

BUCHER
hydraulics

Fixed Displacement Piston Pumps and Motors



OIL SOLUTIONS

AX Series

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"For All Your Hydraulic Needs"



Efficiency to MAX



Efficiency to MAX

General Information

Bucher Hydraulics AX is an innovative piston pump and motor series, designed and developed to match the newest requirements of electric machines with variable speed drives.

Due to a special rotating piston design, based on a high number of rotating pistons, a pressure limit of 500 bar is possible with a very low pressure and flow ripple. Thanks to the short piston stroke, small displacement angle and hydrostatic bearings, AX units can work with reduced noise and low vibration level even at very low speed (under 1 rpm).

Small axial forces due to a symmetrical shaft design make the AX series very compact while maintaining a high power density. AX units provide outstanding efficiency even at the starting point, so much that the starting torque is available as the maximum theoretical value. A version with tandem through-drive is also available.

Features:

- Fixed displacement pump with internal mirrored design of pistons, for open loop and closed loop circuits
- Product range from 18 to 122 cc
- Used in mobile or industrial applications
- Output flow rate is proportional to pump input speed and displacement
- Maximum working pressure of 500 bar
- Required input torque is proportional to the differential pressure at pump ports
- Extremely high mechanical efficiency
- Extremely good starting characteristics
- Especially suited for working at very low speed while maintaining a high pressure
- Very high overall efficiency
- Very high efficiency at a wide range of speed and pressure
- High power density
- Compact dimensions
- Very low ripple for pressure and flow rate
- Low vibrations
- Low noise emission
- Tandem through-drive
- ISO or SAE flanges and shafts
- Speed sensor → optional for motor versions
- Flanged valves → optional for motor versions

Areas of Application

Electric heavy machinery

- Very high efficiency for increased autonomy
- Low noise and low vibrations
- Increased speed range



eh-PTO for truck loading cranes

- High efficiency
- Low noise
- Precise movements



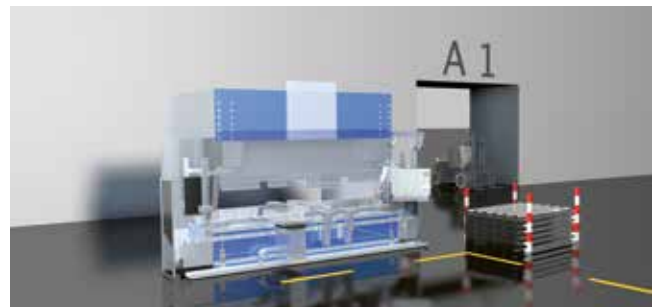
Winches and slew drives

- High starting torque
- Possibility to downsize the motor displacement
- Precise load positioning with no vibrations



Energy recovery

- High efficiency when used as pump and as motor
- Increased speed range
- High dynamics under pressure



Mining machinery

- Low vibrations for precise positioning
- Superior stability at low rpm with high dynamics
- Very high efficiency



Wheel drives and track drives

- High efficiency
- Good low speed behaviour
- High starting torque



Advantages

Heavy duty
500 bar

High efficiency
up to 99% η_{hm}
up to 96% η_{tot}

Long life
expectancy

< 1 rpm at
500 bar

Low noise,
low pulsations

High power
density

Tandem
through-drive

Low temperature
increase



Impressive maximum pressure limits

- 500 bar peak working pressure
- High efficiency and long life expectancy due to very strong cast iron body
- Reduced leakage and deformation thanks to top grade steel

The highest hydro-mechanical efficiency

- Mechanical efficiency up to 99%, even at low speed, due to low friction and direct torque transmission between shaft and pistons
- Very high starting torque (99%) due to a high number of pistons and hydrostatic bearings
- Overall efficiency up to 96% due to short stroke, optimized displacement angle, balanced forces and hydrostatic bearings

Long product service life

- No wear of rotating parts due to hydrostatic bearings
- Balanced axial forces imply reduced stress on bearings
- Less temperature increase because of less friction
- Long maintenance intervals due to robust design
- Convincing validation model of Bucher Hydraulics

Combination of high pressure and low speed

- Very high starting torque (99%) due to a high number of pistons
- Units can work below 1 rpm minimum speed due to hydrostatic bearings and small internal axial forces on roller bearings
- Low friction of rotating parts also prevents wear and stick-slip effect

