RE 14 355/07.02

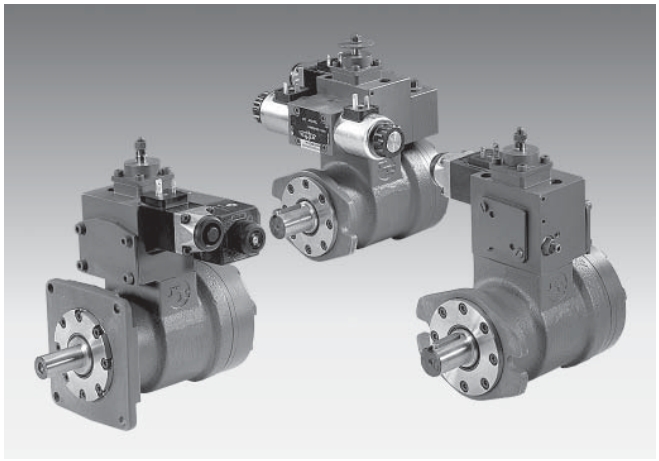
Replaces: 10.98

Hydro-positioning motor with integrated controls
Type GMRP

Nominal sizes 50 to 320

Series 2X

Maximum operating pressure 70 bar



Type: GMRP (various versions)

Overview of contents

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Features

Motor

- Short, compact design
- Good slow running characteristics
- Reversible
- High torques and starting torques
- Low running noise
- Roller guided gerotor motor
- High permissible RPM

Controls

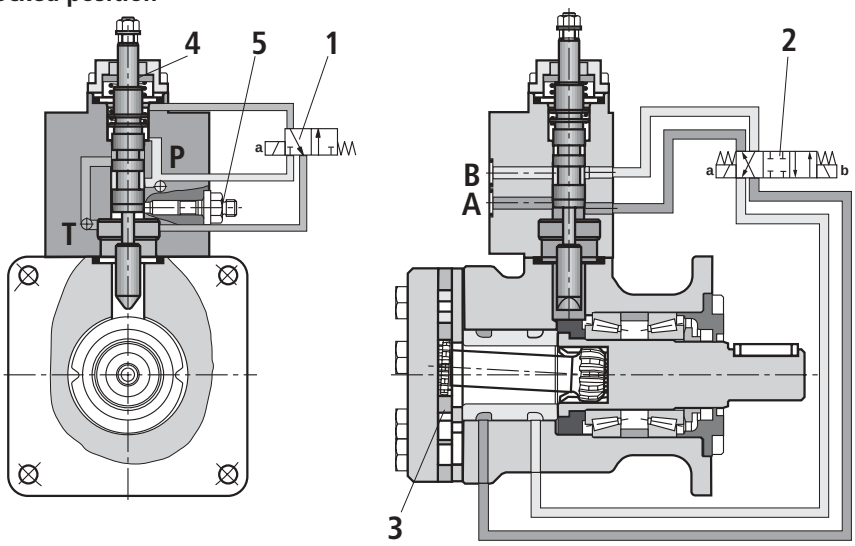
- Valve controls with hydro-mechanical follow-up controls
- Valve control can be optionally rotated through 180°
- Standard directional valve for direction of rotation control
- Holding function in the depressurised condition
- High clock frequency
- Controllable start of delay
- RPM can be steplessly adjusted
- Adjustable delay valve
- Exact positioning
- Ports A and B for additional actuators

Application possibilities

- Tool changers
- Rotary tables
- Conveyor belts
- Handling systems
- Tool magazine chain
- Tool magazine plate
- Tool turret
- Work piece magazine
- Pallet changer

Section, function

Locked position



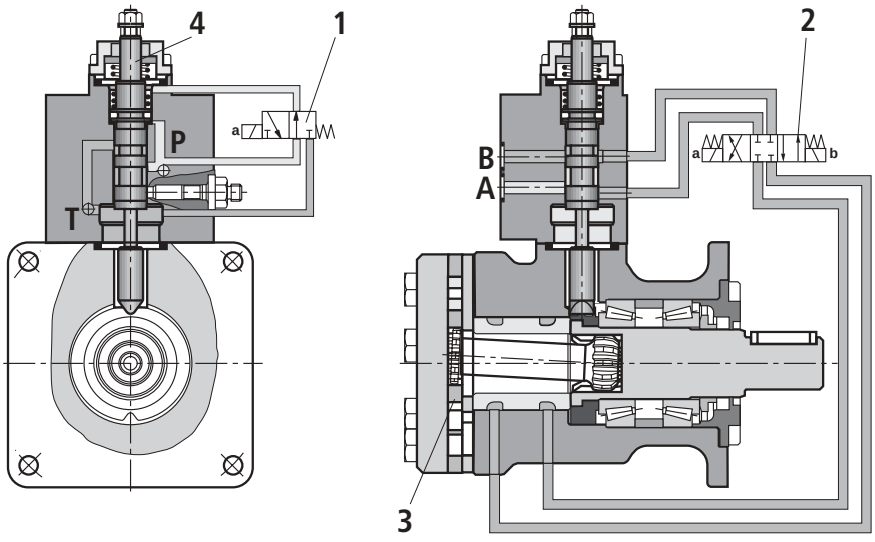
Via the start/stop valve (1) the spring chamber of the control spool (4) is connected with the pressure side (P). There is no connection to the displacment chamber (3). The direction of rotation valve (2) is in the closed centre position.

The motor is locked.

Port (A) is connected to (P). Therefore, for example, a clamping or locking cylinder can be actuated.

Port (B) is connected to tank (T).

