Switch, Deutsch Connector

F – Orifices (mm)

C3	No orifice
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E – Displacement limiters

N	None
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G – Endcap options (Twin port Code 62 Metric 4-Bolt flange)

D6	Endcap for suction filtration
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H – Mounting flange

H	ISO 3019-1, 4-Bolt flange SAE C
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J – Input shaft

A5	23T 16/32, with thread M10, with flange
A6	21T 16/32 per ANSI b92.1b Class 6e, with thread M10
A7	23T 16/32 per ANSI b92.1b Class 6e, with thread M10

Model Code T1P 069/089

T1 P **A** **B** **D** **F** **E** **G** **H** **J** **K** **M** **N** **S** **T** **V** **W** **X** **Y**
 A C 3 N D 3 H A K 4 2 K 4 2 L 2 4 N N N

K – Auxiliary mounting pad

NN	None	
H1	ISO 3019-1, flange 82 - 2, outer Ø19 mm - 4 (SAE A, 11 teeth 16/32 coupling)	Shipping cover
H2	ISO 3019-1, flange 82 - 2, outer Ø16 mm - 4 (SAE A, 9 teeth 16/32 coupling)	
H3	ISO 3019-1, flange 101 - 2, outer Ø22 mm - 4 (SAE B, 13 teeth 16/32 coupling)	
H5	ISO 3019-1, flange 101 - 2, outer Ø25 mm - 4 (SAE B-B, 15 teeth 16/32 coupling)	

M – Overpressure protection type, side “A”

N – Overpressure protection, side “B”

K42	420 bar [6090 psi] High pressure relief valve with bypass without pressure limiter
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S – Charge pump

C	17 cm ³ /rev [1.03 in ³ /rev] (only for 69cc)
M	24 cm ³ /rev [1.46 in ³ /rev] (only for 89cc)

T – Filtration

L	Suction filtration
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V – Charge pressure relief setting

24	24 bar [348 psi]
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W – Special hardware features

PN	EDC/MDC (w/o handle) valve plate
H1	EDC/MDC valve plate, MDC handle

X – Paint and nametag

NNN	Black paint and Danfoss nametag format A
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Y – Special settings

NNN	Default
M00	MDC standard handle position

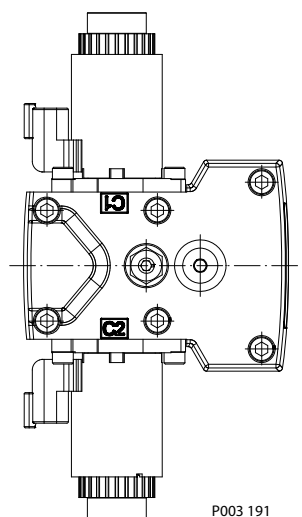
Control options

Electrical Displacement Control (EDC)

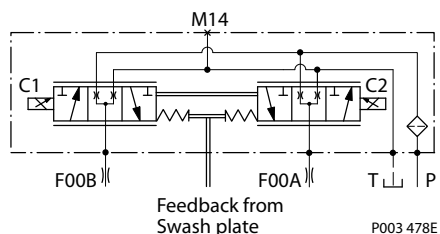
The **Electrical Displacement Control (EDC)** consists of a pair of proportional solenoids on each side of a three-position, four-way porting spool. The proportional solenoid applies a force input to the spool, which ports hydraulic pressure to either side of a double acting servo piston. Differential 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.

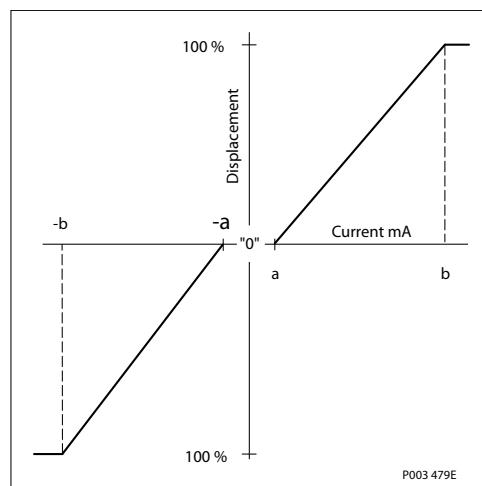
Electrical Displacement Control



EDC schematic



Pump displacement vs. control current



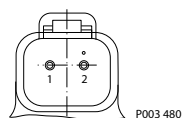
EDC data for T1P

Control minimum current to stroke pump

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

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

Connector



Control options

Connector ordering data

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

Description		24 V
Maximum current		920 mA
Nominal coil resistance	@ 20 °C [68 °F]	14.20 Ω
	@ 80 °C [176 °F]	17.52 Ω
Inductance		140 mH
PWM	Range	70-200 Hz
	Frequency (preferred)*	100 Hz
IP Rating	IEC 60 529	IP 67
	DIN 40 050, part 9	IP 69K with mating connector

* PWM signal required for optimum control performance.

Pump output flow direction vs. control signal

Shaft rotation	CW		CCW	
	C1	C2	C1	C2
Coil energized*				
Port A	out	in	in	out
Port B	in	out	out	in
Servo port pressurized	M4	M5	M4	M5

* For coil location see Installation drawings.

Control response

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). 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 orifice selection for the desired response.

[T1 pumps are limited in mechanical orificing combinations. 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 [141 SUS] and 50 °C [122 °F]
Charge pressure	20 bar [290 psi]
Speed	1800 min ⁻¹ (rpm)

Control options**EDC response time T1P**

Stroking direction (no orifice)	Frame size 069	Frame size 089
Neutral to full flow	0.6 s	1.0 s
Full flow to neutral	0.5 s	0.6 s

Control options

Manual Displacement Control (MDC)

MDC principle

An MDC is a Manual proportional Displacement Control (MDC). The MDC consists of a handle on top of a rotary input shaft. The shaft provides an eccentric connection to a feedback link. This link is connected on its one end with a porting spool. On its other end the link is connected the pumps swashplate.

This design provides a travel feedback without spring. When turning the shaft the spool moves thus providing hydraulic pressure to either side of a double acting servo piston of the pump.

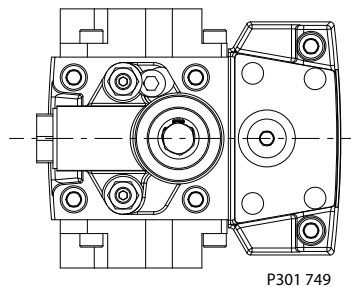
Differential pressure across the servo piston rotates the swash plate, changing the pump's displacement. Simultaneously the swashplate movement is fed back to the control spool providing proportionality between shaft rotation on the control and swashplate rotation.

The MDC changes the pump displacement between no flow and full flow into opposite directions. 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.

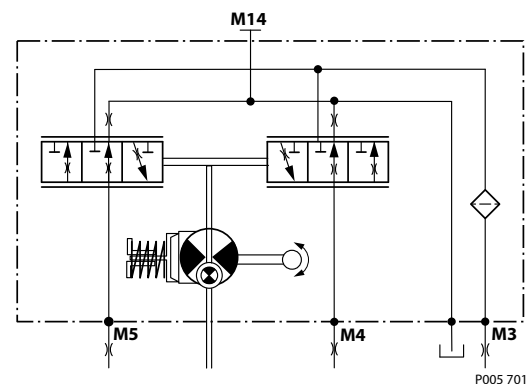
The MDC is sealed by means of a static O-ring between the actuation system and the control block. Its shaft is sealed by means of a special O-ring which is applied for low friction. The special O-ring is protected from dust, water and aggressive liquids or gases by means of a special lip seal.

Manual Displacement Control



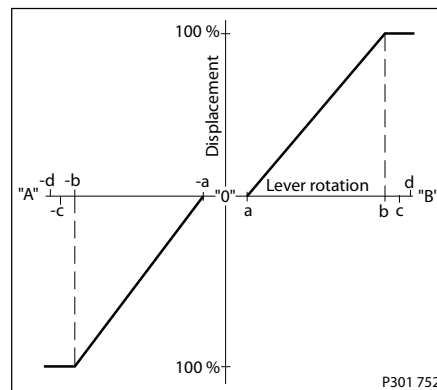
P301 749

MDC schematic diagram



P005 701

Pump displacement vs. control lever rotation



P301 752

Where:

Deadband on **B** side – $a = 3^\circ \pm 1^\circ$

Maximum pump stroke – $b = 30^\circ +2/-1^\circ$

Required customer end stop – $c = 36^\circ \pm 3^\circ$

Internal end stop – $d = 40^\circ$

Volumetric efficiencies of the system will have impacts on the start and end input commands.

MDC torque

Torque required to move handle to maximum displacement	1.4 N·m [12.39 lbf·in]
Torque required to hold handle at given displacement	0.6 N·m [5.31 lbf·in]
Maximum allowable input torque	20 N·m [177 lbf·in]

Control options

MDC general information

In difference to other controls the MDC provides a mechanical deadband. This is required to overcome the tolerances in the mechanical actuation.

The MDC contains an internal end stop to prevent over travel. The restoring moment is appropriate for turning the MDC input shaft back to neutral only. Any linkages or cables may prevent the MDC from returning to neutral.

The MDC is designed for a maximum case pressure of 5 bar and a rated case pressure of 3 bar. If the case pressure exceeds 5 bar there is a risk of an insufficient restoring moment. In addition a high case pressure can cause the NSS to indicate that the control is not in neutral. High case pressure may cause excessive wear.

Customers can apply their own handle design but they must care about a robust clamping connection between their handle and the control shaft and avoid overload of the shaft.

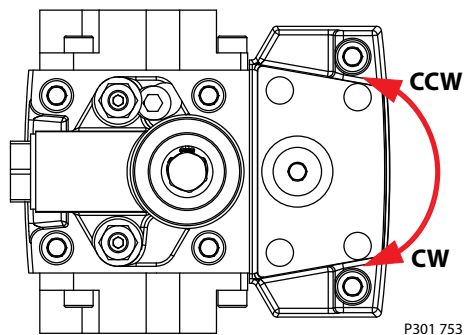
Customers can connect two MDC's on a tandem unit in such a way that the actuation force will be transferred from the pilot control to the second control but the kinematic of the linkages must ensure that either control shaft is protected from torque overload.

To avoid an overload of the MDC, customers must install any support to limit the setting range of the Bowden cable.

Caution

Using the internal spring force on the input shaft is not an appropriate way to return the customer connection linkage to neutral.

Shaft rotation MDC



MDC shaft rotation data

Pump shaft rotation*	Clock Wise (CW)		Counter Clock Wise (CCW)	
	CW	CCW	CW	CCW
Port A	in (low)	out (high)	out (high)	in (low)
Port B	out (high)	in (low)	in (low)	out (high)
Servo port high pressure	M5	M4	M5	M4

* As seen from shaft side.