Low noise and low vibration

- Thanks to low pressure ripple
- Low flow ripple due to a high number of pistons
- Reduced internal forces due to mirrored design
- Flow path optimized with CFD

High power density

- Compact dimensions and high power density because of a small displacement angle
- Power density increasing with displacement if compared to traditional axial piston units

Through-drive shaft design

- Tandem pump configuration is possible in combination with other Bucher Hydraulics pumps thanks to through-drive shaft
- Customized solutions like motor brakes, double shaft, encoder or speed sensor are possible

Low temperature increase over time

- It is possible to downsize heat exchanger, oil tank or prime engine because of higher overall efficiency
- Reduced system energy losses due to the high unit efficiency in a wide range of working conditions

Long experience of endurance testing

- More than 6 years of intensive testing of innovative technology
- Convincing validation model of Bucher Hydraulics
- Impressive results on product reliability
- Robust Bucher Hydraulics design

Technical Data AX-FP



AX24



AX48



AX76



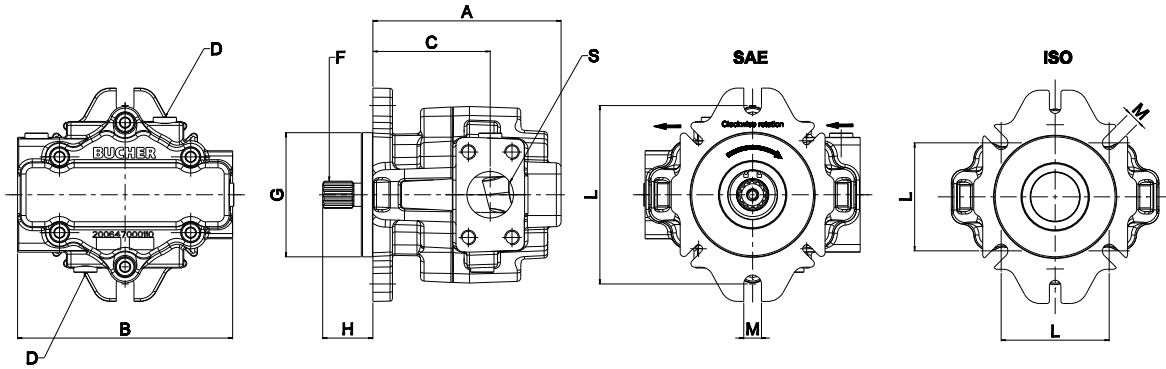
AX122

Single quadrant 1Q	Two quadrant 2Q	Displacement			Max. pressure		Speed (*) maximal [rpm]
		cm ³ /rev	in ³ /rev	Vg - cc	continuous [bar]	intermittent [bar]	
		18	1.10	17.83	450	500	3600
		21	1.28	20.79			
		24	1.46	23.74			
		34	2.07	33.93	450	500	3000
		40	2.45	40.13			
		45	2.75	45.18			
		48	2.93	47.99	450	500	2600
		54	3.30	53.92			
		63	3.84	62.87			
		72	4.39	71.80	450	500	2200
		76	4.64	76.25			
		86	5.25	86.30			
		100	6.10	100.62	450	500	2200
		115	7.02	114.90			
		122	7.44	122.03			

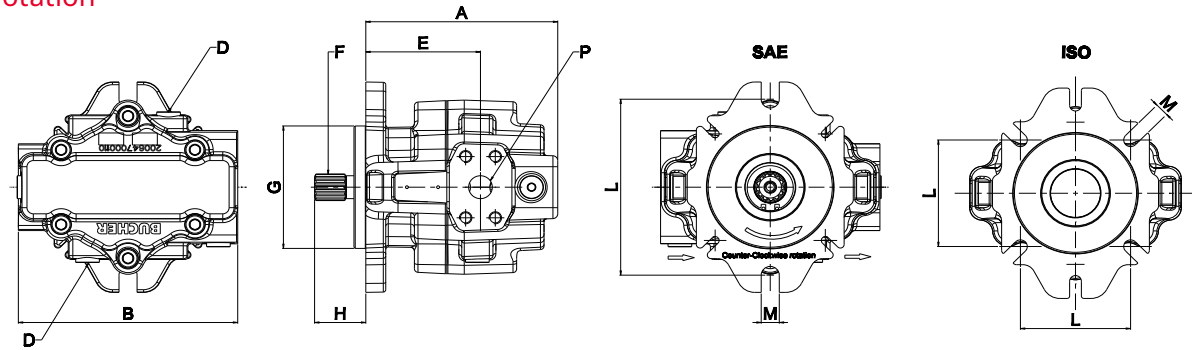
(*) Maximum speed in self-priming conditions. For two-quadrant pump maximum speed, please contact Bucher Hydraulics.

