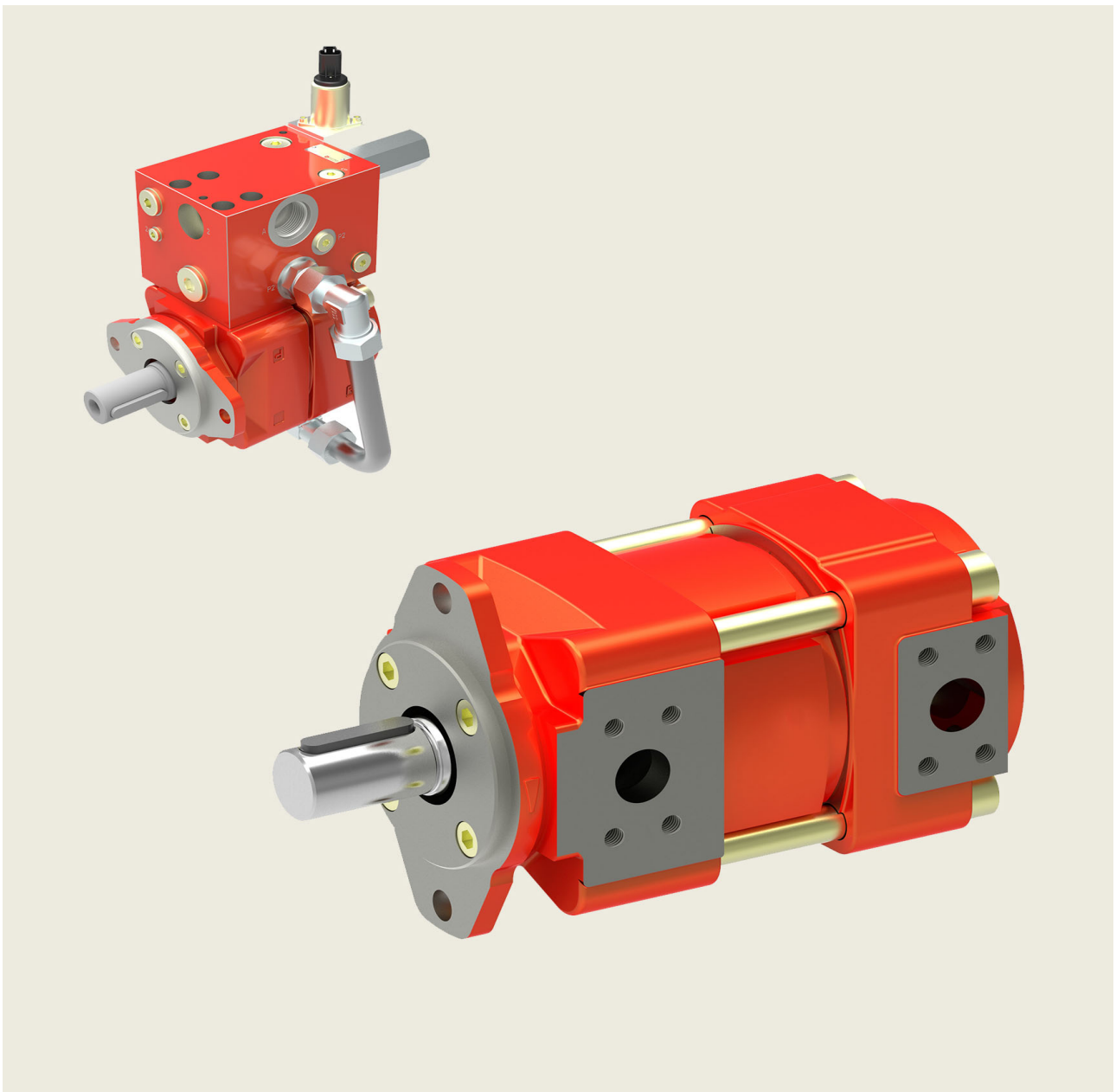


Internal Gear Unit

for motor/pump service
Series QXM



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1 General

1.1 Product description

The QXM drive unit can be used in open- and closed-loop hydrostatic drives, and can operate both as a pump and as a motor.

This flexibility offers possibilities for various applications, one example being the raising and lowering of loads. The QXM works as a pump to lift the load and recovers energy when the load is being lowered.

Used as a fully bi-directional pump/motor (four-quadrant operation), the unit controls a complete motion cycle of a cylinder. Fast acceleration/deceleration sequences can be achieved.

The unit is based on the well-known QX internal gear pump, which is distinguished by its very low noise levels and almost imperceptible pressure pulsations. The large number of closely spaced sizes ensures that the right size is always available for every application.

1.3 Application

- Injection molding machines
- Hydraulic presses
- Flight simulators
- Wind-power plants
- Lift/elevator drives
- Winches

1.4 ATEX compliant explosion protection

The internal gear motors QXM are suitable for application in hazardous areas and complies with the following guidelines:

ATEX directive 94/9/EC
 group II
 equipment category 3
 atmosphere G
 temperature class T3 and T4



II 3 G EEx c II T4
 -20°C ≤ Ta ≤ +40°C



II 3 G EEx c II T3
 -20°C ≤ Ta ≤ +80°C

2 Technical data

2.1 General

Characteristics	Unit	Description, value
Installation attitude		unrestricted
Mounting method (standard)		oval 2-hole flange to ISO 3019/1 (SAE): QXM 3-6 oval 2-hole flange to ISO 3019/2 (metric) QXM 2+8
Direction of rotation		unrestricted
Drive method		in-line, by a flexible coupling
Hydraulic fluid		HLP mineral oils to DIN 51524, Part 2 HFB, HFD and HFC fluids to VDMA 24317 other fluids - contact Bucher Hydraulics
Max. Admissible level of contamination of the hydraulic fluid		ISO 4406 class 20/18/15, or NAS 1638 class 9
Operating viscosity Starting viscosity	mm ² /s	10 to 100 10 to 300 (higher values, contact Bucher Hydraulics)

Hydraulic fluid temperature	°C	HLP mineral oil HFB, HFD and HFC	80 max. 50 max.
Max. pressure at drain port	bar	1.5 absolute (higher values, contact Bucher Hydraulics)	
Accumulated pressure restriction		Port P1 + Port P2 ≤ continuous-/intermittent pressure	



IMPORTANT: The main characteristics are valid for hydraulic oils DIN 51524 with a viscosity of 42mm²/s.