Control response

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). 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 orifice selection for the desired response.

Control options

T1 pumps are limited in mechanical orificing combinations. 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 [141 SUS] and 50 °C [122 °F]
Charge pressure	20 bar [290 psi]
Speed	1800 min ⁻¹ (rpm)

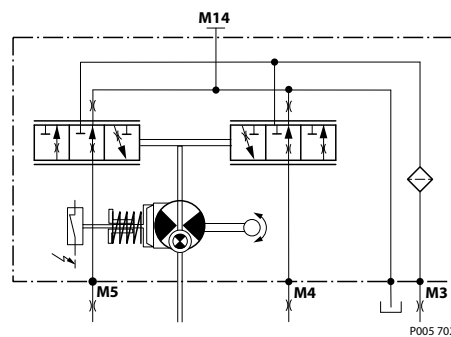
MDC response time T1P

Stroking direction (No orifice)	Size 069	Size 089
Neutral to full flow	0.4 s	0.5 s
Full flow to neutral	0.5 s	0.6 s

Neutral Start Switch (NSS)

The **Neutral Start Switch (NSS)** contains an electrical switch that provides a signal of whether the control is in neutral. The signal in neutral is **Normally Closed (NC)**.

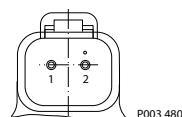
Neutral Start Switch schematic



Neutral Start Switch data

Max. continuous current with switching	8.4 A
Max. continuous current without switching	20 A
Max. voltage	36 V _{DC}
Electrical protection class	IP67 / IP69K with mating connector

Connector



Connector ordering data

Description	Quantity	Ordering number
Mating connector	1	Deutsch® DT06-2S
Wedge lock	1	Deutsch® W2S

Control options

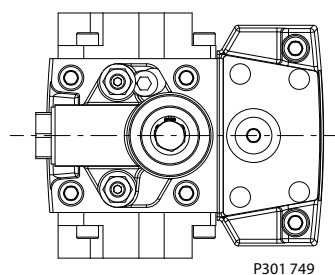
Connector ordering data (continued)

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

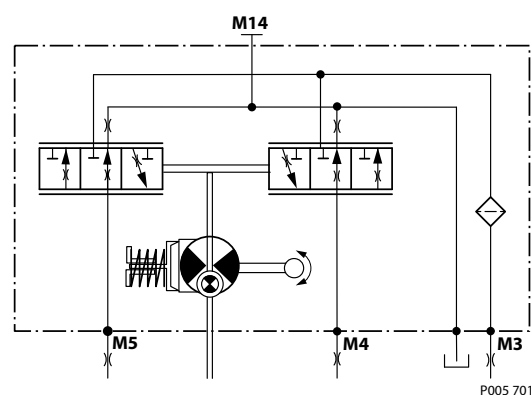
Case gauge port M14

The drain port should be used when the control is mounted on the unit's bottom side to flush residual contamination out of the control.

MDC w/h drain port shown



MDC schematic diagram



Lever

MDC-controls are available with an integrated lever.

Control options

Manual Over Ride (MOR) for T1

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.

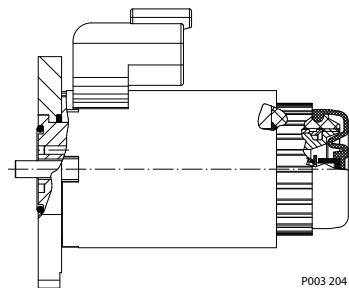
Unintended MOR operation will cause the pump to go into stroke. The vehicle or device must always be in a „safe“ condition (i.e. vehicle lifted off the ground) when using the MOR function.

The MOR plunger 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.

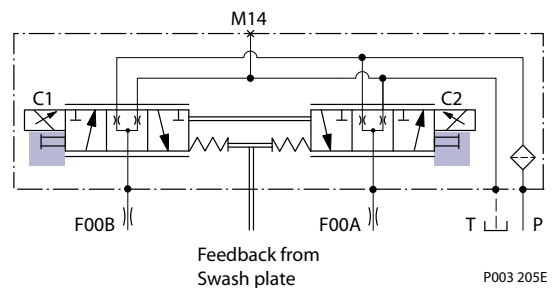
The MOR should be engaged anticipating a full stroke response from the pump.

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

Manual OverRide (MOR)



MOR schematic diagram (EDC shown)



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.

Control-Cut-Off valve (CCO) for T1P

The T1 pump offers an optional control cut off valve integrated into the control. This valve will block charge pressure to the control, allowing the servo springs to de-stroke both pumps regardless of the pump's primary control input. There is also a hydraulic logic port, X7, which can be used to control other machine functions, such as spring applied pressure release brakes. The pressure at X7 is controlled by the control cut off solenoid. The X7 port would remain plugged if not needed.

In the normal (de-energized) state of the solenoid charge flow is prevented from reaching the controls. At the same time the control passages and the X7 logic port are connected and drained to the pump case. The pump will remain in neutral, or return to neutral, independent of the control input signal. Return to neutral time will be dependent on oil viscosity, pump speed, swashplate angle, and system pressure.

When the solenoid is energized, charge flow and pressure is allowed to reach the pump control. The X7 logic port will also be connected to charge pressure and flow.

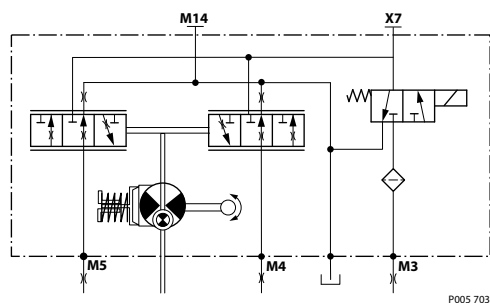
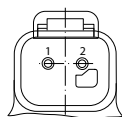
The solenoid control is intended to be independent of the primary pump control making the control cut off an override control feature. It is however recommended that the control logic of the CCO valve be maintained such that the primary pump control signal is also disabled whenever the CCO valve is de-energized. Other control logic conditions may also be considered.

All MDC controls are available with a CCO valve. The CCO-valve is available with 24 V solenoid only. The response time of the unit depends on the control type and the used control orifices.

The location of the brake port see the chapter [Installation drawings](#) on page 27.

Control options

CCO-schematic (MDC shown)


CCO connector


Description	Quantity	Ordering number
Mating connector	1	Deutsch® DT06-2SC
Wedge lock	1	Deutsch® W2SC
Socket contact (16 and 18 AWG)	2	Deutsch® 0462-201-16141

CCO solenoid data for T1P

Nominal supply voltage		24 V
Supply voltage	Maximum	29 V
	Minimum	19 V
Nominal coil resistance at 20°C		41.7 Ω
Supply current	Maximum	430 mA
	Minimum	300 mA
PWM frequency	Range	50-200 Hz
	Preferred	100 Hz
Electrical protection class		IP67 / IP69K with mating connector
Bi-directional diode cut off voltage		53 V

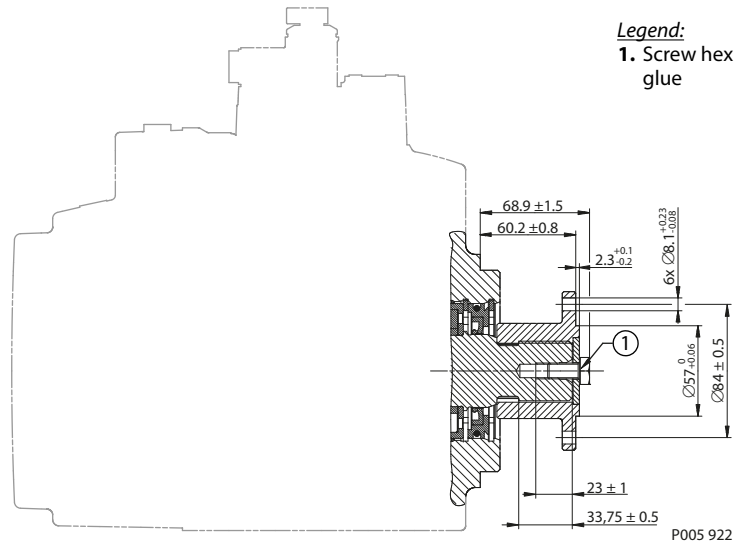
Brake gauge port with MDC
Caution

It is not recommended to use brake port for any external flow consumption to avoid malfunction of CCO function.

Dimensions

T1P input shaft - option A5

Option 23T 16/32, with thread M10, with flange



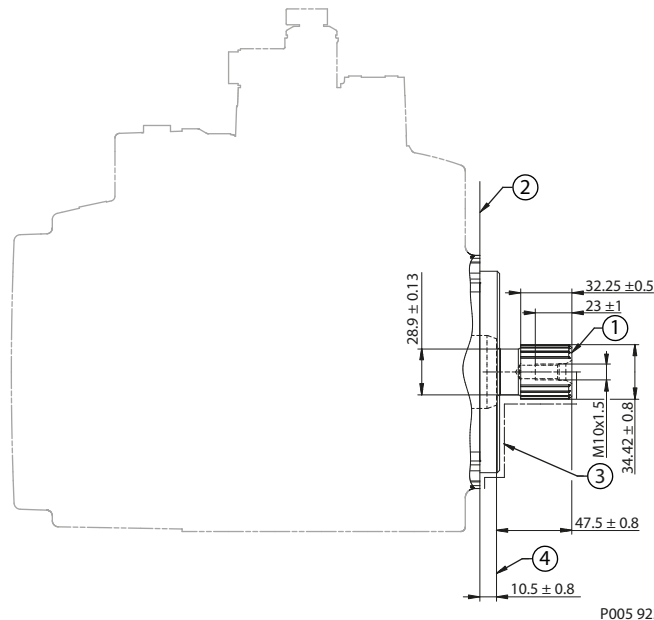
Specifications

Option	A5	
Spline	23 teeth, 16/32	
Flange data	Diameter	$\varnothing 84$
	Active length	68.9 mm
Torque rating	Rated	999 N·m [8840 lbf·in]
	Maximum	1818 N·m [16 090 lbf·in]

Dimensions

T1P input shaft - option A6

Option 21T 16/32 per ANSI B92.1-1996 Class 6H, with thread M10



Legend:

- 1. Spline:**
*Pressure angle: 30°
 Type of fit: Fillet root side per ANSI B92.1-1996 Class 6H*
- 2. Mounting flange surface, flange 127-4 per ISO 3019-1 (SAE J744-C) to be paint free**
- 3. Coupling must not protrude beyond this surface**
- 4. Paint free**