It is possible to order pumps with custom displacement values within the different ranges: between 18 and 24 cc, 34 and 48 cc, 54 and 76 cc, 86 and 122 cc.

CW rotation



CCW rotation



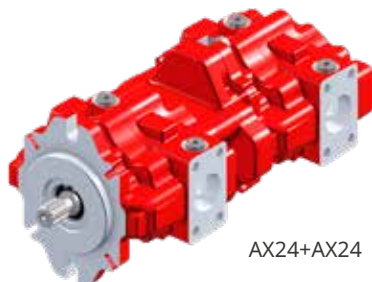
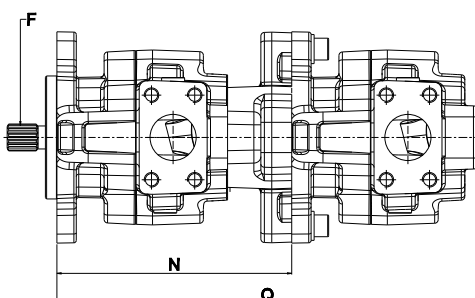
AX-FP Displacements	A mm	B mm	C mm	E mm
18-21-24	154	176	96	92
34-40-45-48	200.5	214	120	119
54-63-72-76	216.5	242	148.5	132.5
86-100-115-122	250	276	172	151

Shafts	Shafts
13T	16/32 D.P. ANSI B92.1A spline
14T	12/24 D.P. ANSI B92.1A spline
15T	16/32 D.P. ANSI B92.1A spline
13T	8/16 D.P. ANSI B92.1A spline
CIL.30	Ø30 DIN 6885 AS8x7x50 Key
CIL.35	Ø35 DIN 6885 AS10x8x64 Key
CIL.40	Ø40 DIN 6885 AS12x8x64 Key
W25	W25x1.5x18x9g DIN5480 spline
W30	W30x2x14x9g DIN5480 spline
W35	W35x2x16x9g DIN5480 spline
W40	W40x2x18x9g DIN5480 spline
W45	W45x2x21x9g DIN5480 spline
W50	W50x2x24x9g DIN5480 spline

AX-FP Displacements	Flanges	F	G mm	H mm	L mm	M mm	Ports (*)
18-21-24	SAE-B	13T	101.6	41.1	146	14.5	S: 1" 1/2 SAE 3000 P: 3/4" SAE 6000 D: 1/4" G-BSP
	SAE B-B	15T	101.6	46.1	146	14.5	
	ISO	W25	100	68	88.4	14.5	
34-40-45-48	SAE B-B	15T	101.6	46	146	14.5	S: 2" SAE 3000 P: 3/4" SAE 6000 D: 3/8" G-BSPP
	SAE-C	14T	127	56	146	14.5	
	ISO	CIL.30	125	92	113.1	14.5	
54-63-72-76	SAE-C	14T	127	56	181	17.5	S: 2" 1/2 SAE 3000 P: 1" SAE 6000 D: 3/8" G-BSPP
	ISO	W35	140	72	127.3	17.5	
	ISO	W40	140	77	127.3	17.5	
86-100-115-122	ISO	CIL.35	140	102	127.3	17.5	S: 3" SAE 3000 P: 1" 1/4 SAE 6000 D: 3/4" G-BSPP
	ISO	CIL.40	140	102	127.3	17.5	
	SAE-D	13T	152.4	75	161.6	20.6	
86-100-115-122	ISO	W40	160	77	141.4	17.5	S: 3" SAE 3000 P: 1" 1/4 SAE 6000 D: 3/4" G-BSPP
	ISO	W45	160	77	141.4	17.5	
	ISO	W50	160	77	141.4	17.5	

(*) For special versions of pumps with rear ports please contact Bucher Hydraulics.