Acceleration phase



By activating the start/stop valve (1) the spring chamber of the control spool (4) is connected to tank (T) and the control spool (4) is moved into the unlocked position.

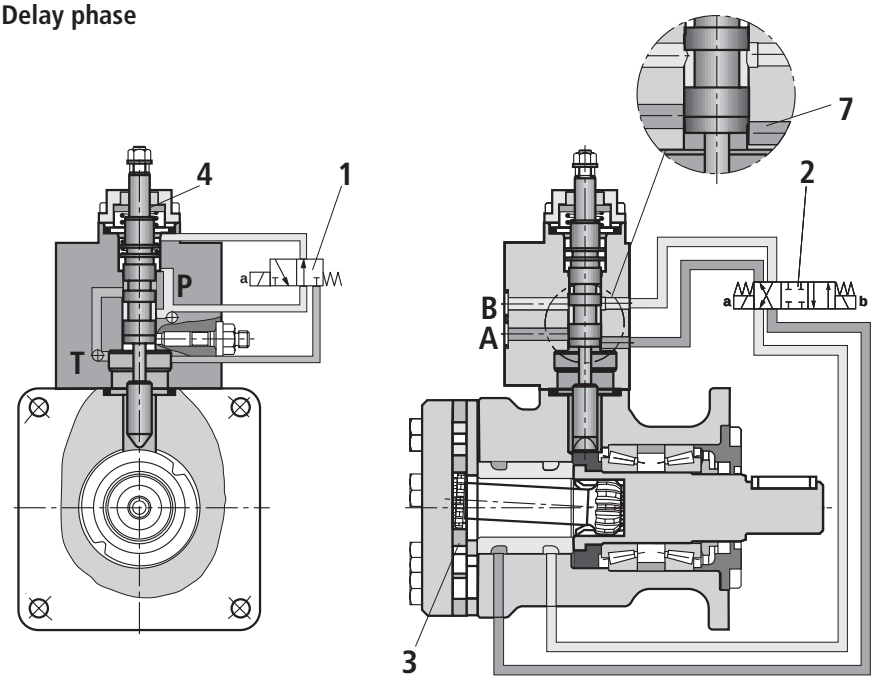
By activating the direction of rotation valve (2) the displacement chamber (3) is pressurised.

The motor starts to turn.

The achievable angular velocity is dependent on the flow. Via the throttle (5) it is possible to individually set the maximum speed.

Port (B) is connected to port (P), port (A) to the tank (T). Clamping or locking cylinders that may be fitted are released.

Delay phase



When approching the required position the delay is activated via the start/stop valve (1).

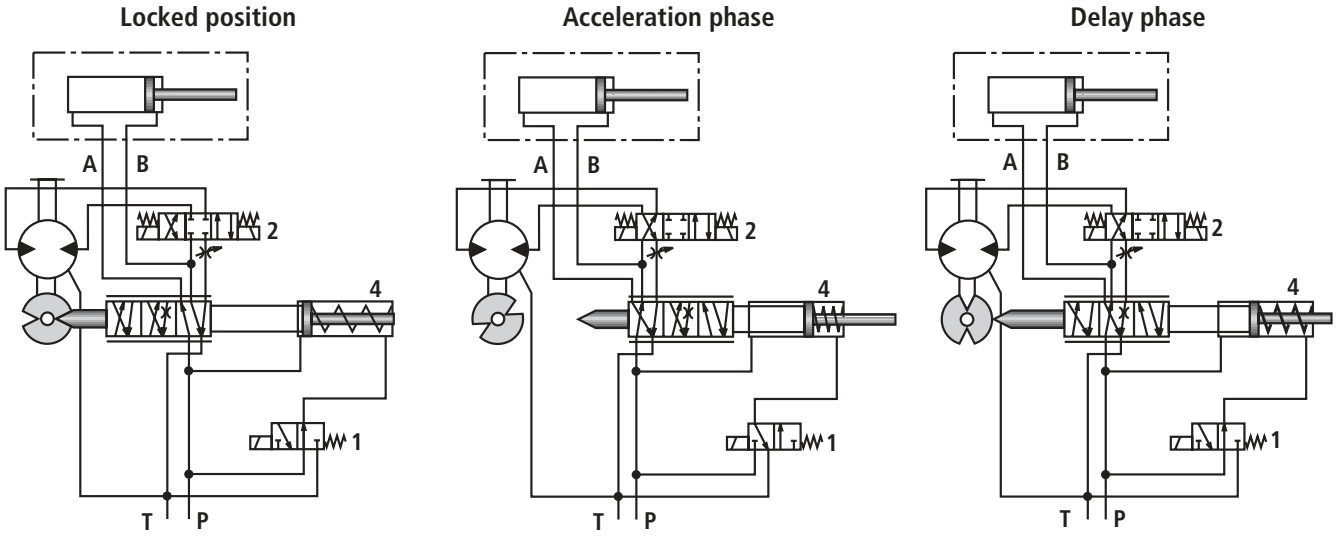
Due to the connection of the spring chamber with (P) the control spool moves in the direction of the detent disc (6).

As soon as the outer contour of thze plate has contanct the damping cross-section (7) of the tank line is virtually closed by the control spool (4).