2.2 Main characteristics for pressure range 1

Type	Displacement		minimum Motor Speed [min ⁻¹] ⁵⁾		maximum Speed [min ⁻¹] ³⁾		Operating pressure [bar]		Torque ²⁾ [Nm]
	nominal [cm ³ /U]	effective [cm ³ /U]	Operating pressure on inlet side		Pump operat. ⁴⁾	Motor operating	conti- nous	intermit- tent ¹⁾	
			... 50%	... 100%					
QXM21-010 QXM21-012 QXM21-016	010 012 016	10 12,6 15,6	1000	2500	4000 3600 3200	5500	160 125 100	210 160 125	25
QXM31-020 QXM31-025 QXM31-032	020 025 032	20,3 25,1 32,3	800	2000	3200 3000 2700	5000	160 125 100	210 160 125	50
QXM41-040 QXM41-050 QXM41-063	040 050 063	39,2 50,5 63,5	600	1500	2700 2350 2050	4600	160 125 100	210 160 125	100
QXM51-080 QXM51-100 QXM51-125	080 100 125	80,1 100,9 124,6	600	1500	2050 1900 1620	4000	160 125 100	210 160 125	200
QXM61-160 QXM61-200 QXM61-250	160 200 250	162,7 200,9 248,8	600	1500	1500 1350 1200	3200	160 125 100	210 160 125	400
QXM81-315 QXM81-400 QXM81-500	315 400 500	326 402,6 498,5	600	1200	1200 1100 1000	3000	160 125 100	210 160 125	800

1) Intermittent pressure for max. 20 sec/min but not more than 10% of the duty cycle

2) Theoretical value at the maximum permitted continuous pressure. For starting torques, see section 3.

3) For higher speed contact us

4) Minimum inlet pressure 1 bar absolute

5) Recommended speed. For less speed the pressure must be reducing (linear rate).
For customized working cycle contact Bucher Hydraulics.

2.3 Main characteristics for pressure range 2

Type	Displacement		minimum Motor Speed [min ⁻¹] ⁵⁾		maximum Speed [min ⁻¹] ³⁾		Operating pressure [bar]		Torque ²⁾
	nominal [cm ³ /U]	effective [cm ³ /U]	Operating pressure on inlet side ... 50% ... 100%		Pump operat. ⁴⁾	Motor operating	conti- nous	intermit- tend ¹⁾	[Nm]
QXM22-005 QXM22-006 QXM22-008	005 006 008	5,1 6,3 8,0	1650	3000	3250	6000	210	250	17 21 26,5
QXM32-010 QXM32-012 QXM32-016	010 012 016	10,0 12,6 15,6	1400	2500	3050	5500	210	250	33,5 42 52
QXM42-020 QXM42-025 QXM42-032	020 025 032	20,3 25,1 32,3	1000	1800	2900	5000	210	250	68 84 108
QXM52-040 QXM52-050 QXM52-063	040 050 063	39,2 50,5 63,5	1000	1800	2500	4500	210	250	131 169 212
QXM62-080 QXM62-100 QXM62-125	080 100 125	80,1 100,9 124,6	1000	1800	2250 2050 1800	4000	210	250	268 337 416
QXM82-160 QXM82-200 QXM82-250	160 200 250	162,7 200,9 248,8	1000	1800	1600 1500 1350	3500	210	250	544 671 832

1) Intermittent pressure for max. 20 sec/min but not more than 10% of the duty cycle

2) Theoretical value at the maximum permitted continuous pressure. For starting torques, see section 3.

3) For higher speed contact us

4) Minimum inlet pressure 1 bar absolute

5) Recommended speed. For less speed the pressure must be reducing (linear rate).
For customized working cycle contact Bucher Hydraulics.

2.4 Main characteristics for pressure range 3

Type	Displacement		minimum Motor Speed [min ⁻¹] ⁵⁾		maximum Speed [min ⁻¹] ³⁾		Operating pressure [bar]		Torque ²⁾ [Nm]
	nominal [cm ³ /U]	effective [cm ³ /U]	Operating pressure on inlet side ... 50% ... 100%		Pump operat. ⁴⁾	Motor operating	conti- nous	intermit- tend ¹⁾	
QXM23-005 QXM23-006 QXM23-008	005 006 008	5,1 6,3 8,0	1200	2500	3250	6000	320	400	26 32 41
QXM33-010 QXM33-012 QXM33-016	010 012 016	10,0 12,6 15,6	1000	2000	3050	5500	320	400	51 64 80
QXM43-020 QXM43-025 QXM43-032	020 025 032	20,3 25,1 32,3	750	1500	2900	5000	320	400	103 128 164
QXM53-040 QXM53-050 QXM53-063	040 050 063	39,2 50,5 63,5	750	1500	2500	4500	320	400	200 257 323
QXM63-080 QXM63-100 QXM63-125	080 100 125	80,1 100,9 124,6	750	1500	2250 2050 1800	4000	320	400	408 514 635
QXM83-160 QXM83-200 QXM83-250	160 200 250	162,7 200,9 248,8	750	1500	1600 1500 1350	3500	320	400	828 1023 1267

1) Intermittent pressure for max. 20 sec/min but not more than 10% of the duty cycle

2) Theoretical value at the maximum permitted continuous pressure. For starting torques, see section 3.

3) For higher speed contact us

4) Minimum inlet pressure 1 bar absolute

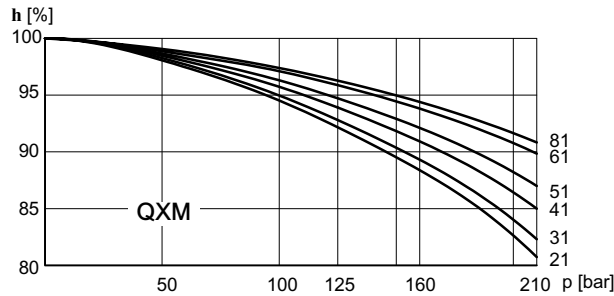
5) Recommended speed. For less speed the pressure must be reducing (linear rate).
For customized working cycle contact Bucher Hydraulics.

