

MASTER CYLINDERS WITHOUT HYDRAULIC BOOSTER

- Single and Step Bore Master Cylinders
- Single and Dual Circuit Master Cylinders
- Balanced Step Bore Master Cylinders
- Pedal Brackets and Circuit Parts



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070 - ACCESSORIES

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INTRODUCTION

SINGLE BORE MASTER CYLINDERS : GENERAL FEATURES

These unboosted hydraulic Master Cylinders are actuated by foot effort, via the brake pedal. The entire braking operation is controlled by the Master Cylinder.

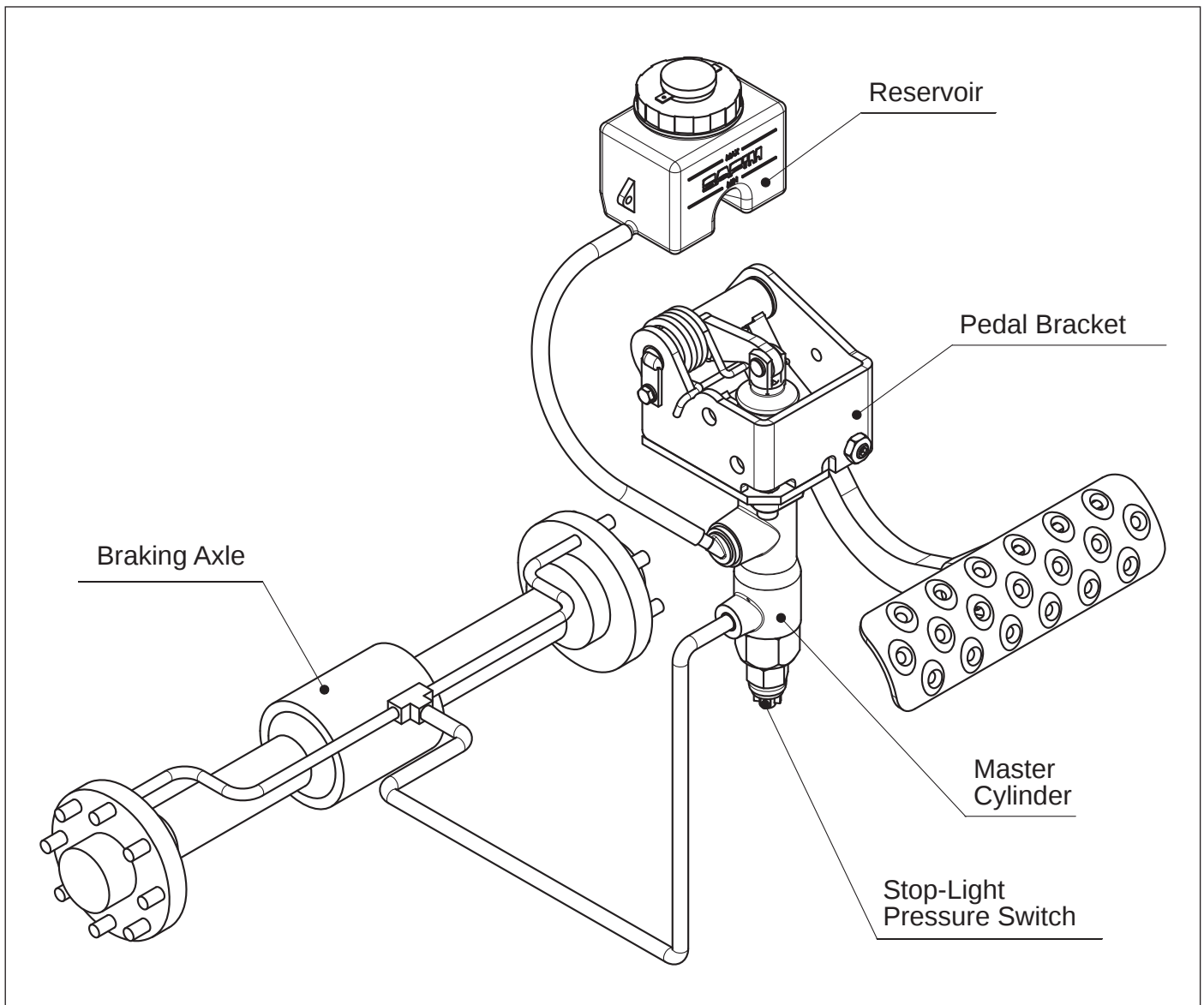
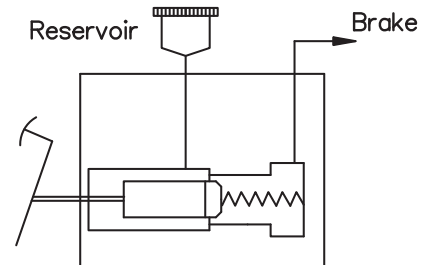
When the pedal is at rest, the Master Cylinder connects the brakes to the reservoir; when the pedal is applied, the Master Cylinder piston displaces the brake fluid in the brake system, into the disk brake calipers or into the wheel cylinders.