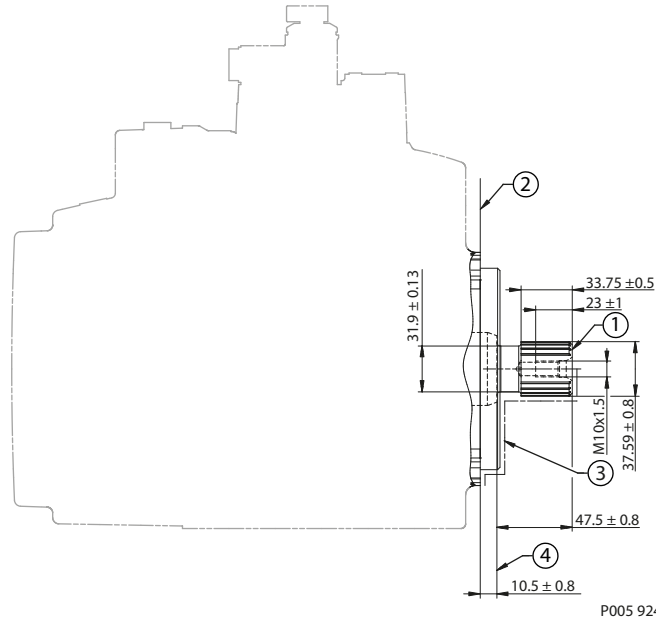
Specifications

Option		A6
Spline		21 teeth, 16/32
Flange data	Pitch diameter:	Ø33.338 mm
	Active length	32.25 mm
Torque rating	Rated	760 N•m [6730 lbf•in]
	Maximum	1137 N•m [10 060 lbf•in]

Dimensions

T1P input shaft - option A7

Option 23T 16/32 per ANSI B92.1-1996 Class 6H, with thread M10



Legend:

- 1. Spline:**
*Pressure angle: 30°
 Type of fit: Fillet root side per ANSI B92.1-1996 Class 6H*
- 2. Mounting flange surface, flange 127-4 per ISO 3019-1 (SAE J744-C) to be paint free**
- 3. Coupling must not protrude beyond this surface**
- 4. Paint free**

P005 924

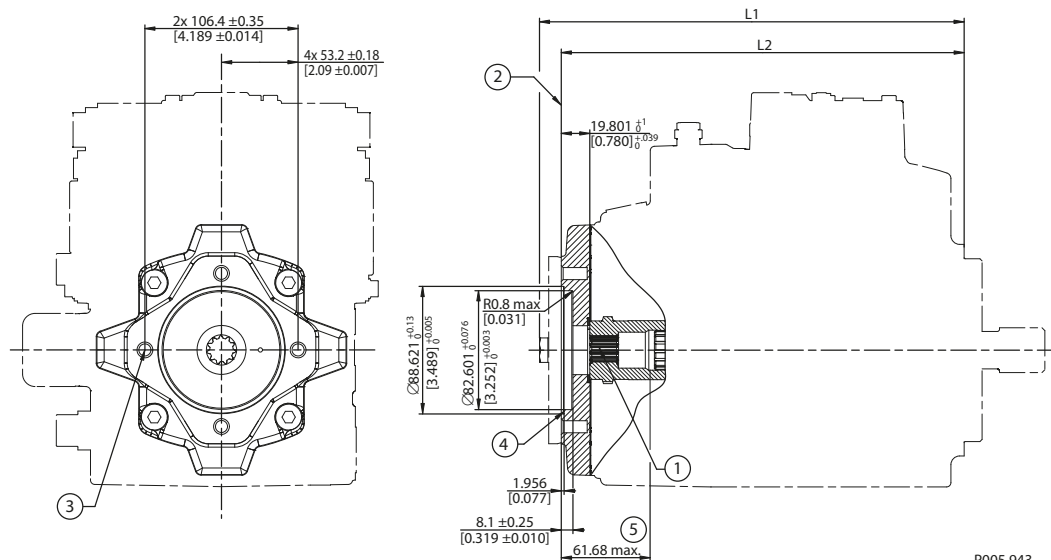
Specifications

Option		A7
Spline		23 teeth, 16/32
Flange data	Pitch diameter:	Ø36.513 mm
	Active length	33.75 mm
Torque rating	Rated	999 N·m [8840 lbf·in]
	Maximum	1818 N·m [16 090 lbf·in]

Dimensions

T1P auxiliary mounting pad, option H1 (SAE A, 11 teeth)

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



P005 943

Legend:

1. Spline data: 11 teeth, Pressure angle 30°, Pitch: 16/32, Ø17.463 [dia 0.6875]

Typ of fit: fillet root, side fit per Ansi B92.1-1996 Class 6 min active spline length 10.5 mm.

2. Mounting flange SAE A flange 82 - 2 per ISO 3019-1, surface to be paint free.

3. Thread: M10x1.5-6H, depth: 15 [0.591] min.; recommended screw-in depth 1.5 x thread dia (4x).

4. O-ring seal required, Ref 82.22 [3.237] i.D. 2.62 [0.103] cross section.

5. Auxiliary pump shaft length.

Option H1	Frame size 069	Frame size 089
L1	294.956 ± 2 [11.612 ± 0.079]	311.838 ± 2 [12.277 ± 0.079]
L2	279.83 ± 2 [11.017 ± 0.079]	296.83 ± 2 [11.686 ± 0.079]
Maximum torque	296 N·m [2620 lbf·in]	296 N·m [2620 lbf·in]

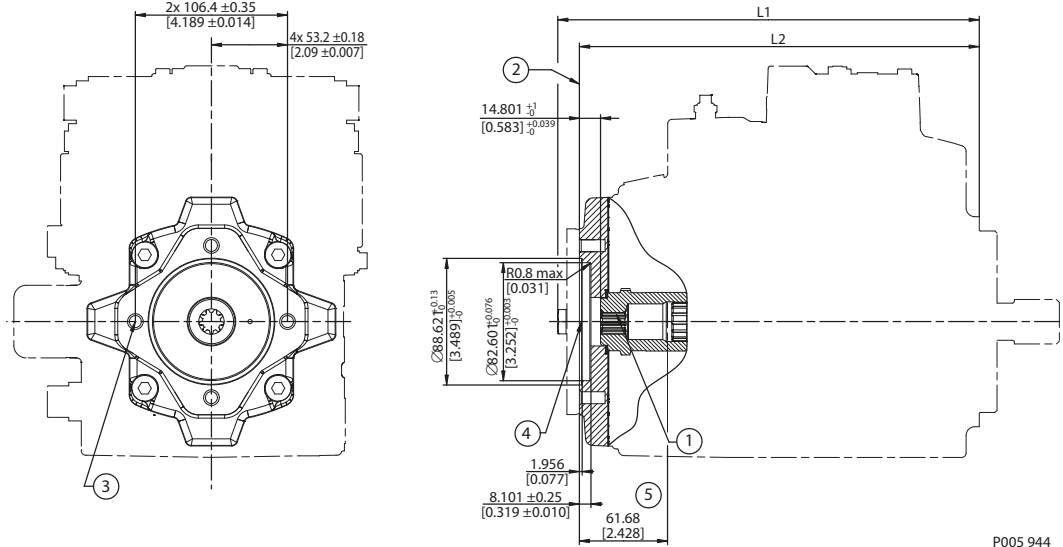
! Caution

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

Dimensions

T1P auxiliary mounting pad, option H2 (SAE A, 9 teeth)

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



P005 944

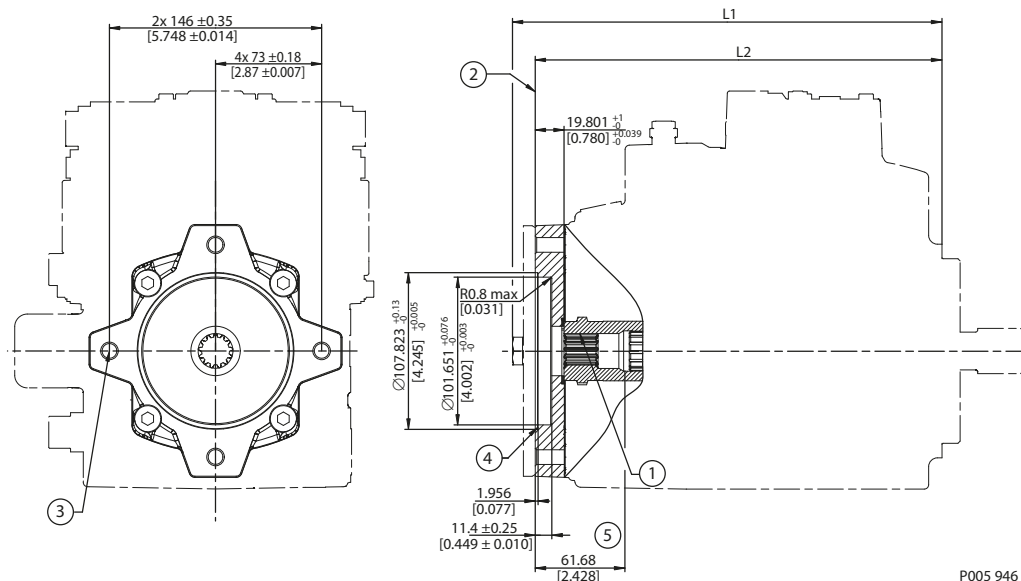
Legend:

- 1. Spline** data: 9 teeth, Pressure angle 30°, Pitch: 16/32, Ø14.288 [dia 0.5625]
 Typ of fit: fillet root, side fit per Ansi B92.1-1996 Class 6 min active spline length 10.5 mm.
- 2. Mounting flange** SAE A flange 82 - 2 per ISO 3019-1, surface to be paint free.
- 3. Thread:** M10x1.5-6H, depth: 15 [0.591] min.; recommended screw-in depth 1.5 x thread dia (4x).
- 4. O-ring seal** required, Ref 82.22 [3.237] i.D. 2.62 [0.103] cross section.
- 5. Auxiliary pump shaft** length.

Option H1	Frame size 069	Frame size 089
L1	294.956 ± 2 [11.612 ± 0.079]	311.838 ± 2 [12.277 ± 0.079]
L2	279.83 ± 2 [11.017 ± 0.079]	296.83 ± 2 [11.686 ± 0.079]
Maximum torque	162 N·m [1430 lbf·in]	162 N·m [1430 lbf·in]

! 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
T1P auxiliary mounting pad, option H3 (SAE B, 13 teeth)
Option H3, ISO 3019-1, flange 101-2 (SAE B, 13 teeth)


P005 946

Legend:
1. Spline data: 13 teeth, Pressure angle 30°, Pitch: 16/32, $\text{Ø}20.638$ [dia 0.813]

Typ of fit: fillet root, side fit per Ansi B92.1-1996 Class 6 min active spline length 10.5 mm.