3 Performance graphs

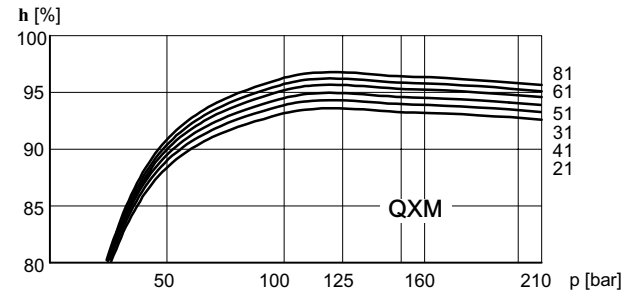
3.1 Pressure range 1

3.1.1 Volumetric efficiency

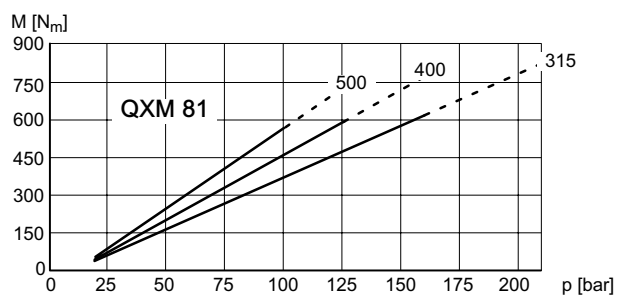
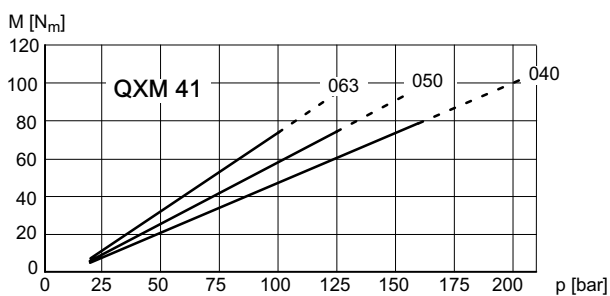
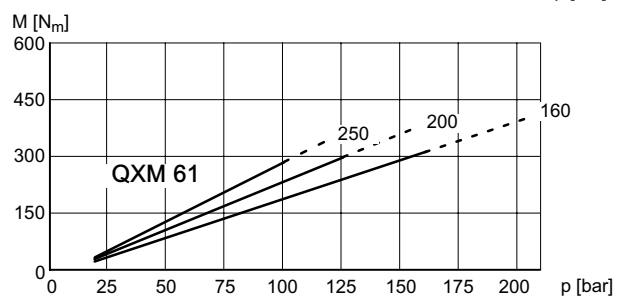
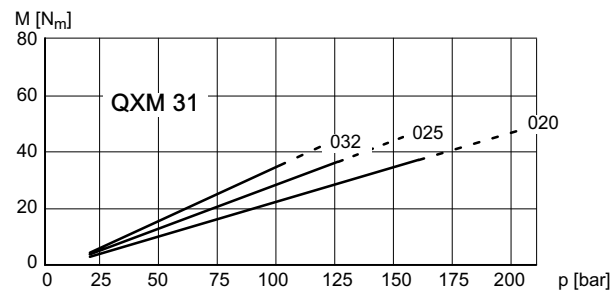
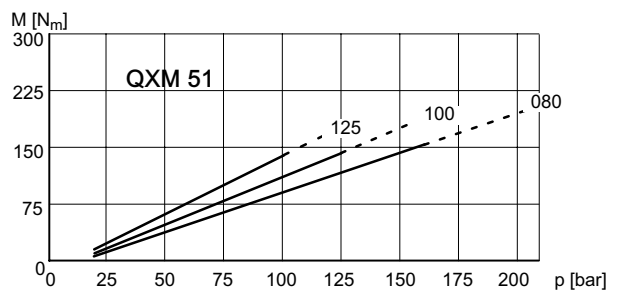
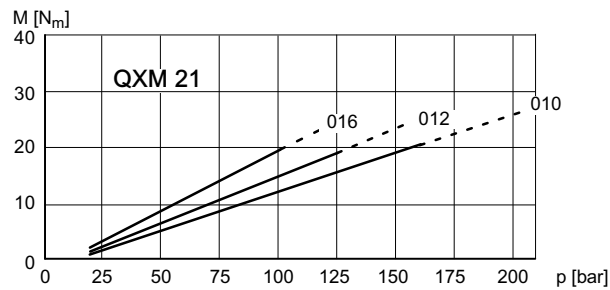
Measured with $n = 1450 \text{ min}^{-1}$, viscosity $42 \text{ mm}^2/\text{s}$



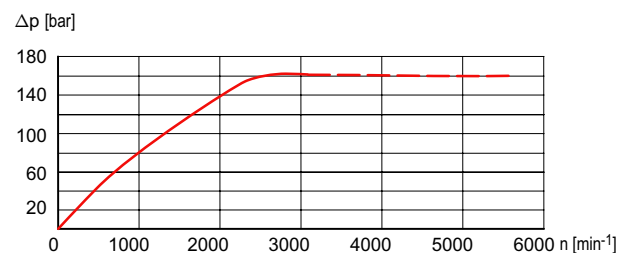
3.1.2 Hydro-mechanical efficiency



3.1.3 Starting torque



3.1.4 Maximum pressure accumulation at $P_1 + P_2$



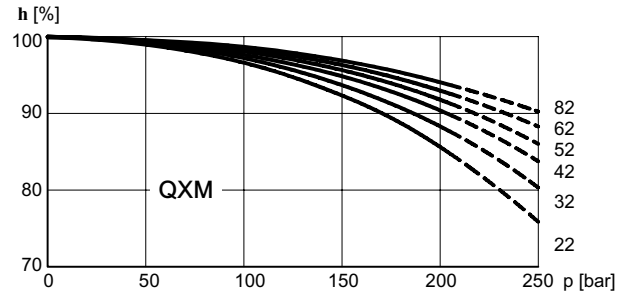
--- = Dependent on frame size (see 2.2)