AX-FP piston pump dimensions: tandem version



	F	N mm	Q mm
AX-FP 24 + 24	15T SAE B-B	197	347
AX-FP 48 + 48	14T SAE C	240	439
AX-FP 76 + 76	14T SAE C	283	505

Note: In addition it is possible to have a through-drive predisposition with SAE flange piston pumps and group 2 external gear pumps.

Technical Data AX-FM



AXM24



AXM48



AXM76

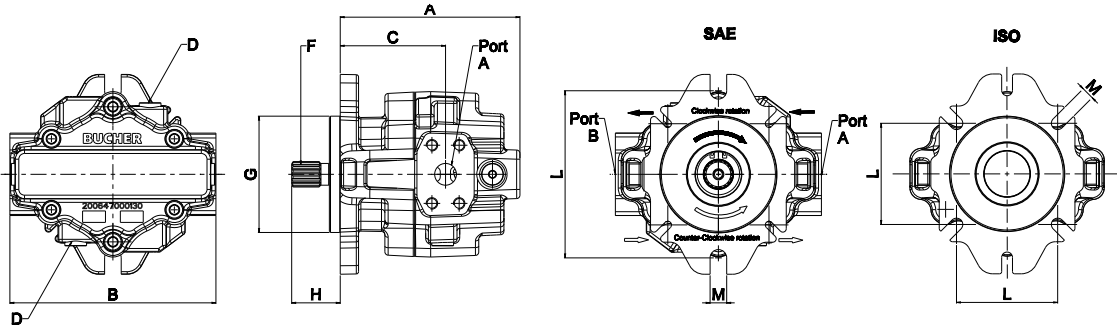


AXM122

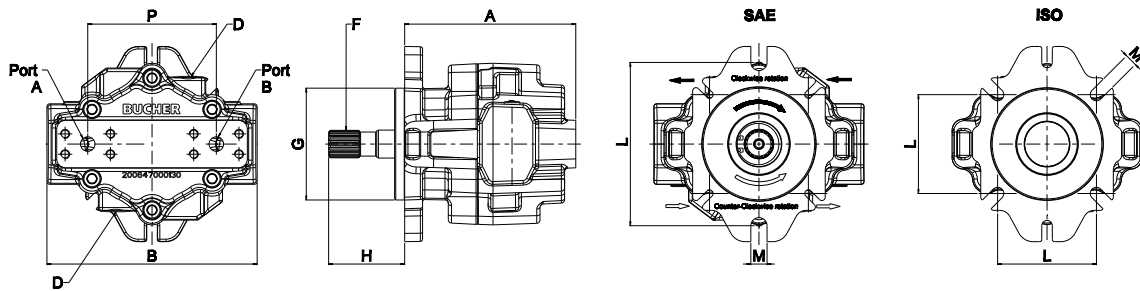
Bi-directional	Displacement			Max. pressure		Speed (*) maximal [rpm]
	cm ³ /rev	in ³ /rev	Vg - cc	continuous [bar]	intermittent [bar]	
	18	1.10	17.83	450	500	5000
	21	1.28	20.79			
	24	1.46	23.74			
	34	2.07	33.93	450	500	4500
	40	2.45	40.13			
	45	2.75	45.18			
	48	2.93	47.99	450	500	4000
	54	3.30	53.92			
	63	3.84	62.87			
	72	4.39	71.80	450	500	3500
	76	4.64	76.25			
	86	5.25	86.30			
	100	6.10	100.62			
	115	7.02	114.90			
	122	7.44	122.03			

(*) For special high speed versions, or for four-quadrant pump versions, please contact Bucher Hydraulics.
 It is possible to order motors with custom displacement values within the different ranges: between 18 and 24 cc, 34 and 48 cc, 54 and 76 cc, 86 and 122 cc.