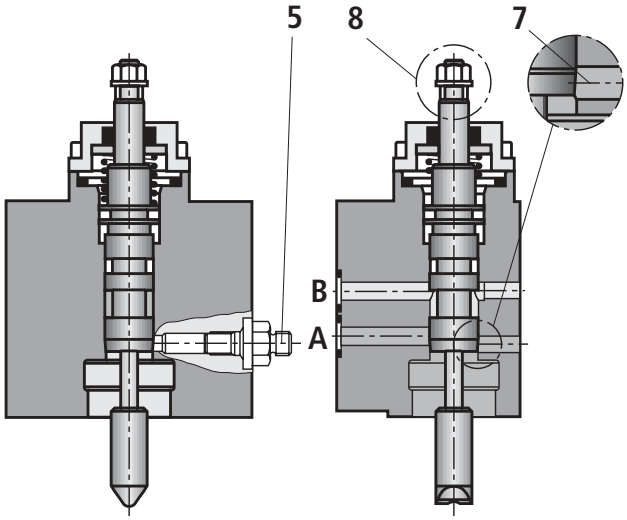
Thereby the flow is throttled and the speed is correspondingly reduced.

When the detent position is reached the connection to the tank is completely closed and the motor is in its locked position.

Symbolic representation



Adjustment of the delay relationship



The outer contour of the detent disc is so formed that as the detent notch is approached the disc radius and thereby the damping cross-section (7) reduced.

The delay characteristics of the GMRP motor is progessive.

So that the mass moved can be individually matched it is possible to adjust the damping cross-section (7). The damping cross-section (7) can be set via an adjustment mechanism (8) on the control spool. The delay relationship can be, therefore steplessly selected between "soft" and "hard". This is also possible during or after the machine commissioning.

Determination of the delay angle

To guarantee shock-free positioning, the start valve must be reset at a specific angle before the end position of the motor is reached.

This angle (φ_P) can be determined as follows:

φ_P = disc delay angle φ_V + progress angle during the signal propagation time within the electronics φ_E

φ_V = 60° with 1 and 2 positions per rotation
40° with 3 positions per rotation

$$\varphi_E = \frac{n}{60} \bullet (t_S + t_{valve}) \bullet 360°$$

n = RPM of the GMRP motor [min^{-1}]
(set at the RPM screw)

t_S = Signal propagation time within the electroncis [s]
(angle of rotation transmitter, control)

t_{valve} = Switch-off time of the start valve (0.025 s)

$$\Rightarrow \quad \varphi_P = \varphi_V + \frac{n}{60} \bullet (t_S + 0.025\ s) \bullet 360°$$

If the calculated angle φ_P is greater than:

350° with 1 position per rotation
170° with 2 positions per rotation
110° with 3 positions per rotation

Then this can lead to faulty positioning.
In this case the motor speed should be reduced via the throttle **5**.

Ordering details

GMRP			2X	/	M		–		/		*

Nominal size

50 cm³	**= 050**
80 cm³	**= 080**
100 cm³	**= 100**
125 cm³	**= 125**
160 cm³	**= 160**
200 cm³	**= 200**
250 cm³	**= 250**
320 cm³	**= 320**

Shaft end

Cylindrical Ø 1", with key-way [1]	**= W**
Cylindrical Ø 1 1/4", with key-way [2]	**= W**
Cylindrical Ø 20 mm, without key-way [1]	**= T**

Series 20 to 29 **= 2X**
(20 to 29: unchanged installation and connection dimensions

Seals

NBR seals suitable for mineral oil HLP to DIN 51 524, part 2 for operating temperatures < 70 °C. **= M**

Please take into our specifications stated within catalogue sheet RE 07 075.

Mounting flange

2-hole, SAE A [3]	**= R**
4-hole, spigot Ø 80 mm	**= A**

No. of detent notches

One position per rotation	**= 1**
Two positions per rotation	**= 2**
Three positions per rotation	**= 3**

Positioning valve

1 = Ports at rear – directional valve on drive shaft side (can be rotated through180 °
2 = Ports at the front – directional valve on end cap side (can be rotated through180 °)

Direction of rotation valve

1 = Porting pattern to DIN 24 340, form A, ISO 4401 and CETOP-RP 121 H for valve NS 6
2 = With built-on directional valve, for further information see catalogue sheet RE 23 178
3 = With built-on direction of rotation plate, clockwise rotation [4]
4 = With built-on direction of rotation plate, anti-clockwise rotation [4]

Solenoid voltage

G24 = 24V/DC
W110 = 110V/AC

Hydraulic connections

No code = Connection surface with O-ring seal
01 = Connection plate with pipe thread to ISO 228/1