2. Mounting flange SAE A flange 101 - 2 per ISO 3019-1, surface to be paint free.

3. Thread: M10x1.5-6H, depth: 15 [0.591] min.; recommended screw-in depth 1.5 x thread dia (4x).

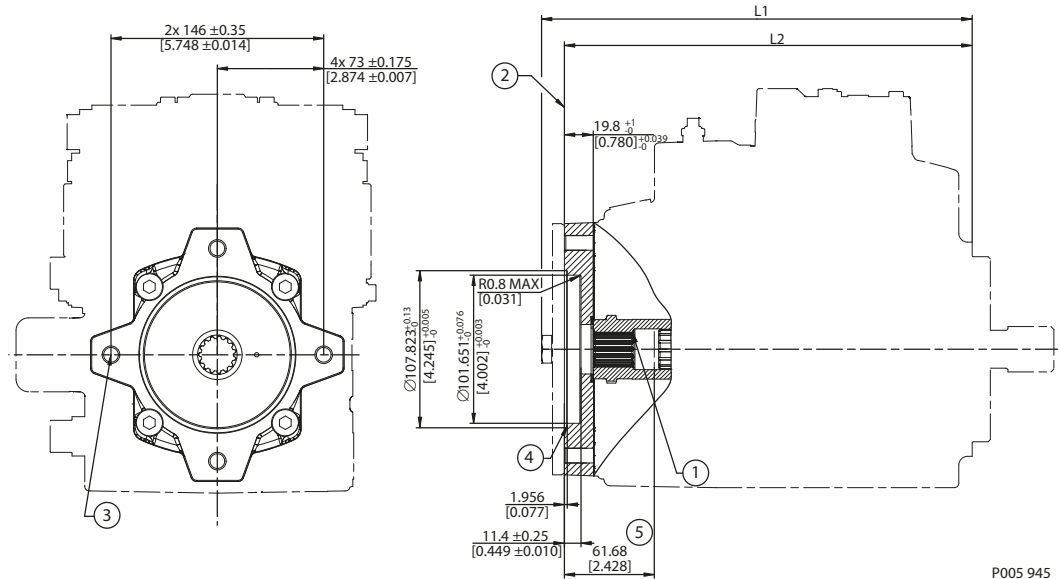
4. O-ring seal required, Ref 101.32 [3.989] id X 2.62 [0.103] cross section.

5. Auxiliary pump shaft length.

Option H1	Frame size 069	Frame size 089
L1	295.459 ± 2 [11.32 ± 0.079]	312.486 ± 2 [12.303 ± 0.79]
L2	279.83 ± 2 [11.017 ± 0.079]	296.83 ± 2 [11.686 ± 0.079]
Maximum torque	395 N·m [3500 lbf·in]	395 N·m [3500 lbf·in]

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
T1P auxiliary mounting pad, option H5 (SAE B-B, 15 teeth)
Option H5, ISO 3019-1, flange 101-2 (SAE B-B, 15 teeth)


P005 945

Legend:

1. Spline data: 15 teeth, Pressure angle 30°, Pitch: 16/32, Ø23.813 [dia 0.938]

Typ of fit: fillet root, side fit per Ansi B92.1-1996 Class 6 min active spline length 10.5 mm.

2. Mounting flange SAE A flange 101 - 2 per ISO 3019-1, surface to be paint free.

3. Thread: M12x1.75-6H, depth: 20 [0.787 min.; recommended screw-in depth 1.5 x thread dia (4x).

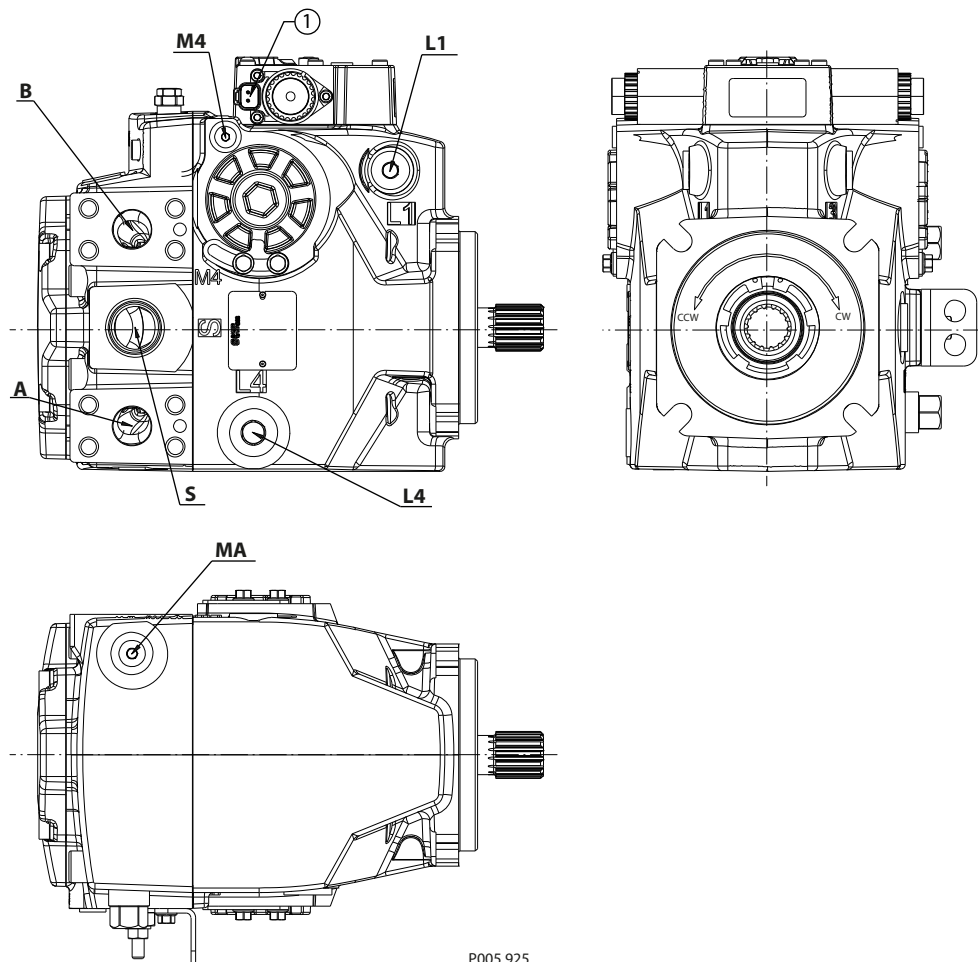
4. O-ring seal required, Ref 101.32 [3.989] id X 2.62 [0.103] cross section.

5. Auxiliary pump shaft length.

Option H1	Frame size 069	Frame size 089
L1	294.956 ± 2 [11.612 ± 0.079]	312.486 ± 2 [12.303 ± 0.79]
L2	279.83 ± 2 [11.017 ± 0.079]	296.83 ± 2 [11.686 ± 0.079]
Maximum torque	693 N•m [6130 lbf•in]	693 N•m [6130 lbf•in]

Caution

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

Installation drawings
T1P 069/089 ports description

Legend:

- 1.** Connector: Deutsch DT04-2P

Connector, shaft and mounting flange surface to be paint free.

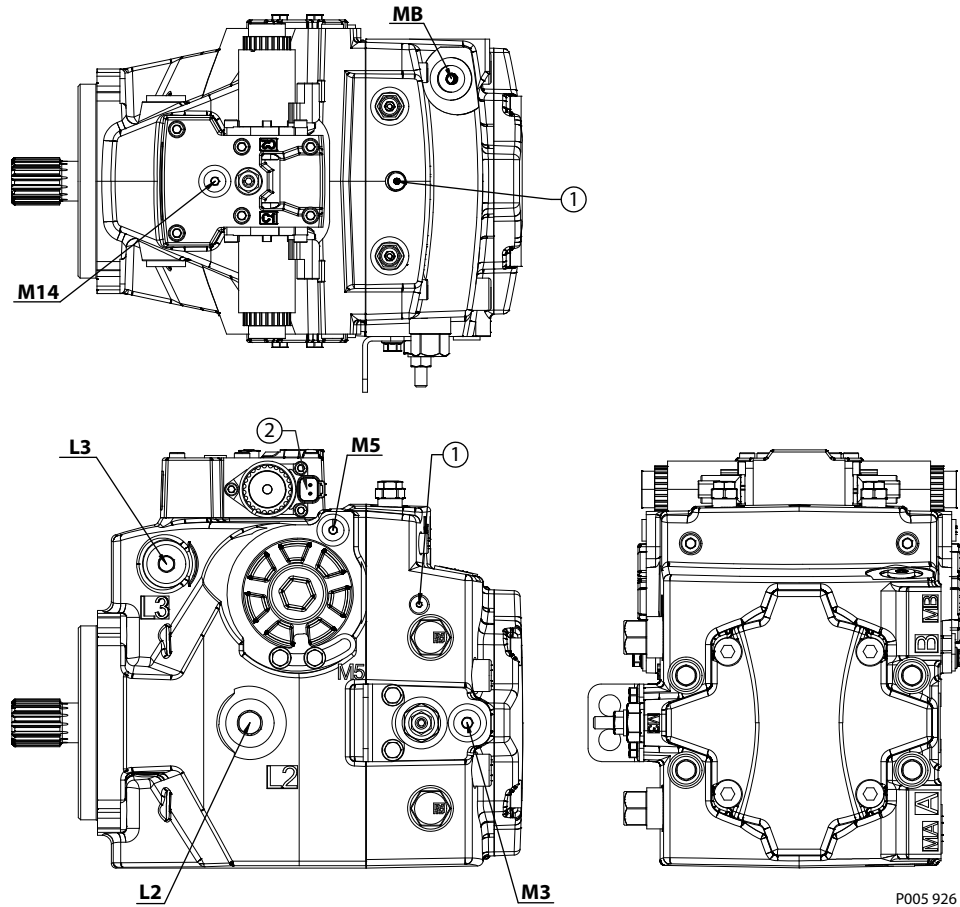
Ports per ISO 11926-1 description

Port	Description	Size 069	Size 089
A, B	System ports A and B ; 450 bar, Split flange boss per ISO 6162	Ø 25.4 mm; M12 x 1.75; 20 min. full thread depth; Recommended screw in depth 1.5 x thread dia	
L4	Case drain port	1 ¹ / ₁₆ -12; Ø48 max clearance for fitting	
MA	System A gauge port	9 ⁹ / ₁₆ -18; Ø28 max clearance for fitting	
M4	Servo gauge port	7 ⁷ / ₁₆ -20; Ø21 max clearance for fitting	
L1	Case pressure port	7 ⁷ / ₈ -14 Ø42 max clearance for fitting	1 ¹ / ₁₆ -12 Ø48 max clearance for fitting
S	Charge inlet port;	1 ⁵ / ₁₆ -12 Ø63 max clearance for fitting	1 ⁵ / ₈ -12 Ø69 max clearance for fitting

Please contact Danfoss Power Solutions representative for specific installation drawings.