Lateral ports dimensions



Rear ports dimensions



AX-FM Displacements	A mm	B mm	C mm	P mm
18-21-24	154	176	92	115
34-40-45-48	200.5	214	119	140
54-63-72-76	216.5	242	132.5	138
86-100-115-122	250	276	172	151

Shafts	
13T	16/32 D.P. ANSI B92.1A spline
14T	12/24 D.P. ANSI B92.1A spline
15T	16/32 D.P. ANSI B92.1A spline
13T	8/16 D.P. ANSI B92.1A spline
W25	W25x1.5x18x9g DIN5480 spline
W30	W30x2x14x9g DIN5480 spline
W35	W35x2x16x9g DIN5480 spline
W40	W40x2x18x9g DIN5480 spline
W45	W45x2x21x9g DIN5480 spline
W50	W50x2x24x9g DIN5480 spline

AX-FM Displacements	Flanges	F	G mm	H mm	L mm	M mm	Ports							
18-21-24	SAE-B	13T	101.6	41.1	146	14.5	A-B: 1/2" SAE 6000 (rear ports)							
	SAE B-B	15T	101.6	46.1	146	14.5	A-B: 3/4" SAE 6000 (lateral ports)							
	ISO	W25	100	68	88.4	14.5	D: 1/4" G-BSPP							
34-40-45-48	SAE B-B	15T	101.6	46	146	14.5	A-B: 3/4" SAE 6000 D: 3/8" G-BSPP							
	SAE-C	14T	127	56	146	14.5								
	ISO	CIL.30	125	92	113.1	14.5								
54-63-72-76	SAE-C	14T	127	56	181	17.5	A-B: 1" SAE 6000 D: 3/8" G-BSPP							
	ISO	W35	140	72	127.3	17.5								
	ISO	W40	140	77	127.3	17.5								
	ISO	CIL.35	140	102	127.3	17.5								
86-100-115-122	ISO	CIL.40	140	102	127.3	17.5	A-B: 1" 1/4" SAE 6000 D: 3/4" G-BSPP							
	SAE-D	13T	152.4	75	161.6	20.6								
	ISO	W40	160	77	141.4	17.5								
							ISO	W45	160	77	141.4	17.5		
								ISO	W50	160	77	141.4	17.5	

Table of Technical Data

A nominal working pressure of 450bar and 500bar peak pressure is available for the entire product range.

Note: the theoretical values reported in the following tables are considered before mechanical or volumetric efficiency. These values are calculated for parts at nominal dimensions. The data has been considered for operation with a mineral oil that has a viscosity class of ISO VG 32 and a temperature of 40°C.

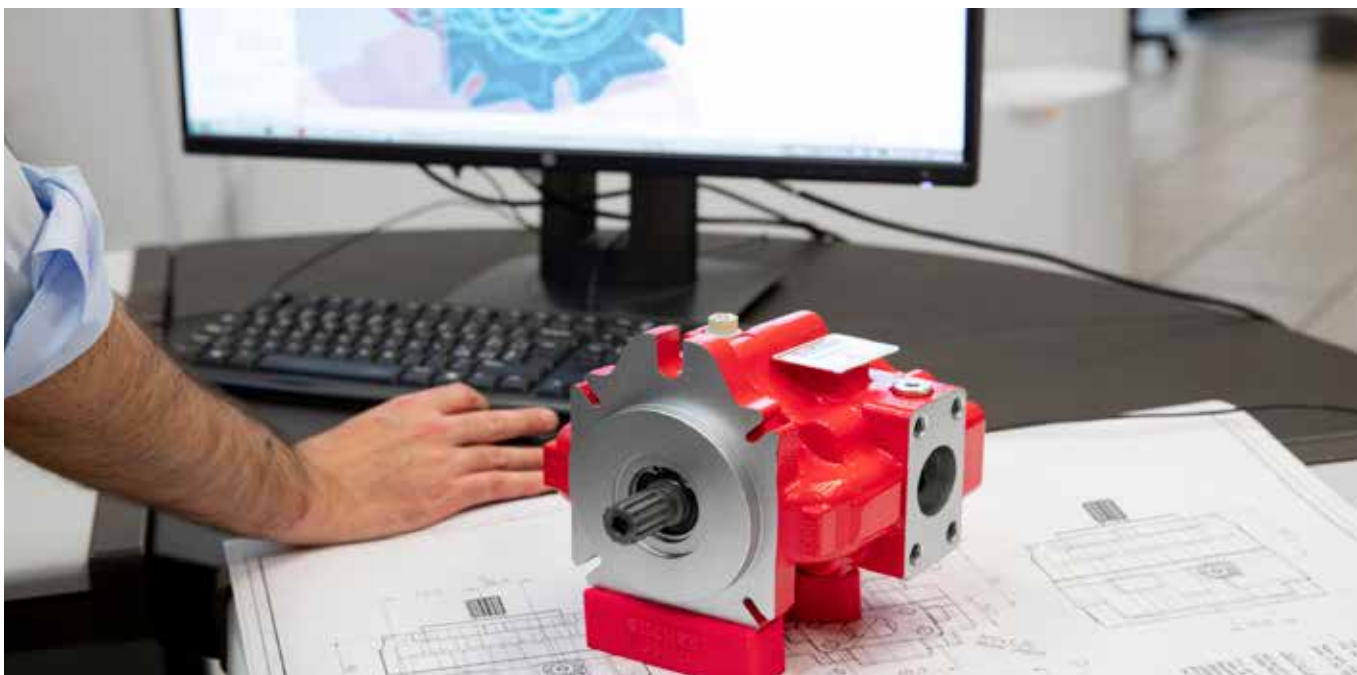
Note: peak pressure operating conditions must not exceed