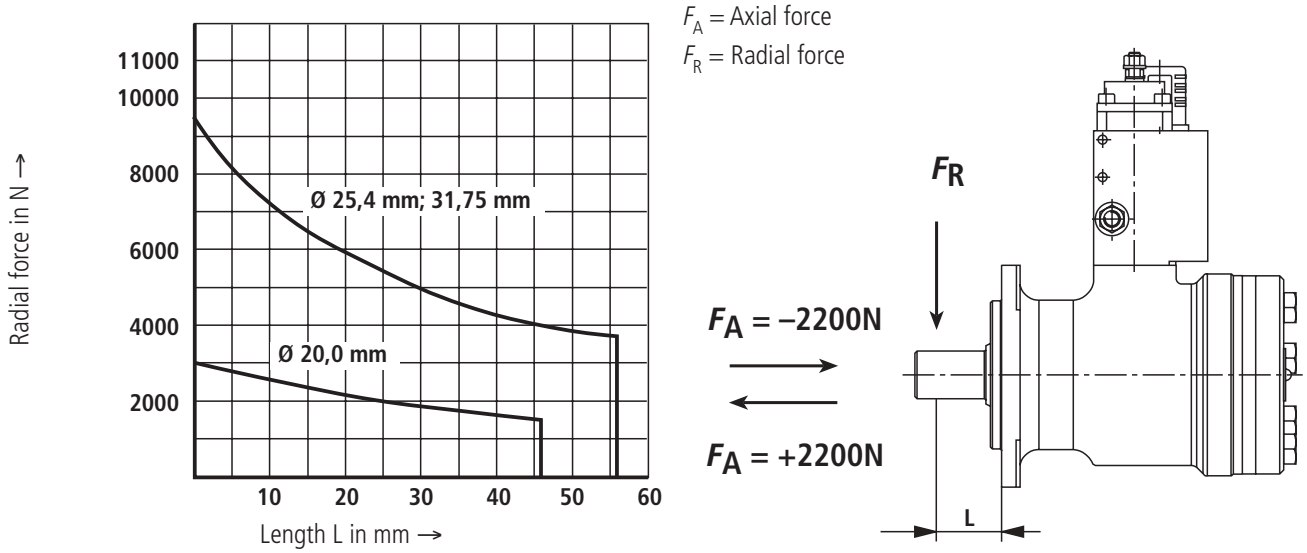
Status acquisition

No code = Without status acquisition
S = With switching disc

Further details in clear text

[1] NS 50 to NS 200
[2] NS 250 and NS 320
[3] Not with NS 250 and NS 320
[4] Direction of rotation viewed on the drive shaft

Permissible drive shaft loading



Technical data: motor (for applications outside these parameters, please consult us!)

General

Design	Gerotor motor with valve control and hydro-mechanical follow-up controls
Type	GMRP
Mounting style	Flange mounting
Shaft loading	See page 4
Direction of rotation	Clockwise / anti-clockwise - reversible

Hydraulic

Nominal size		NS	**50**	**80**	**100**	**125**	**160**	**200**	**250**	**320**
Displacement volume	V	cm^3	50.9	78.7	98.9	123.6	158.5	197.8	247.2	316.9
Start-up torque (at p = 70 bar)	T_{Start}	Nm	31	60	76	96	125	150	206	262
Torque	T_{max}	Nm	44	73	90	113	148	184	232	294
RPM (at 20 L/min)	n_{max}	min^{-1}	378	240	190	155	119	96	77	60
Operating pressure (continuous operation)	p_{max}	bar	70							
Return pressure	p_{max}	bar	10							
Inlet pressure	p_{max}	bar	70							
Pressure fluid			Mineral oil (HLP) to DIN 51 524; part 2							
Pressure fluid temperature range	ϑ	°C	– 10 to + 70							
Viscosity range	ν	mm^2/s	10 to 160 at operating temperature (max. 800 at start-up)							
Degree of contamination			Maximum permissible degree of contamination of the pressure fluid is to NAS 1638 class 10. We, therefore recommend a filter with a minimum retention rate of $\beta_{20} \geq 100$. To ensure a long service life, we recommend class 9 to NAS 1638. Achievable with a filter that has a minimum retention rate of $\beta_{10} \geq 100$.							
Positioning time for 180°	t	s	< 0.5							
Positions per rotation			1, 2 or 3							
Type of positioning			Posative locking							

Technical data: start / stop - valve

Electrical

Voltage type			DC	AC
Available voltages	U	V	24	Solenoid 96V/DC with rectifier for 110V/AC
Power consumption at 20 °C	P	W	26	
Duty		%	100	
Switching time	t_{on}	ms	≤ 20 to 45	
	t_{off}	ms	≤ 10 to 25	
Protection to DIN 40 050	Solenoid and connection		IP 65	
Switching frequency	f	Hz	4	
Ambient temperature	ϑ	°C	Up to 50	
Coil temperature	ϑ	°C	Up to 150	

Attention!

The use of a fault protection circuit to CE increases the switch-off time. When operating with AC voltage the rectifier plug supplied must be used.

Technical data (average values, measured at $\nu = 46$ mm²/s and $\vartheta = 45$ °C)

NS 50			Flow q_v in L/min				
			0	**5**	**10**	**15**	**20**
Pressure differential Δp in bar	**20**	T in Nm	6	10	8	7	6
		n in min^{-1}	0	93	192	286	382
	40	T in Nm	16	24	22	18	12
		n in min^{-1}	0	93	192	286	382
	60	T in Nm	27	38	37	32	27
		n in min^{-1}	0	93	192	286	382
	70	T in Nm	31	44	44	40	34
		n in min^{-1}	0	91	187	286	378

NS 80			Flow q_v in L/min				
			0	**5**	**10**	**15**	**20**
Pressure differential Δp in bar	**20**	T in Nm	15	19	14	8	0
		n in min^{-1}	0	60	117	183	0
	40	T in Nm	32	42	39	31	22
		n in min^{-1}	0	57	117	183	240
	60	T in Nm	50	64	62	56	45
		n in min^{-1}	0	54	117	178	240
	70	T in Nm	60	73	73	67	57
		n in min^{-1}	0	52	114	174	240

NS 100			Flow q_v in L/min				
			0	**5**	**10**	**15**	**20**
Pressure differential Δp in bar	**20**	T in Nm	18	24	19	10	0
		n in min^{-1}	0	47	93	144	0
	40	T in Nm	40	51	47	39	28
		n in min^{-1}	0	47	93	142	190
	60	T in Nm	65	77	74	67	57
		n in min^{-1}	0	46	93	141	190
	70	T in Nm	76	90	88	82	70
		n in min^{-1}	0	43	93	141	190

NS 125			Flow q_v in L/min				
			0	**5**	**10**	**15**	**20**
Pressure differential Δp in bar	**20**	T in Nm	23	31	25	14	0
		n in min^{-1}	0	38	80	118	0
	40	T in Nm	53	64	60	49	34
		n in min^{-1}	0	38	80	118	158
	60	T in Nm	83	97	95	85	71
		n in min^{-1}	0	37	78	117	156
	70	T in Nm	96	113	113	104	88
		n in min^{-1}	0	35	76	116	155