3.2 Pressure range 2

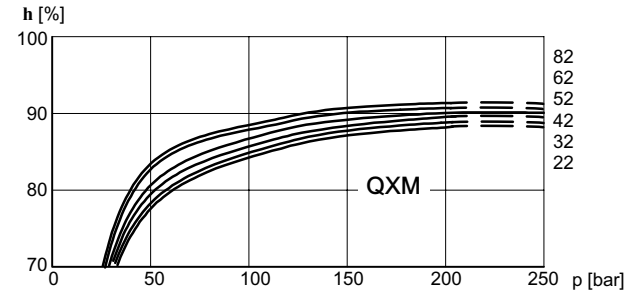
3.2.1 Volumetric efficiency

Measured with viscosity 42 mm²/s, speed 1450 min⁻¹

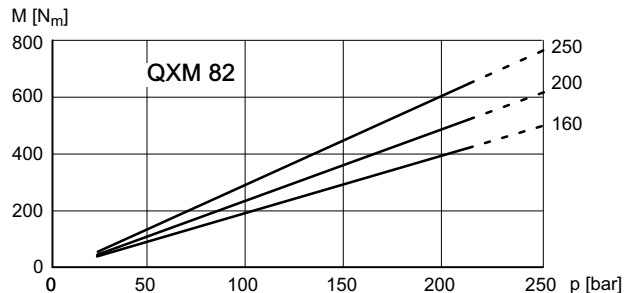
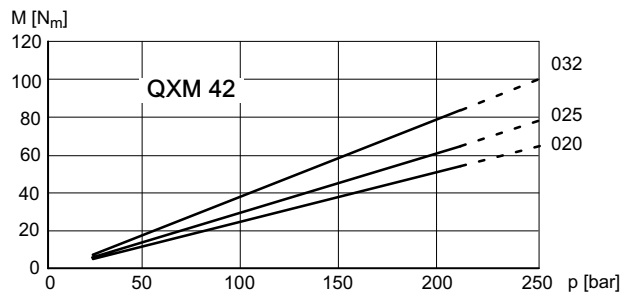
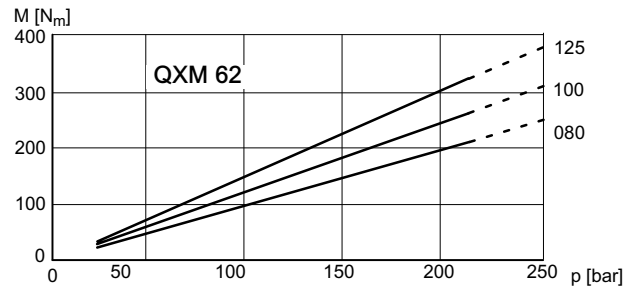
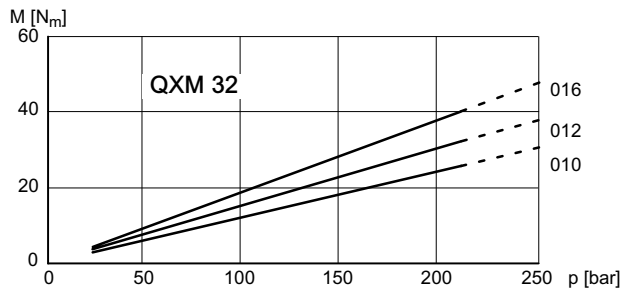
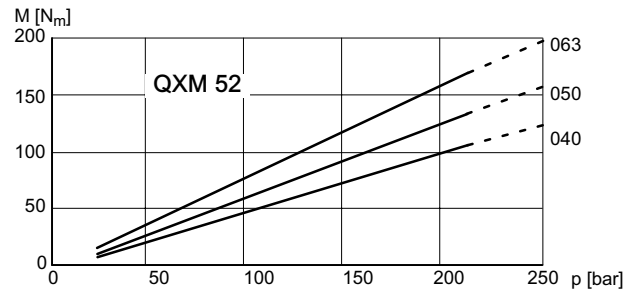
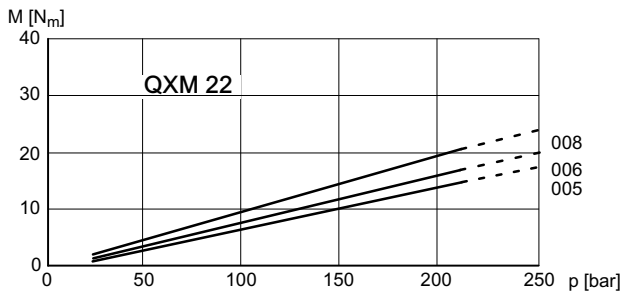
Solid line = continuous pressure / dashed line = max. intermittent pressure



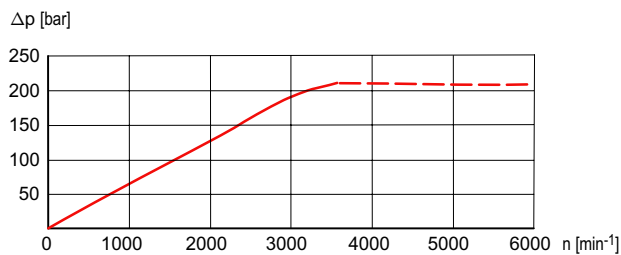
3.2.2 Hydro-mechanical efficiency



3.2.3 Starting torque



3.2.4 Maximum pressure accumulation at P₁ + P₂

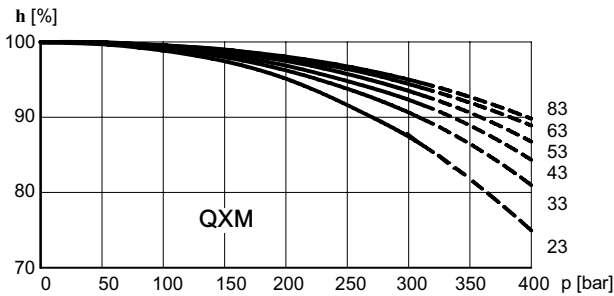


----- = Dependent on frame size (see 2.3)