Installation drawings

T1P 069/089 ports description



P005 926

Legend:

1. Charge pressure construction port ISO 11926-1 - $5/16$ -24
2. Connector: Deutsch DT04-2P

Connector, shaft and flange surface to be paint free.

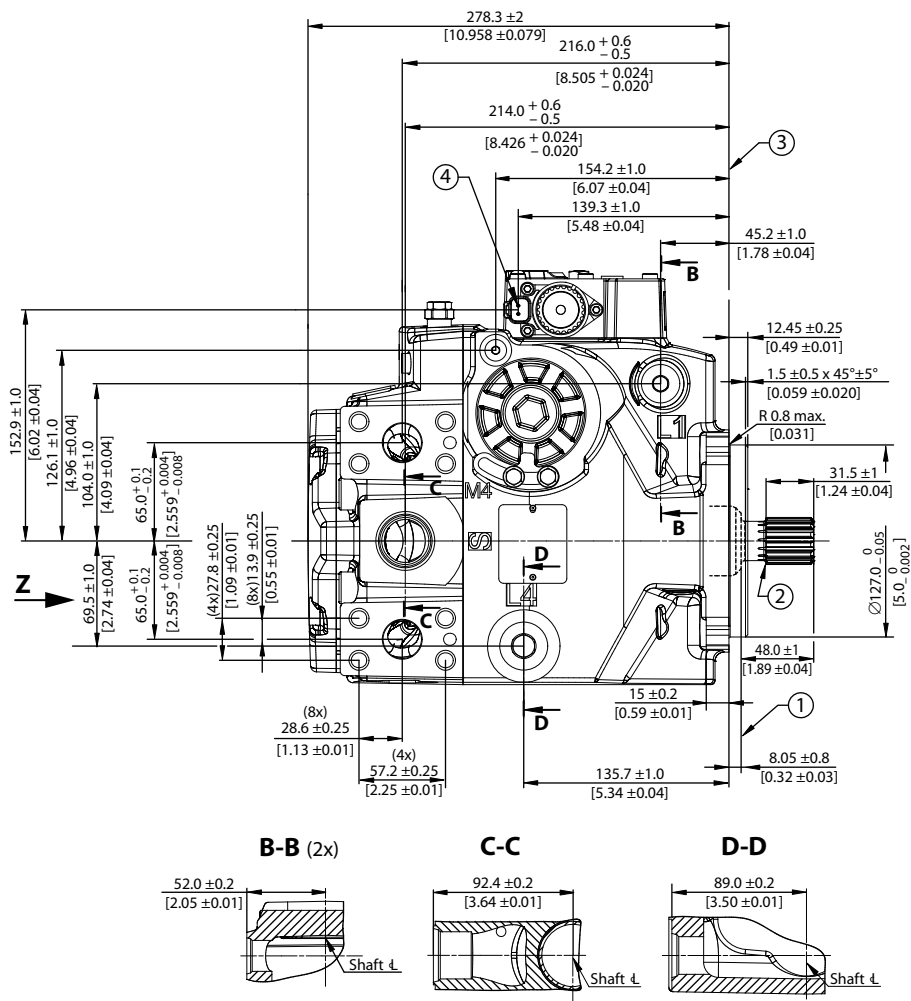
Ports per ISO 11926-1 description

Port	Description	Size 069	Size 089
L3	Case pressure port	$7/8$ -14 Ø42 max clearance for fitting	$1\frac{1}{16}$ -12 Ø48 max clearance for fitting
L2	Case drain ports	$1\frac{1}{16}$ -12; Ø48 max clearance for fitting	
MB	System B gauge port	$9/16$ -18; Ø28 max clearance for fitting	
M3	Charge gauge port, after filtering	$9/16$ -18; Ø28 max clearance for fitting	
M5	Servo gauge port	$7/16$ -20; Ø21 max clearance for fitting	
M14	Case gauge port	$7/16$ -20; Ø21 max clearance for fitting	

Please contact Danfoss Power Solutions representative for specific installation drawings.

Installation drawings

Dimensions T1P 069 with EDC



P005 927

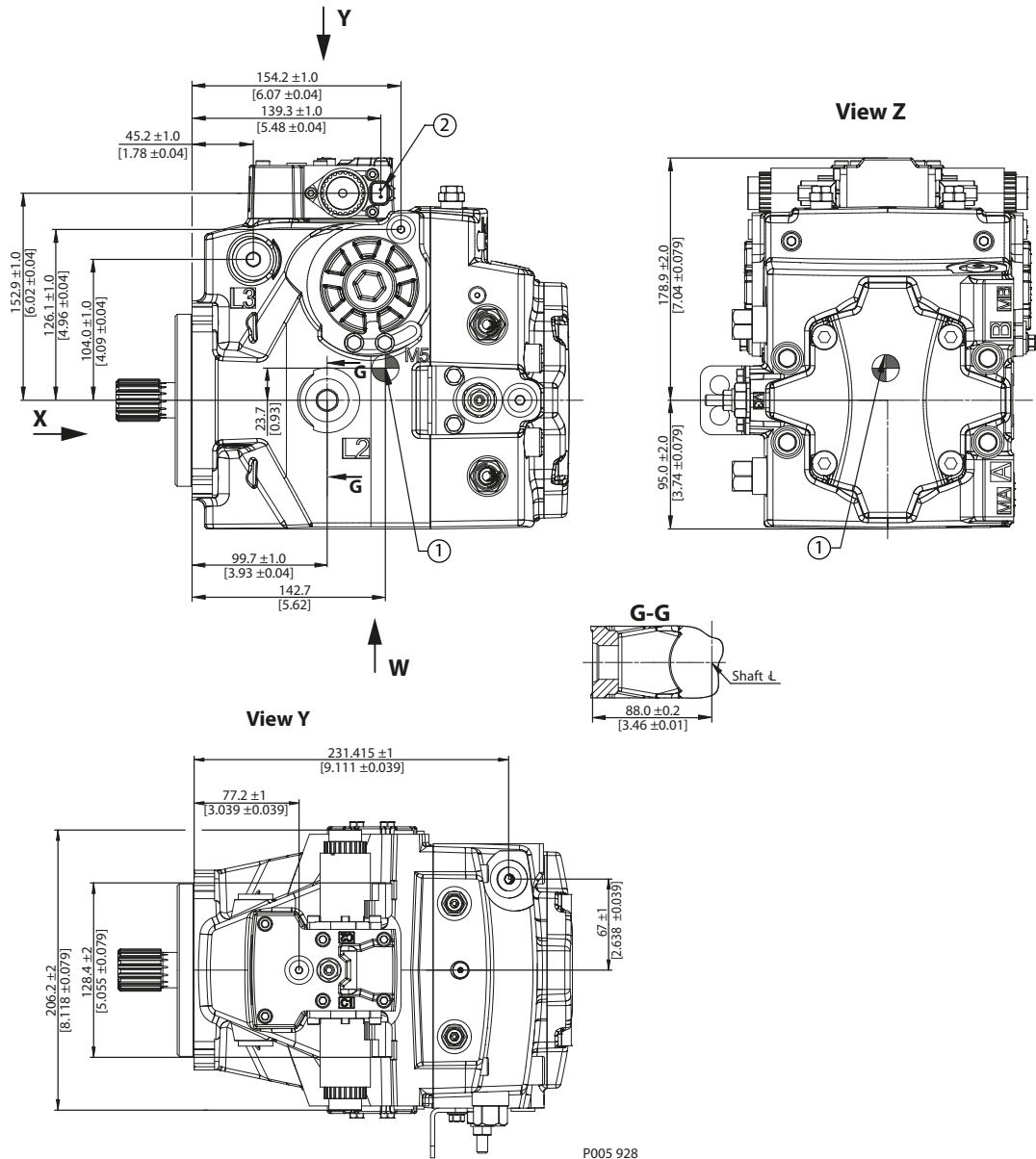
Legend:

1. Coupling must not protrude beyond this surface
2. Shaft to be paint free
3. Mounting flange surface (Flange 127-4 per ISO 3019-1) to be paint free
4. Connector (Deutsch DT04-2P) to be paint free

Please contact Danfoss Power Solutions representative for specific installation drawings.

Installation drawings

Dimensions T1P 069 with EDC



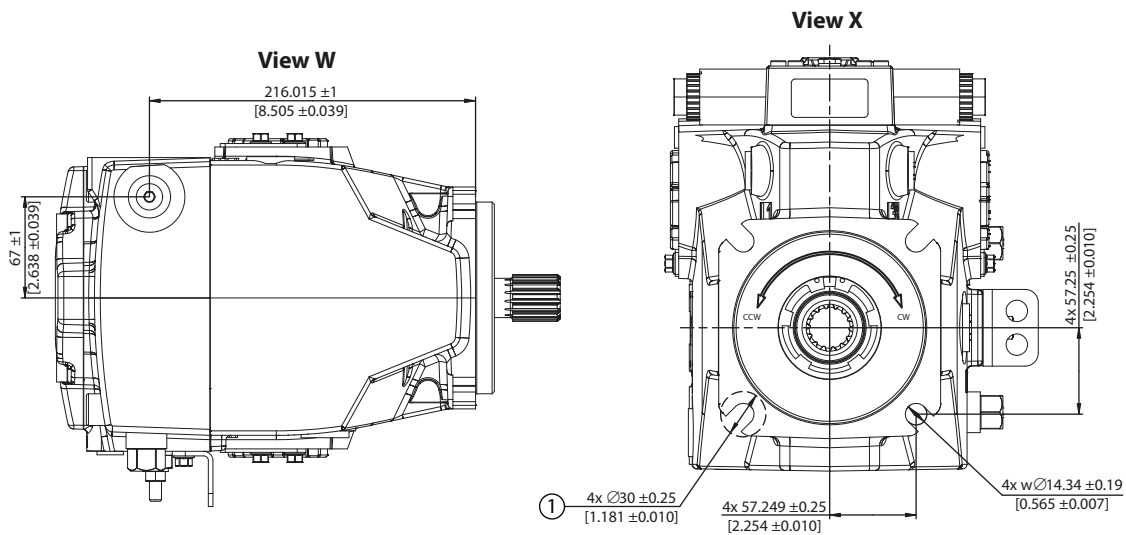
Legend:

1. Approximate center of gravity
2. Connector (Deutsch DT04-2P) to be paint free

Please contact Danfoss Power Solutions representative for specific installation drawings.