NS 160			Flow q_v in L/min				
			0	**5**	**10**	**15**	**20**
Pressure differential Δp in bar	**20**	T in Nm	30	42	33	17	0
		n in min^{-1}	0	30	62	92	0
	40	T in Nm	67	84	77	64	46
		n in min^{-1}	0	30	62	91	121
	60	T in Nm	109	127	124	111	93
		n in min^{-1}	0	29	59	91	121
	70	T in Nm	125	148	146	136	116
		n in min^{-1}	0	26	59	88	119

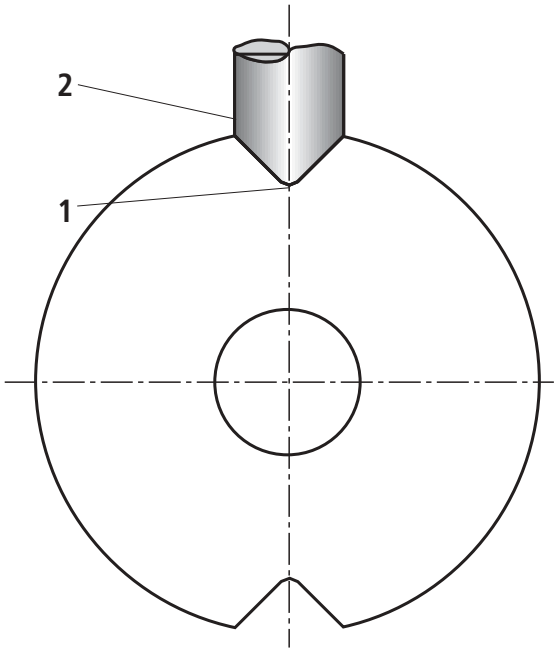
Technical data (average values, measured at $\nu = 46$ mm²/s and $\vartheta = 45$ °C)

NS 200			Flow q_v in L/min				
			0	**5**	**10**	**15**	**20**
Pressure differential Δp in bar	**20**	T in Nm	40	52	42	23	0
		n in min^{-1}	0	25	49	73	0
	40	T in Nm	87	106	99	79	58
		n in min^{-1}	0	25	49	73	97
	60	T in Nm	130	158	154	139	113
		n in min^{-1}	0	24	48	73	97
	70	T in Nm	150	184	180	167	142
		n in min^{-1}	0	22	48	73	96

NS 250			Flow q_v in L/min				
			0	**5**	**10**	**15**	**20**
Pressure differential Δp in bar	**20**	T in Nm	47	64	50	27	0
		n in min^{-1}	0	21	40	60	0
	40	T in Nm	106	133	124	102	70
		n in min^{-1}	0	20	40	59	80
	60	T in Nm	175	200	192	173	147
		n in min^{-1}	0	19	39	59	77
	70	T in Nm	206	232	228	210	180
		n in min^{-1}	0	19	37	57	77

NS 320			Flow q_v in L/min				
			0	**5**	**10**	**15**	**20**
Pressure differential Δp in bar	**20**	T in Nm	62	83	69	35	0
		n in min^{-1}	0	14	30	46	0
	40	T in Nm	144	171	158	131	94
		n in min^{-1}	0	14	30	45	60
	60	T in Nm	230	258	246	223	187
		n in min^{-1}	0	14	30	45	60
	70	T in Nm	262	294	290	265	229
		n in min^{-1}	0	14	29	44	60

Detent notches

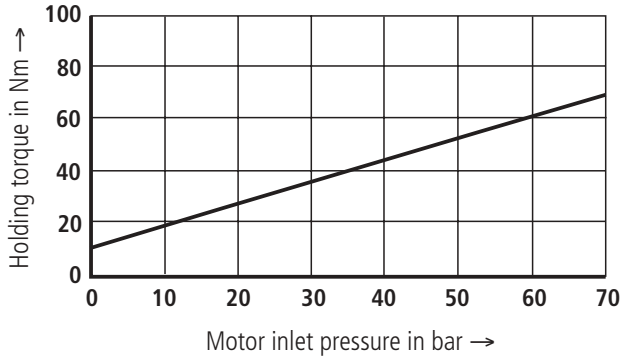


Detent notches

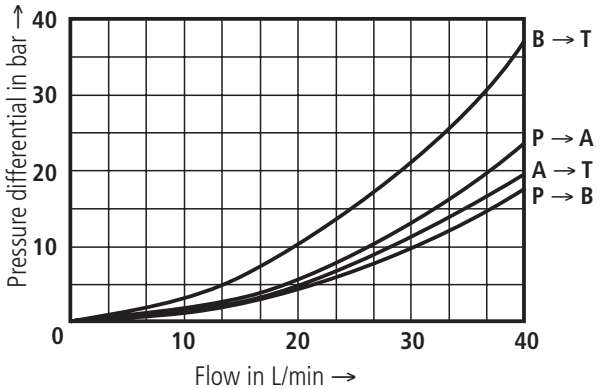
The form of the detent notch **1** and the detent element **2** determines the holding torque in the locked condition and the positional accuracy.