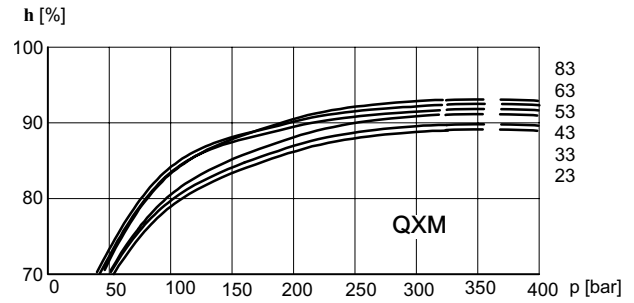
3.3 Pressure range 3

3.3.1 Volumetric efficiency

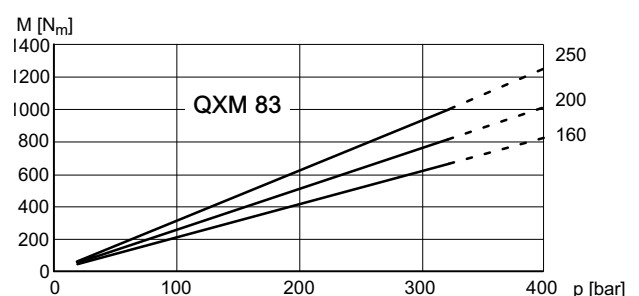
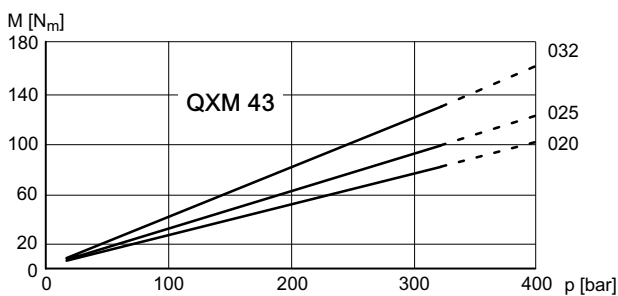
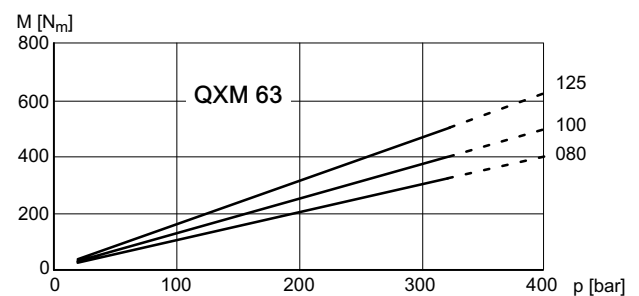
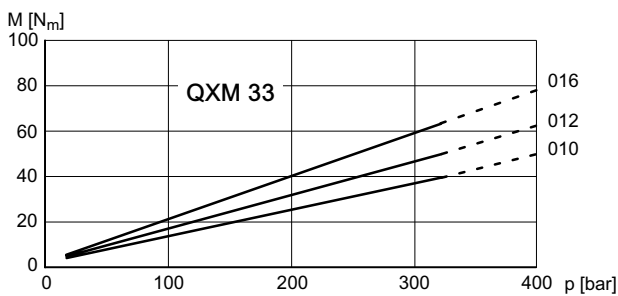
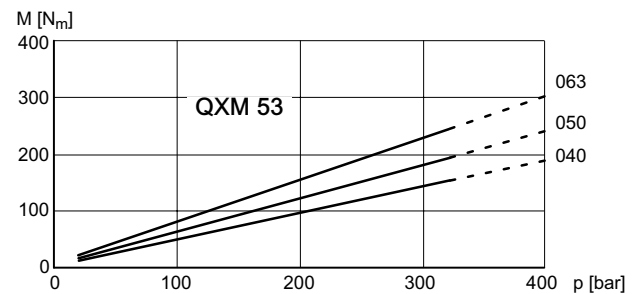
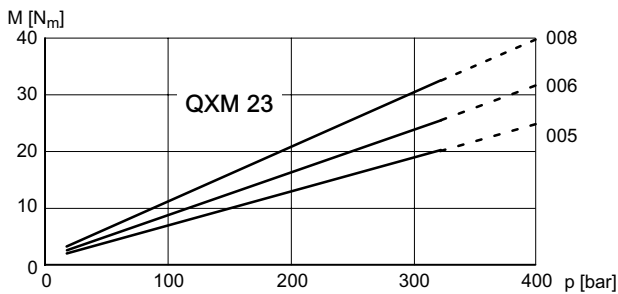
Measured with viscosity 42 mm²/s, speed 1450 min⁻¹,
 Solid line = continuous pressure / dashed line = max. intermittent pressure



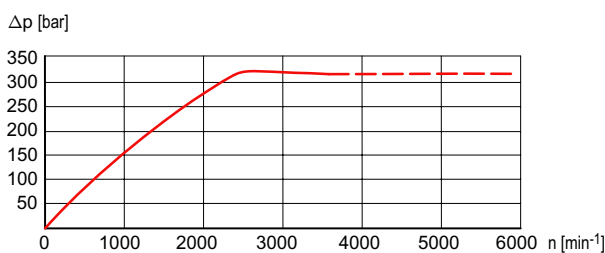
3.3.2 Hydro-mechanical efficiency



3.3.3 Starting torque



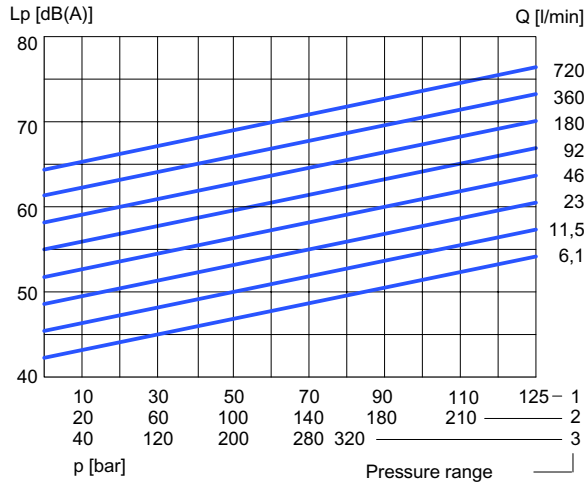
3.3.4 Maximum pressure accumulation at P₁ + P₂



----- = Dependent on frame size (see 2.4)

3.4 Noise level (L_p)

Measured to DIN 45635, Part 26, in Stuttgart University's low-echo noise
Measurement chamber;
Measurement distance 1 m; speed n = 1500 rpm; viscosity = 42 mm²/s