Installation drawings

Dimensions T1P 069 with EDC



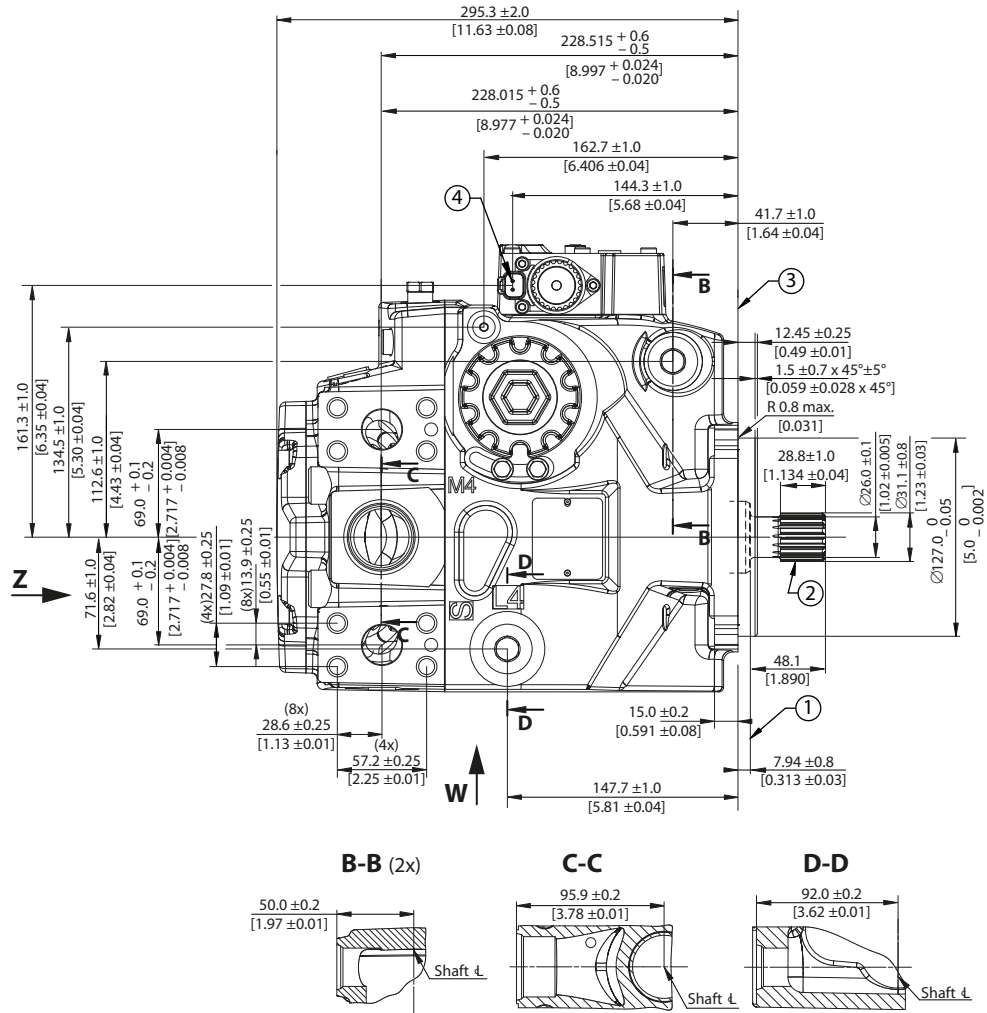
Legend:

- 1. Other side screw, head space

Please contact Danfoss Power Solutions representative for specific installation drawings.

Installation drawings

Dimensions T1P 089 with EDC



P005 937

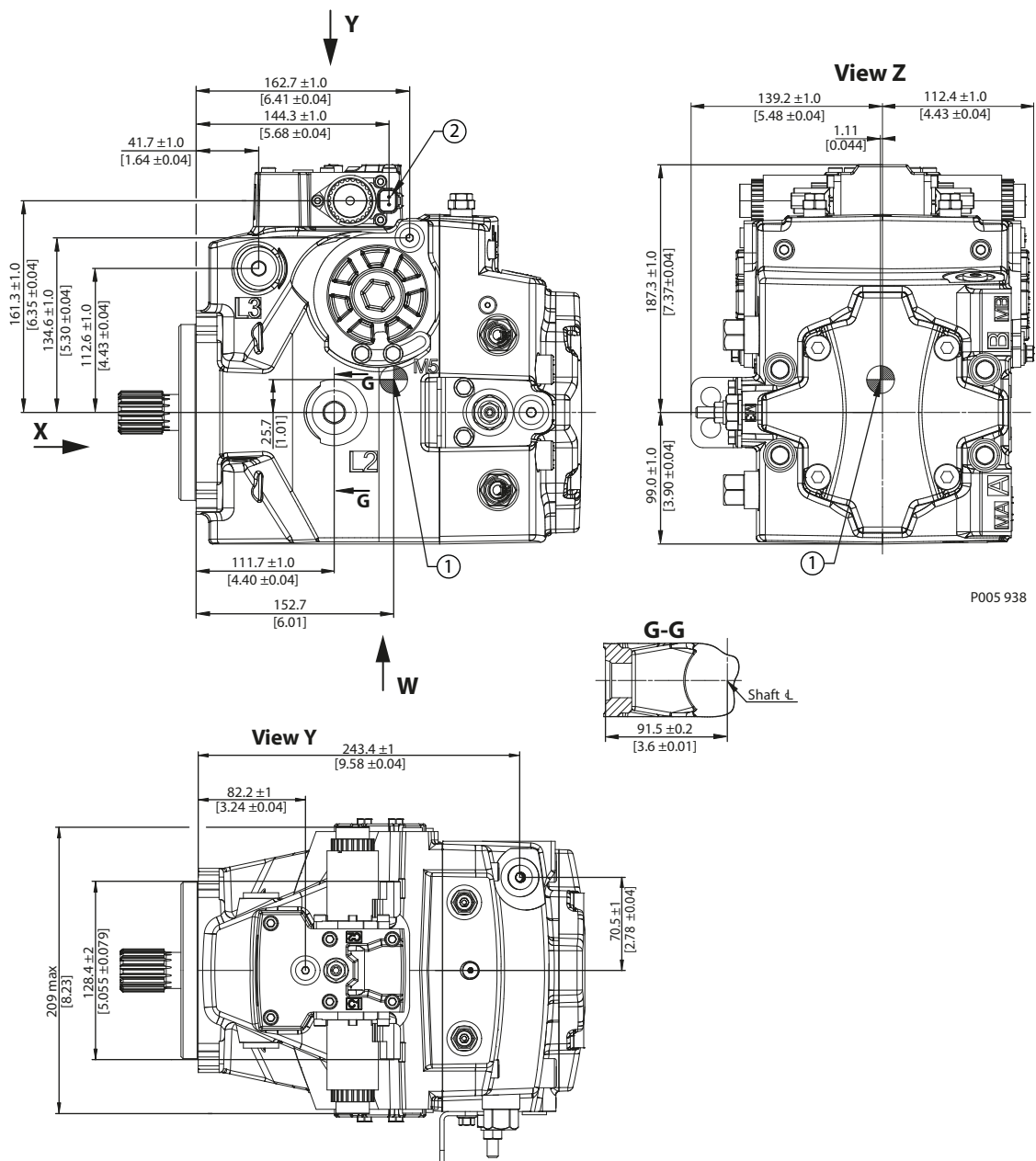
Legend:

1. Coupling must not protrude beyond this surface
2. Shaft to be paint free
3. Mounting flange surface (Flange 127-4 per ISO 3019-1) to be paint free
4. Connector (Deutsch DT04-2P) to be paint free

Please contact Danfoss Power Solutions representative for specific installation drawings.

Installation drawings

Dimensions T1P 089 with EDC



P005 938

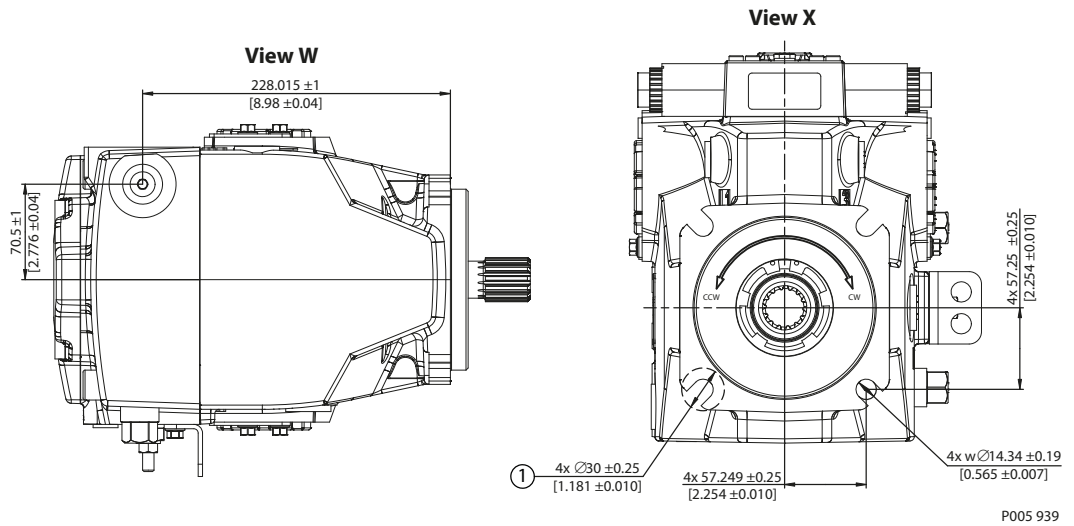
Legend:

- 1.** Approximate center of gravity
- 2.** Connector (Deutsch DT04-2P) to be paint free

Please contact Danfoss Power Solutions representative for specific installation drawings.

Installation drawings

Dimensions T1P 089 with EDC



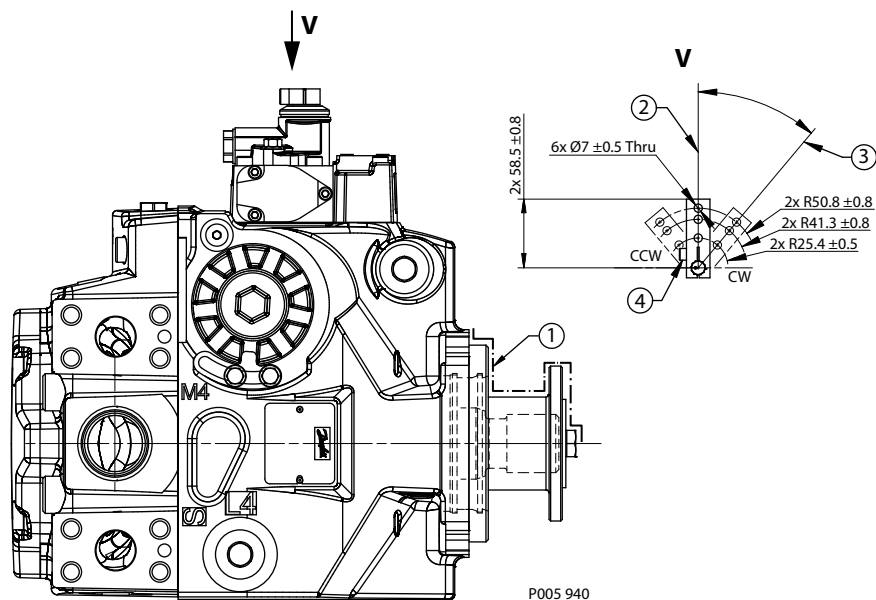
Legend:

- 1. Other side screw head space

Please contact Danfoss Power Solutions representative for specific installation drawings.