Positional accuracy: 30'
Repeatability: 10'

Holding torque of the GMRP positioning detent



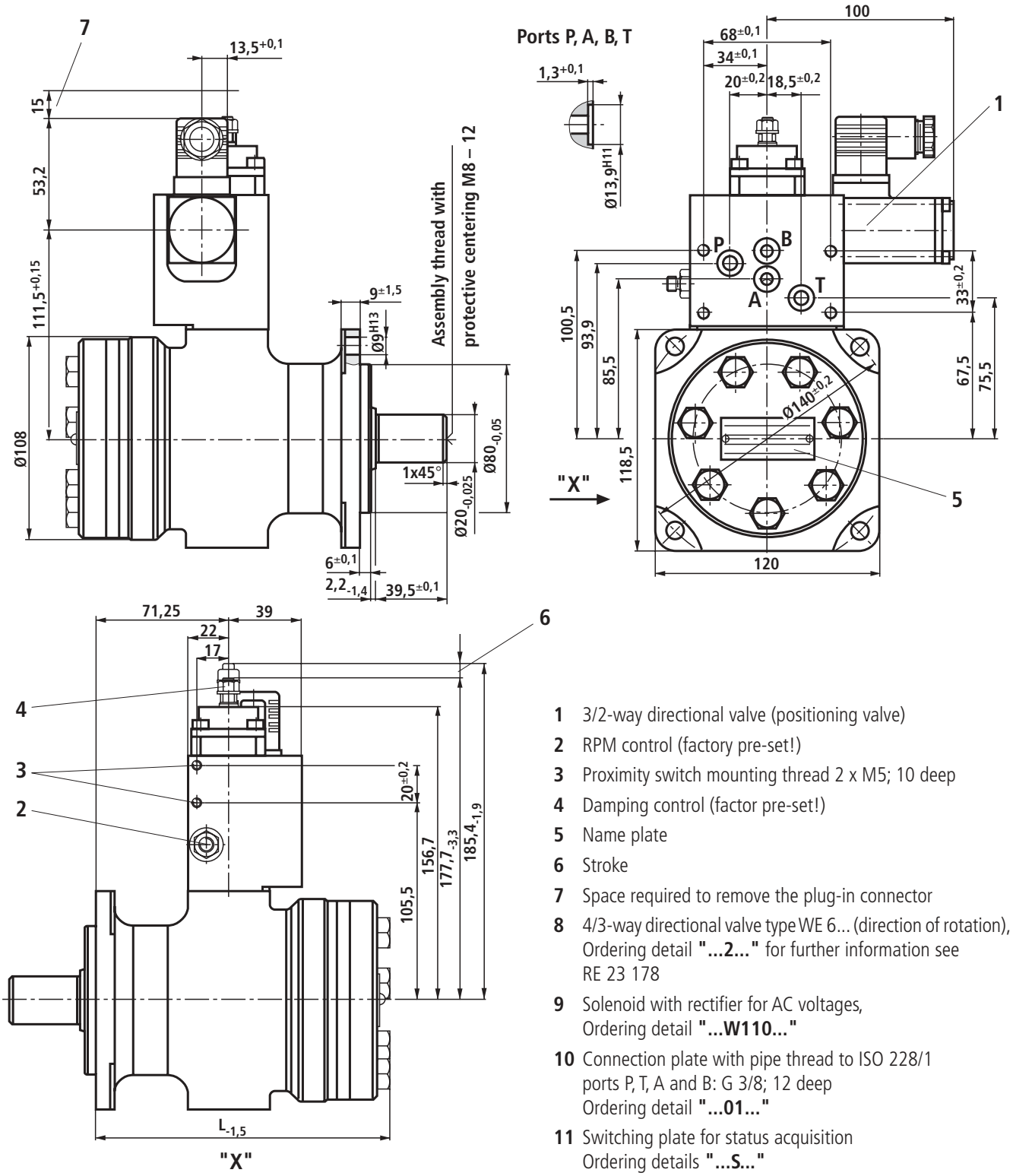
Control connections A and B ($\Delta p - q_V$–characteristic curves, measured at $\nu = 30$ mm²/s)



Motor locked: P → A; B → T;
Motor unlocked: P → B; A → T;

Via the control ports **A** and **B** it is possible to directly supply the clamping cylinders.

If higher flows are required, then we recommend that a hydraulically actuated NS 6 or 10 directional control valve (RE 22 282 or RE 22 331) is operated via the control ports **A** and **B** of the positioning motor.



1 3/2-way directional valve (positioning valve)

2 RPM control (factory pre-set!)

3 Proximity switch mounting thread 2 x M5; 10 deep

4 Damping control (factor pre-set!)

5 Name plate

6 Stroke

7 Space required to remove the plug-in connector

8 4/3-way directional valve type WE 6... (direction of rotation), Ordering detail **"...2..."** for further information see RE 23 178

9 Solenoid with rectifier for AC voltages, Ordering detail **"...W110..."**

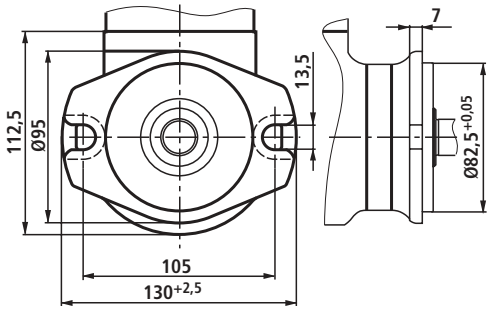
10 Connection plate with pipe thread to ISO 228/1 ports P, T, A and B: G 3/8; 12 deep Ordering detail **"...01..."**

11 Switching plate for status acquisition Ordering details **"...S..."**

NS	50	80	100	125	160	200	250	320
$L_{-1,5}$	158	162	165	168	173	178.5	185	195

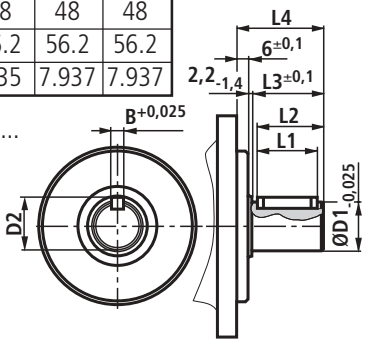
Unit dimensions (for position explanations see page 9) (Dimensions in mm)

GMRP..T2X/M**R**...