4 Dimensions

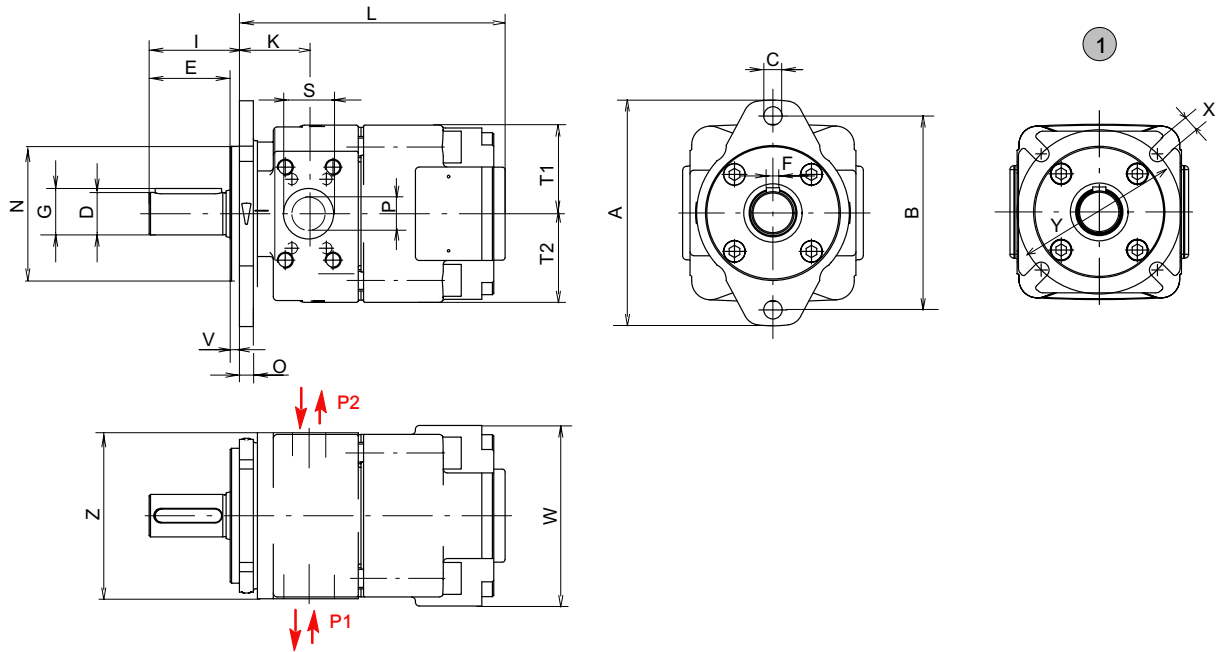
Frame size		2			3			4			5			6			8		
Pressure range		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Service ports to SAE J518 ¹⁾	P ₁ , P ₂	G1/2" ³⁾ thread			G 3/4" ³⁾ thread			1"			1 1/4"			1 1/2"			2"		
Drain port to DIN 3852 Teil 2 Part 2	P _L	G1/4"			G1/4"			G1/4"			G1/4"			G 3/8"			G1/2"		
Mounting: oval 2-hole flange to ISO 3019/1 (SAE - size 3-6) ISO 3019/2 (Metr. - sizes 2+8)	A	118			132			170			212			267			330		
	B(SAE)	-			106			146			181			229			-		
	B(Metr.)	100			109			140			180			224			280		
	C	9			11			14			18			22			26		
	N(SAE)	-			82,55 - 0,05			101,6 - 0,05			127 - 0,05			152,4 - 0,05			-		
	N(Metr.)	63 h8			80 h8			100 - h8			125 h8			160 h8			200 h8		
Shaft end: parallel, to ISO/R775 ²⁾	O	8,5			8,5			10,5			12,5			16,5			20		
	V	6			6			7			7			7			9		
	D	20 j6			25 j6			32 j6			40 j6			50 j6			63 j6		
	E	36			42			58			82			82			105		
	F	6			8			10			12			14			18		
Housing	G	22,5			28			35			43			53,5			67		
	I	45			50			68			92			92			117		
	K	38			44			52			60,5			74			90		
	L	136	118	153	164	144	189	202	176	232	242	210	280	288	248	338	361	331	446
	M	-	55	90	-	70	114	-	87	143	-	102	172	-	119	209	-	151	266
	T1	43			54			67			89			107			137		
	T2	43			54	60		67		70	89		107		110		137		138
Z	100			120			126			156			195		197		250		
W	80			100			136			165			203			256			
Weight	kg	5	5	6,5	10	9,5	12,5	18	17	22	33	31	40	64	60	76	130	120	160