Installation drawings

Dimensions T1P with MDC

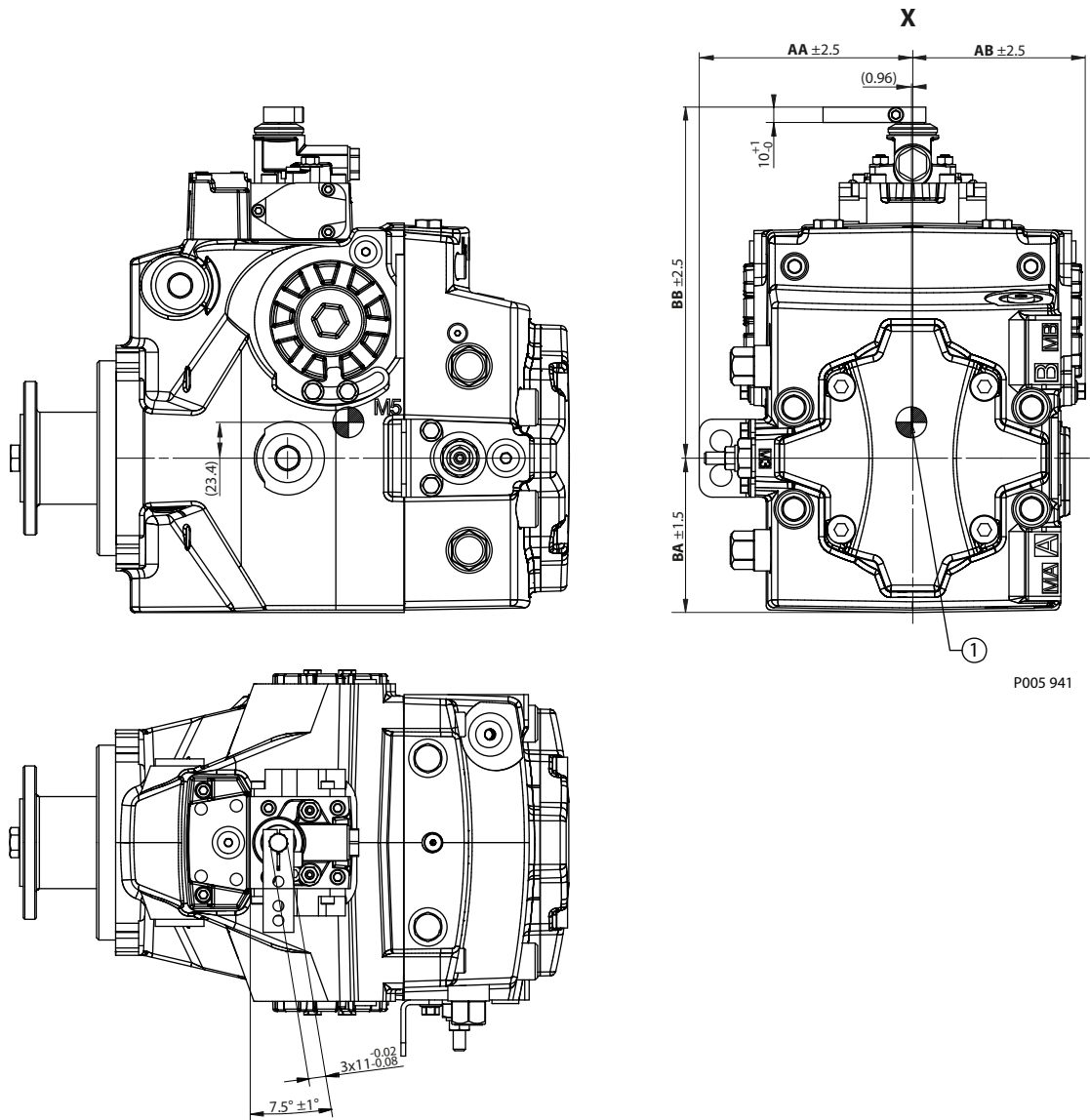


1. Paint free
2. Neutral
3. Maximum displacement
4. 2x control handle screw, wrench size 5, internal hex

For other dimensions see the sections [Dimensions T1P 069 with EDC](#) on page 29 and [Dimensions T1P 089 with EDC](#) on page 32.

Please contact Danfoss Power Solutions representative for specific installation drawings.

Installation drawings

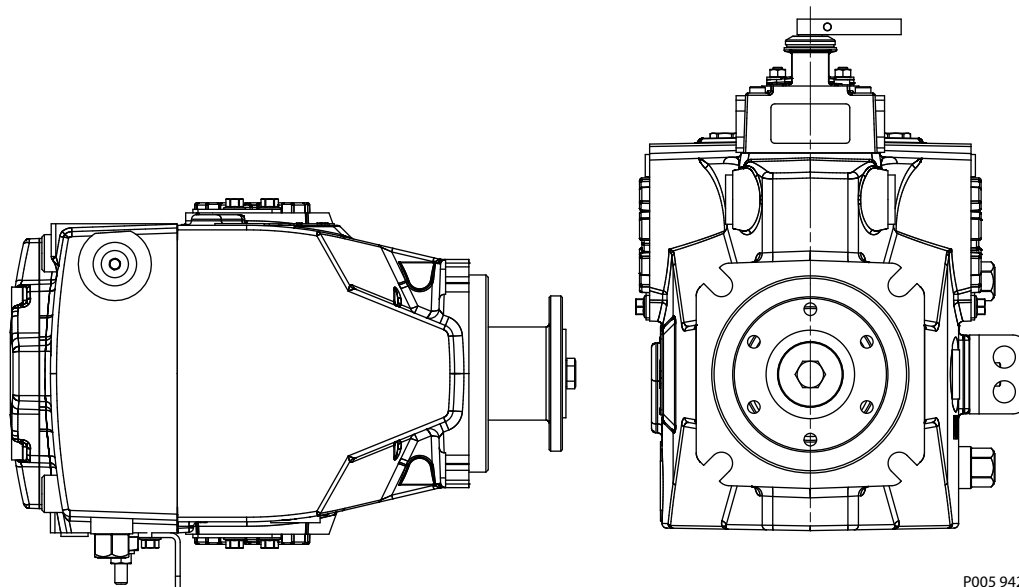


1. Approximate center of gravity

Callout letter in the drawing	Size 069	Size 089
AA	138.18 ±2	139.176 ±2
AB	108.9 ±2	112.4 ±2
BA	95.0 ±2	100.6 ±2
BB	178.9 ±2	228.89 ±2

For other dimensions see the sections [Dimensions T1P 069 with EDC](#) on page 29 and [Dimensions T1P 089 with EDC](#) on page 32.

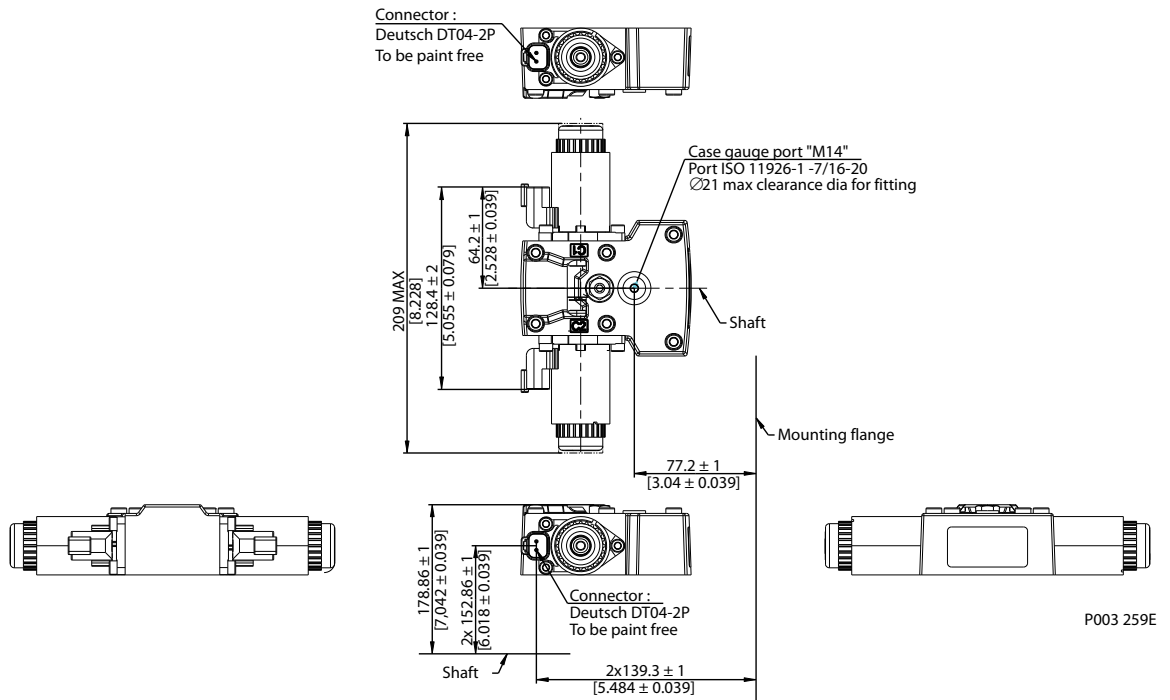
Installation drawings



Please contact Danfoss Power Solutions representative for specific installation drawings.