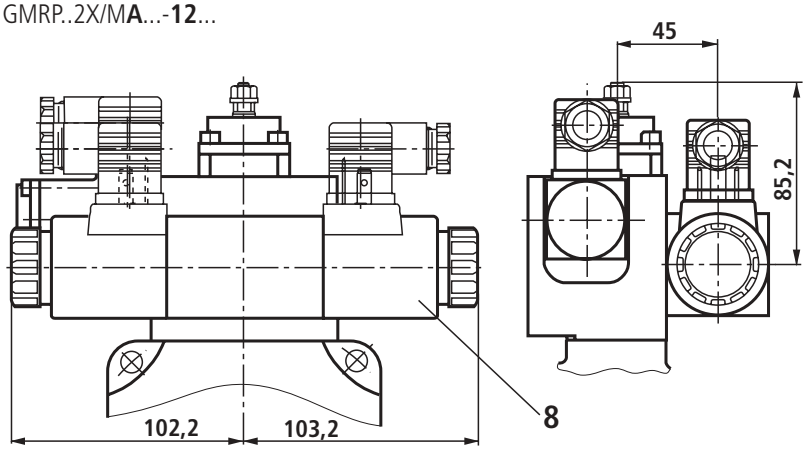


NS	50	80	100	125	160	200	250	320
ØD1	25.4	25.4	25.4	25.4	25.4	25.4	31.75	31.75
D2	28.1	28.1	28.1	28.1	28.1	28.1	35.33	35.33
L1	31.75	31.75	31.75	31.75	31.75	31.75	31.75	31.75
L2	31.75	31.75	31.75	31.75	31.75	31.75	36.8	36.8
L3	38	38	38	38	38	38	48	48
L4	46.2	46.2	46.2	46.2	46.2	46.2	56.2	56.2
B+0.025	6.35	6.35	6.35	6.35	6.35	6.35	7.937	7.937

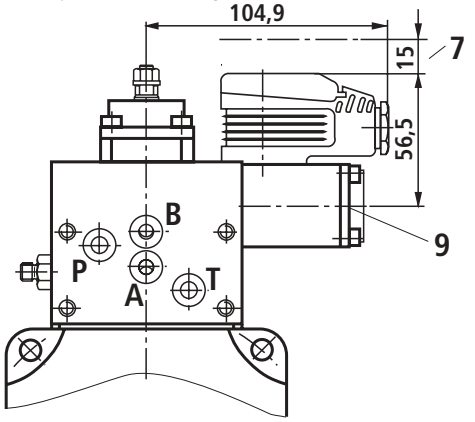
GMRP..**W**2X/M...



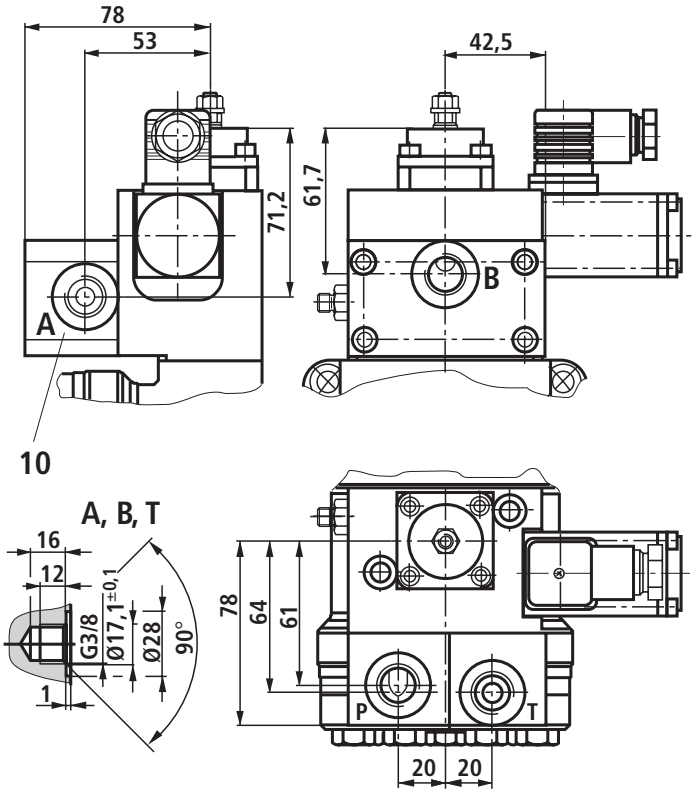
GMRP..2X/M**A**...-**12**...



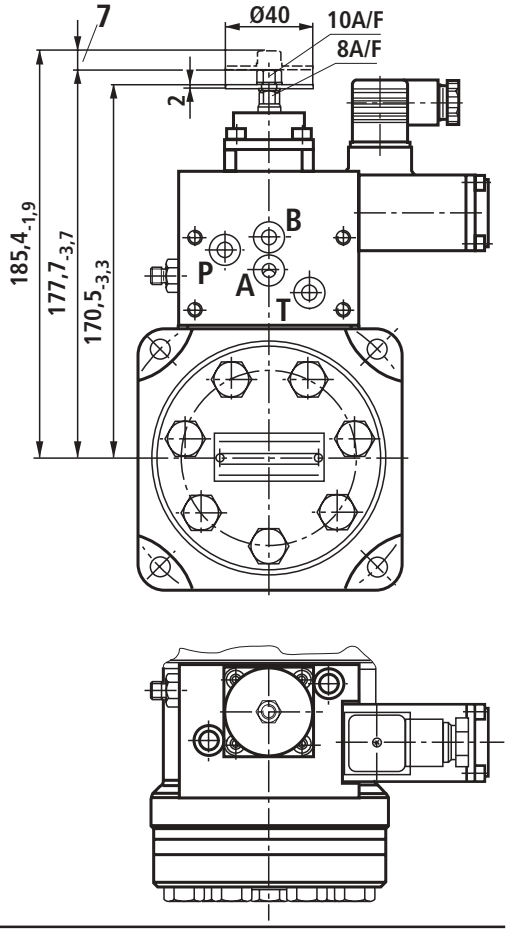
GMRP..2X/M**A**...-**11W110**...