1) For SAE J518 code 61 bzw. ISO6162-1 pipe flange dimensions see section 9

2) For other shaft ends, contact Bucher Hydraulics

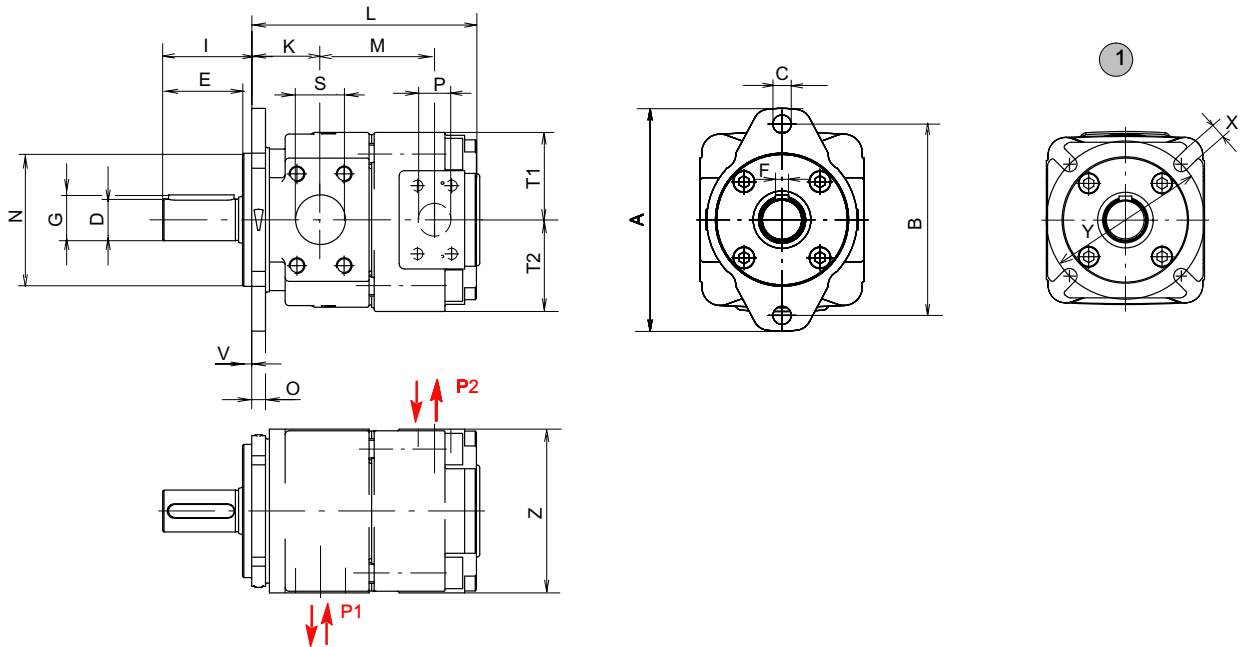
3) Threaded ports to DIN 3852 Part 2

4.1 Pressure range 1



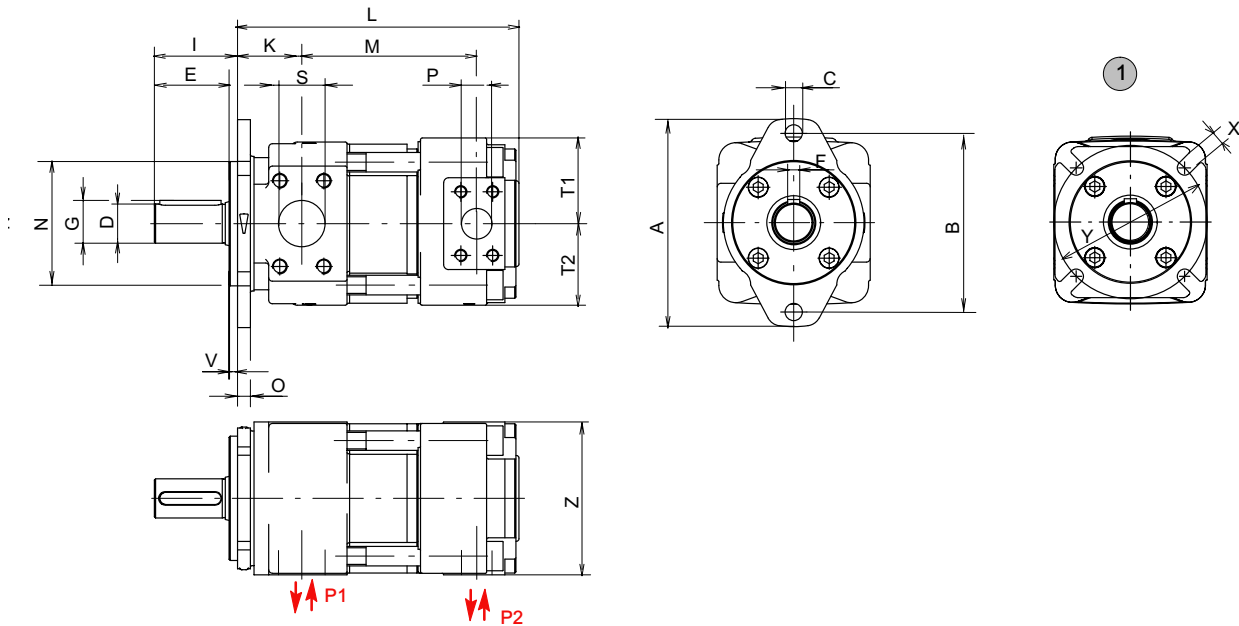
1 special model: 4-hole flange ISO 3019/2

4.2 Pressure range 2



1 special model: 4-hole flange ISO 3019/2

4.3 Pressure range 3



1 special model: 4-hole flange ISO 3019/2

4.4 Ordering details

		Q	X	M	5	3	-	0	4	0	N	*	*	*
Internal gear unit	QXM													
Frame size	2 / 3 / 4 / 5 / 6 / 8													
Pressure range	1 / 2 / 3													
Geom. Displ./Consump. in cm ³ /rev	005 - 500													
Direction of rotation, unrestricted	= N (see section 4.8)													
Variants / special features	(to be inserted by the factory, see section 4.7 for a selection)													

4.5 Ordering example

Required: internal gear drive unit QXM
 Displ./Consump.: 40 cm³/rev
 Continuous pressure: 300 bar
 For use with mineral oil: HLP
 Ordering code: QXM 53-040 N

4.6 Standard configuration

- Direction of rotation - unrestricted
- 2-hole mounting flange to ISO 3019/1; Frame size QXM 3-6
- 2-hole mounting flange to ISO 3019/2; Frame size QXM 2+8
- Nitrile seals
- Cylindrical shaft end to ISO R775
- Separate drain port in rear cover of the drive unit
- Ports P1 + P2 both the same size
- Compression proof shaft seal
- black priming, flange without priming

4.7 Special features

- O = without priming
- 09 = Viton seals, without priming
- 130 = 2-quadrant operation, service port dimensions as per QX pumps
2-hole mounting flange to ISO 3019/2 (metric)

For other special features, contact Bucher Hydraulics

5 Fluid cleanliness

QXM internal gear units require a fluid with a minimum cleanliness level of NAS 1638, Class 9 or ISO 4406, code 20/18/15.

HLP hydraulic oils to DIN 51524, Part 2, can be used without any special restriction as long as they remain within the specified temperature and viscosity ranges. HFC fire-resistant fluids to DIN 51502 can be used. Note that all fire-resistant fluids require special versions of the pumps or motors and must be approved by Bucher Hydraulics. We recommend the use of fluids that contain anti-wear additives for mixed-friction operating conditions. Fluids without appropriate additives can reduce the service life of pumps and motors. The user is responsible for maintaining, and regularly checking, the fluid quality. Bucher Hydraulics recommends a load capacity of $\geq 30 \text{ N/mm}^2$ to Brugger DIN 51347-2.

6 Note

This catalogue is intended for users with specialist knowledge. The user must check the suitability of the equipment described herein in order to ensure that all of the conditions necessary for the safety and proper functioning of the system are fulfilled. If you have any doubts or questions concerning the use of these pumps, please consult Bucher Hydraulics.

7 Fluid cleanliness

Cleanliness class (RK) as per ISO 4406 and NAS 1638

Code ISO 4406	Dirt particle number / 100 ml			
	$\leq 4 \mu\text{m}$	$\leq 6 \mu\text{m}$	$\leq 14 \mu\text{m}$	NAS 1638
23/21/18	8000000	2000000	250000	12
22/20/18	4000000	1000000	250000	-
22/20/17	4000000	1000000	130000	11
22/20/16	4000000	1000000	64000	-
21/19/16	2000000	500000	64000	10
20/18/15	1000000	250000	32000	9
19/17/14	500000	1300000	16000	8
18/16/13	250000	64000	8000	7
17/15/12	130000	32000	4000	6
16/14/12	64000	16000	4000	-
16/14/11	64000	16000	2000	5
15/13/10	32000	8000	1000	4
14/12/9	16000	4000	500	3
13/11/8	8000	2000	250	2

4.8 Direction of rotation

Direction of rotation: right:
(clockwise, viewed from the shaft end) = oil flows from P₁ to P₂

Direction of rotation: left:
(counterclockwise, viewed from the shaft end) = oil flows from P₂ to P₁

8 Operational reliability

To ensure a reliable operation and a long service life of the QXM internal gear units, a maintenance schedule must be prepared for the power unit, machine or system. The maintenance schedule must make sure that the provided or permissible operating conditions of the QXM internal gear units are adhered to over the period of use.