Controls

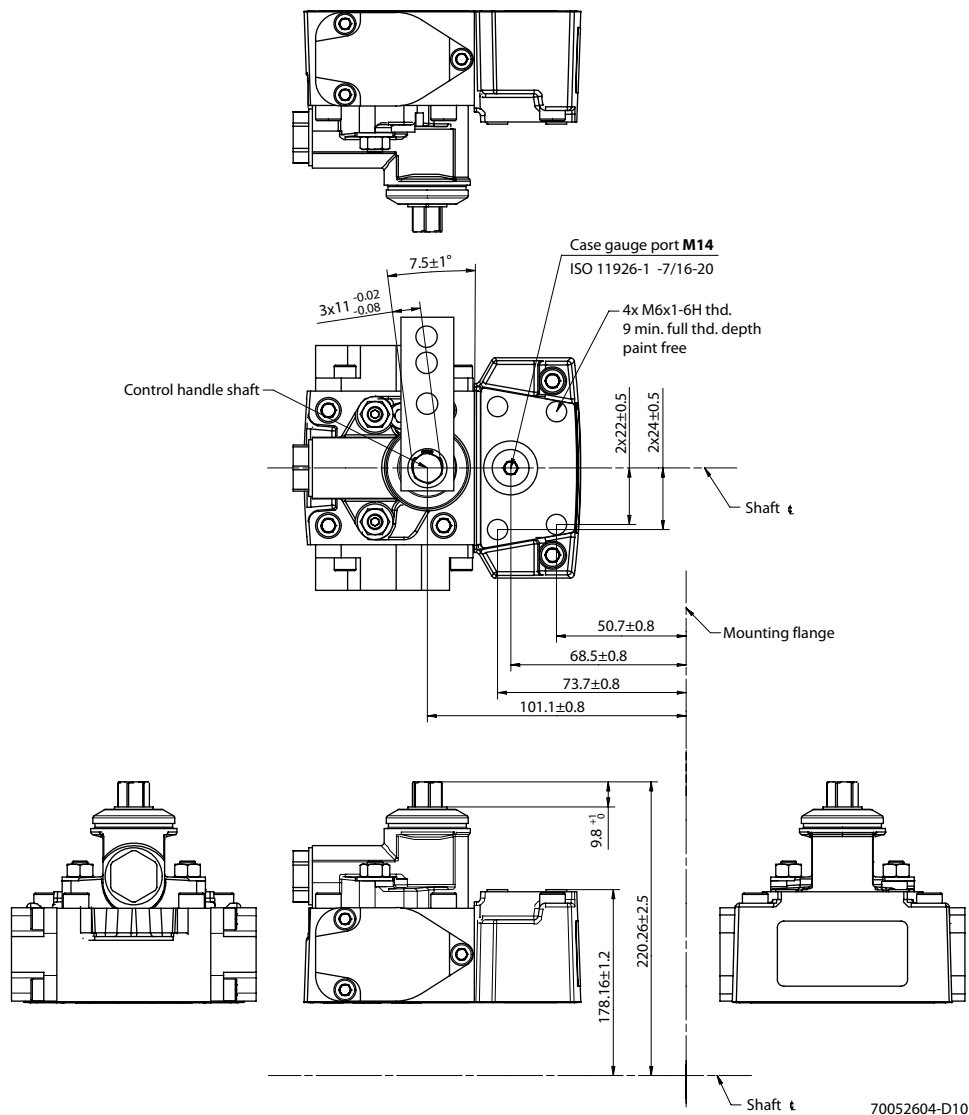
T1P 069/089 Electric Displacement Control (EDC) with MOR, option A5 (24 V)



Please contact Danfoss Power Solutions representative for specific installation drawings.

Controls

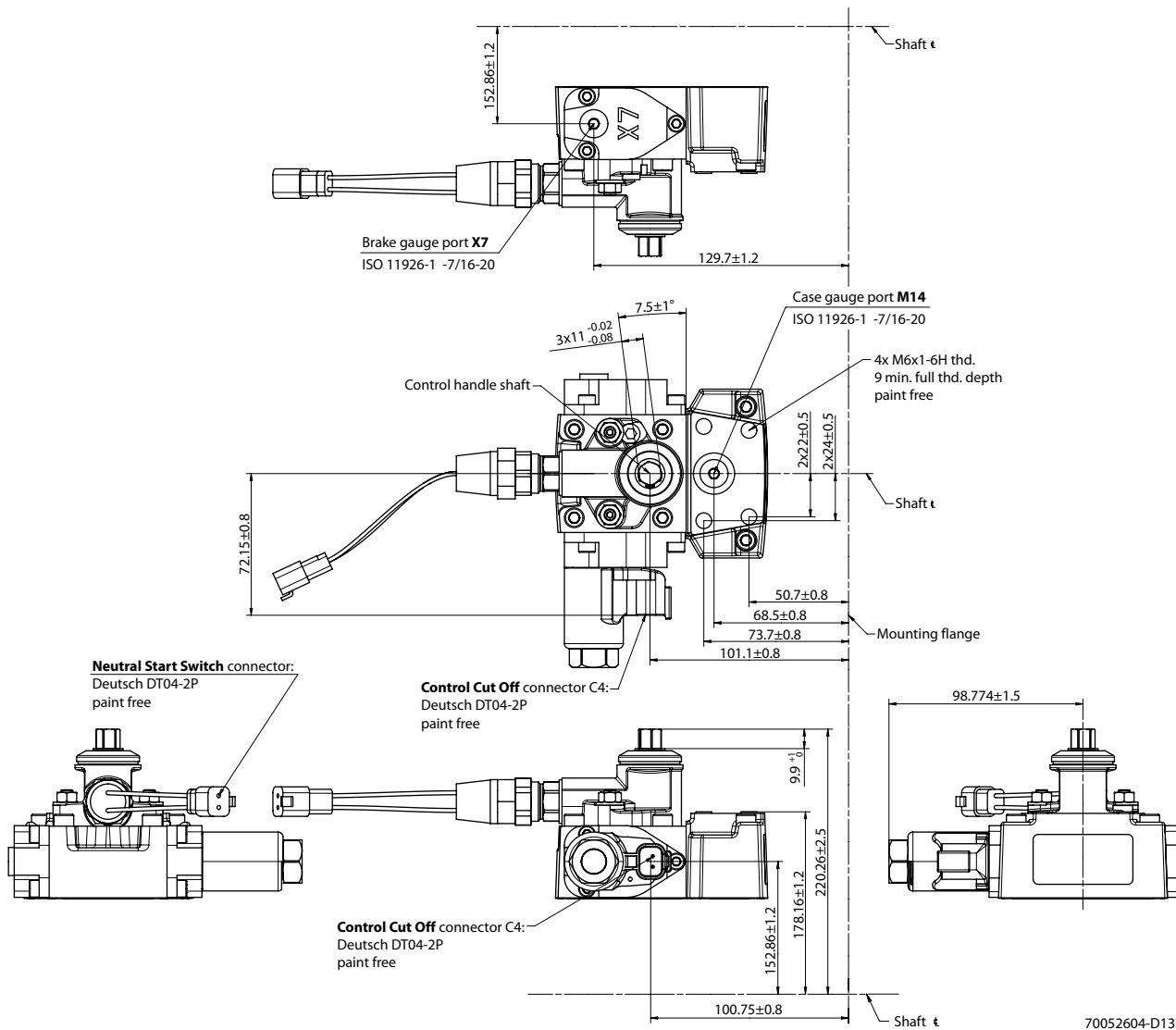
T1P 069/089 Manual Displacement Control (MDC), option M1



Please contact Danfoss Power Solutions representative for specific installation drawings.

Controls

T1P 069/089 Manual Displacement Control (MDC) with NSS and CCO, option M6

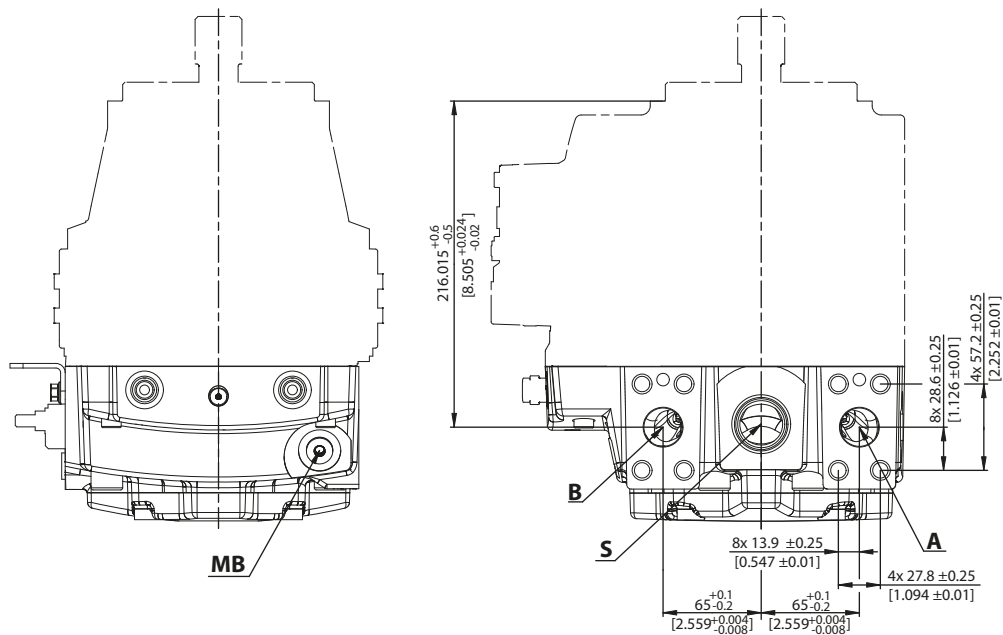


70052604-D13

Neutral Start Switch connector / Control Cut Off connector C4:

Pin	Assignment
1	Supply
2	Ground

Please contact Danfoss Power Solutions representative for specific installation drawings.

Filtration
T1P 069/089 suction filtration


P003 329

Ports per ISO 11926-1 description

Port	Description	Size 069	Size 089
A, B	System ports A and B ; 450 bar, Split flange boss per ISO 6162	Ø 25.4 mm; M12 x 1.75; 20 min. full thread depth; Recommended screw in depth 1.5 x thread dia	
MB	System B gauge port	$\frac{9}{16}$ -18; Ø28 max clearance for fitting	
S	Charge inlet port;	$1\frac{5}{16}$ -12 Ø63 max clearance for fitting	$1\frac{5}{8}$ -12 Ø69 max clearance for fitting

Please contact Danfoss Power Solutions representative for specific installation drawings.

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Local address:

Danfoss Power Solutions (US) Company
2800 East 13th Street
Ames, IA 50010, USA
Phone: +1 515 239 6000

Danfoss Power Solutions GmbH & Co. OHG
Krokamp 35
D-24539 Neumünster, Germany
Phone: +49 4321 871 0

Danfoss Power Solutions ApS
Nordborgvej 81
DK-6430 Nordborg, Denmark
Phone: +45 7488 2222

Danfoss Power Solutions Trading (Shanghai) Co., Ltd.
Building #22, No. 1000 Jin Hai Rd
Jin Qiao, Pudong New District
Shanghai, China 201206
Phone: +86 21 3418 5200

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