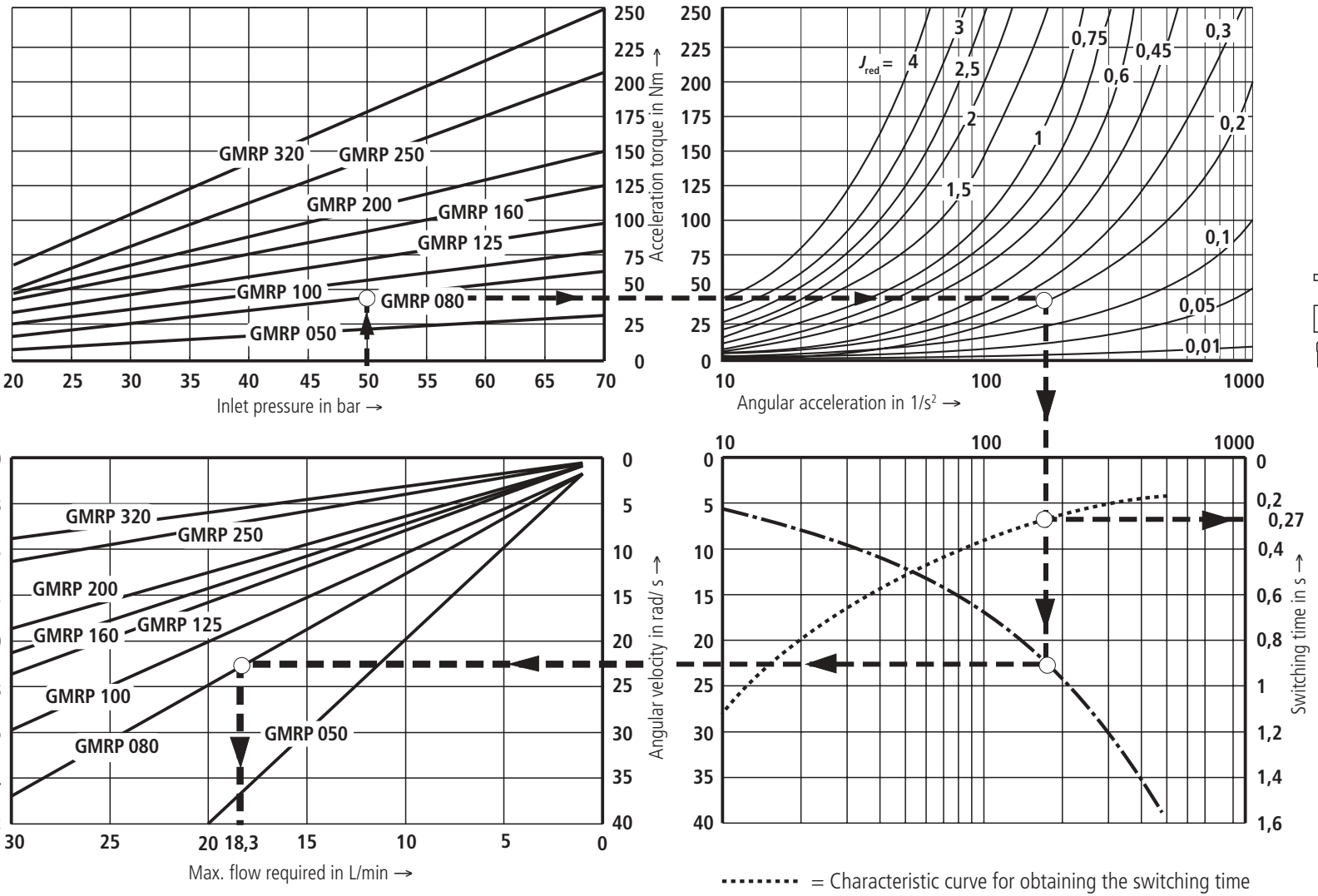
GMRP..2X/M**A**...-**11G24-01**



GMRP..2X/M**A**...-**11G24...S**

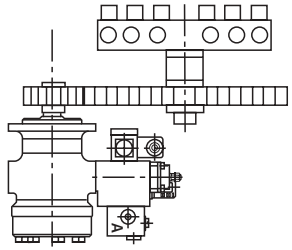


Drive variants, selection table



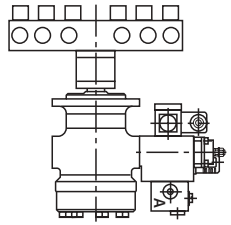
Drive via a gearbox

$$J_{red} = \frac{J}{i^2}$$



Direct drive

$$J_{red} = J$$



Example:
System pressure = 50 bar
Motor type GMRP 080
Reduced moment
of inertia J_{red} = 0.2 kgm²

Readable results:
Acceleration torque = 42 Nm
Angular velocity = 23 rad/s
Switching time = 0.27 s
Required flow = 18.3 L/min

Notes

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