In particular, compliance with the following operating parameters must be ensured:

- The required oil cleanliness
- The operating temperature range
- The fluid level

Moreover, the QXM internal gear units and the system must be inspected at regular intervals for changes in the following parameters:

- Vibration
- Noise
- Differential temperature of internal gear unit – fluid in the tank
- Foaming in the tank
- Freedom from leakage

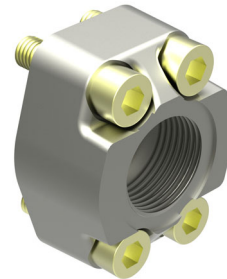
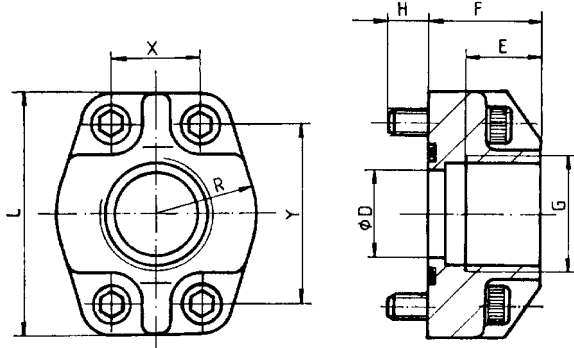
Changes in these parameters indicate wear of components (e.g. drive motor, coupling, internal gear unit, etc.). The cause must be immediately pinpointed and eliminated.

To provide high operational reliability of the QXM internal gear unit in the machine or system, we recommend continuous, automatic checks of the above parameters and an automatic shutdown in the case of changes that exceed the usual fluctuations within the provided operating range.

Commissioning see operating instructions 100-I-000014

9 Accessories

9.1 Pipe flanges - high pressure type



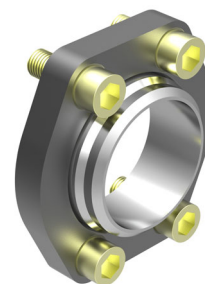
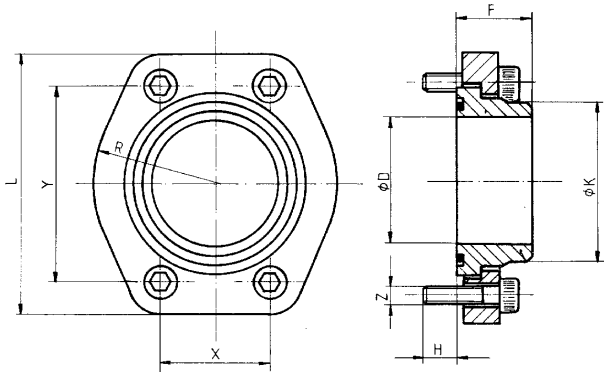
- Max. operating pressure 420 bar
- Flange size SAE J518 code 61 / ISO 6162-1

Threaded pipe flanges are spot-faced for DIN 2353 pipe fittings
Material: ST37 / For Viton seals, contact Bucher Hydraulics

Ordering-number	Ordering code	Size	DØ	E	F	H	L	R	X	Y	Viton seal 90 Shore 'A'	Retaining screws DIN912-12.9 / Torque Nm
037000	RF 01-R08	G 1/2"	12,5	16	27	13	54	23	17,5	38	20,24x2,62	M8x30 30
037010	RF 02-R10	G 3/4"	20	18	30	12	65	26	22,2	47,6	26,65x2,62	M10x30 60
037020	RF 03-R11	G 1"	25	20	34	13	70	29	26,2	52,4	32,99x2,62	M10x35 60
037030	RF 04-R12	G 1 1/4"	32	22	38	14	80	36	30,2	58,6	40,86x3,53	M10x40 60
037040	RF 05-R13	G 1 1/2"	38	24	41	19	94	41	35,7	70	44,04x3,53	M12x45 120
037050	RF 06-R14	G 2"	50	26	45	20	102	48	42,9	77,8	59,92x3,53	M12x50 120
055470*	RF 07-R16	G 2 1/2" *	63	30	50	18	114	57	50,8	89	72,62x3,53	M12x45 120

* At RF07 only to 210 bar be allowed

9.2 Low pressure type



- Max. operating pressure 16 bar
- Flange size SAE J518 code 61 / ISO 6162-1

Material: ST37 / for Viton seals, contact Bucher Hydraulics

Ordering number	Ordering code	SAE flange Size	D	K	F	H	L	R	X	Y	Viton seal 90 Shore 'A'	Retaining screws DIN 912-8.8 Torque Nm	pipe ¹⁾ O/dia. approx.
062450	RN 07-S	2 1/2"	63	75	35	14	120	57	51	89	69,44x3,53	M12 x 30 70	75
063880	RN 08-S	3"	76	88			140,5	68	62	106,5	85,32x3,53	M16 x 40 180	88
063890	RN 09-S	3 1/2"	89	100	40	19	158,5	73	70	120,3	98,02x3,53	M16 x 40 180	100
063900	RN 10-S	4"	103	115			168	79	78	130	110,72x3,53	M16 x 40 180	115

1) We recommend the use of seamless precision steel tube to DIN 2391 with-wallthick. max 6 mm

9.3 Bolt-on valves - SAE J518 code 61 / ISO 6162-1 pattern

Pressure relief valve A _G ^S DF / ASDH	Pressure relief valve solenoid control A _G ^S DA	Accumulator charging valve AGSF
<p>Technical data sheet 100-P-000123</p>	<p>Technical data sheet 100-P-000119</p>	<p>Technical data sheet 100-P-0000124</p>

9.3.1 Examples for Bolt-on valves, mounted on QX Internal Gear Motors

Bolt-on valve with threaded ports AGDF	Bolt-on valves with pipe flanges SAE ¹⁾ ASDF+RF	Bolt-on valve with pipe flanges SAE + RVSAE ²⁾ ASDF+RF+RVSAE+DPSAE+ZPSAE



IMPORTANT: For detailed informations on Bolt-on valves see www.bucherhydraulics.com

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