1% per minute. It is not recommended to use the units at maximum pressure and maximum speed simultaneously. Operation at values above the maximum admitted working conditions may lead to reduced life, failure, or loss of function of the pump/motor. For max working conditions of tandem units, please contact Bucher Hydraulics.



			AX24			AX48			
	Symbol	Unit	18	21	24	34	40	45	48
Displacement	Vg	cm ³ /rev	17.83	20.79	23.74	33.93	40.13	45.18	47.99
		in ³ /rev	1.09	1.27	1.45	2.07	2.41	2.76	2.93
Max. operating pressure	p _{max}	bar	450			450			
Maximum peak pressure	P _{max}	bar	500			500			
Speed (pump max)	n _{pump}	rpm	3600	3600	3600	3000	3000	3000	3000
Speed (motor max)	n _{motor}	rpm	5000	5000	5000	4500	4500	4500	4500
Flow at n _{pump}	Q	l/min	62.4	72.8	83.1	101.8	118.7	135.5	144.0
Torque at Δp=450 bar	T1	Nm	127.7	148.9	170.0	243.0	283.3	323.6	343.7
Torque at Δp=500 bar	T _{max}	Nm	141.9	165.4	188.9	270.0	314.8	359.5	381.9
Power at n _{pump} and Δp=450 bar	P1	kW	46.8	54.6	62.3	76.3	89.0	101.7	108.0
Power at n _{pump} and Δp=500 bar	P _{max}	kW	52.0	60.6	69.2	84.8	98.9	113.0	120.0
Moment of inertia for Rotary Group	J _{gr}	kgm ²	0.00126			0.00400			
Case volume	V	l	0.3			0.5			
Weight	m	kg	13.8			22.2			

			AX76				AX122			
	Symbol	Unit	54	63	72	76	86	100	115	122
Displacement	Vg	cm ³ /rev	53.92	62.87	71.80	76.25	86.30	100.62	114.90	122.03
		in ³ /rev	3.29	3.84	4.38	4.65	5.27	6.14	7.01	7.45
Max. operating pressure	p _{max}	bar	450			450				
Maximum peak pressure	P _{max}	bar	500			500				
Speed (pump max)	n _{pump}	rpm	2600	2600	2600	2600	2200	2200	2200	2200
Speed (motor max)	n _{motor}	rpm	4000	4000	4000	4000	3500	3500	3500	3500
Flow at n _{pump}	Q	l/min	140.2	163.5	186.7	198.3	190	221	254	270
Torque at Δp=450 bar	T1	Nm	386.2	450.3	514.2	546.1	618.4	721.0	823.3	874.4
Torque at Δp=500 bar	T _{max}	Nm	429.1	500.3	571.4	606.8	687.1	801.1	914.7	971.5
Power at n _{pump} and Δp=450 bar	P1	kW	105.1	122.6	140.0	148.7	148.9	173.6	198.3	210.6
Power at n _{pump} and Δp=500 bar	P _{max}	kW	116.8	136.2	155.6	165.2	165.5	192.9	220.3	234.0
Moment of inertia for Rotary Group	J _{gr}	kgm ²	0.00912			0.01870				
Case volume	V	l	0.7			1				
Weight	m	kg	32.6			50.0				



[bucherhydraulics.com](https://www.bucherhydraulics.com)

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