The brake pressure is related to actuation force and depends on the piston bore size : the smaller the bore, the higher the pressure.

The volume of oil that these Master Cylinders can displace depends on piston area and stroke.

Dual circuit Master Cylinders allow separation of the braking circuits: in the event of failure in one circuit, the other continues to operate.

Hydraulic diagram



SINGLE BORE MASTER CYLINDERS: SUMMARY

Brake Diameter [mm]	Total Displacement [cc]	Master Cylinder Ref.	Push-Rod Stroke [mm]	1st Circuit Stroke [mm]	1st Circuit Displacement [cc]	2nd Circuit Piston Diameter [mm]	2nd Circuit Stroke [mm]	2nd Circuit Displacement [cc]	Max Pressure [bar]	Page
19	8,2	021279	35	35	10,7 / 19,5	/	/	/	120	020.030
19,05	7,8	023295	29,5	15,5	3,7	19,05	14	3,7	100	030.030
22,2	13,5	022164	36	36	13,5	/	/	/	120	020.040
22	11,4	023300	31,6	12,5	4,4	22	19,1	7	100	030.040
25,4	16	021118	33	33	16	/	/	/	120	020.010
25,4	17,5	021266	36	36	17,5	/	/	/	120	020.050
25,4	15,7	021499	33	19	9,2	25,4	14	6,5	150	030.050
25,4	16,5	021115	36	19	9,2	25,4	17	7,3	150	030.010
27	19,4	022261	35	35	19,4	/	/	/	120	020.060
31,75	27	021119	36	36	27	/	/	/	120	020.020
31,75	27,3	022439	36	36	27,3	/	/	/	120	020.070
31,75	22	021116	31	15,5	11	31,75	15,5	11	150	030.020

STEP BORE MASTER CYLINDERS : GENERAL FEATURES

010

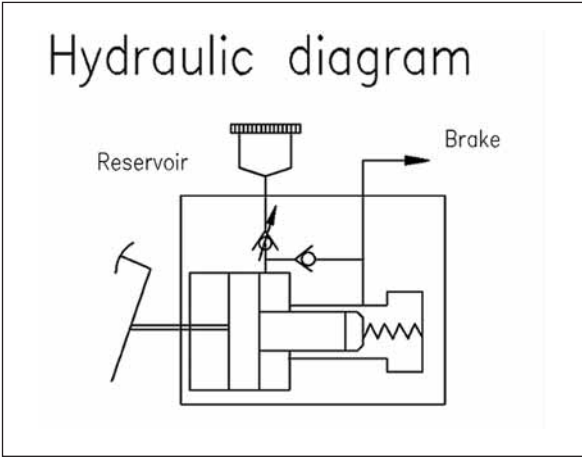
These master cylinders have a step bore piston, with special valves fitted internally which regulate their operation.

The brake fluid in the vehicle can be displaced by the larger diameter piston in large volumes, but at low pressure.

The valves are regulated in such a way that once a pressure level has been reached, at which the brakes friction surfaces are in line (filling pressure), the larger diameter piston is being gradually inhibited, allowing the smaller diameter piston to take over.

Thus high brake pressures can be obtained without excessive efforts.

For the reasons explained above, these master cylinders do not meter out a specific fluid volume, but a variable one, depending on the type of brake system, brake clearances, etc.

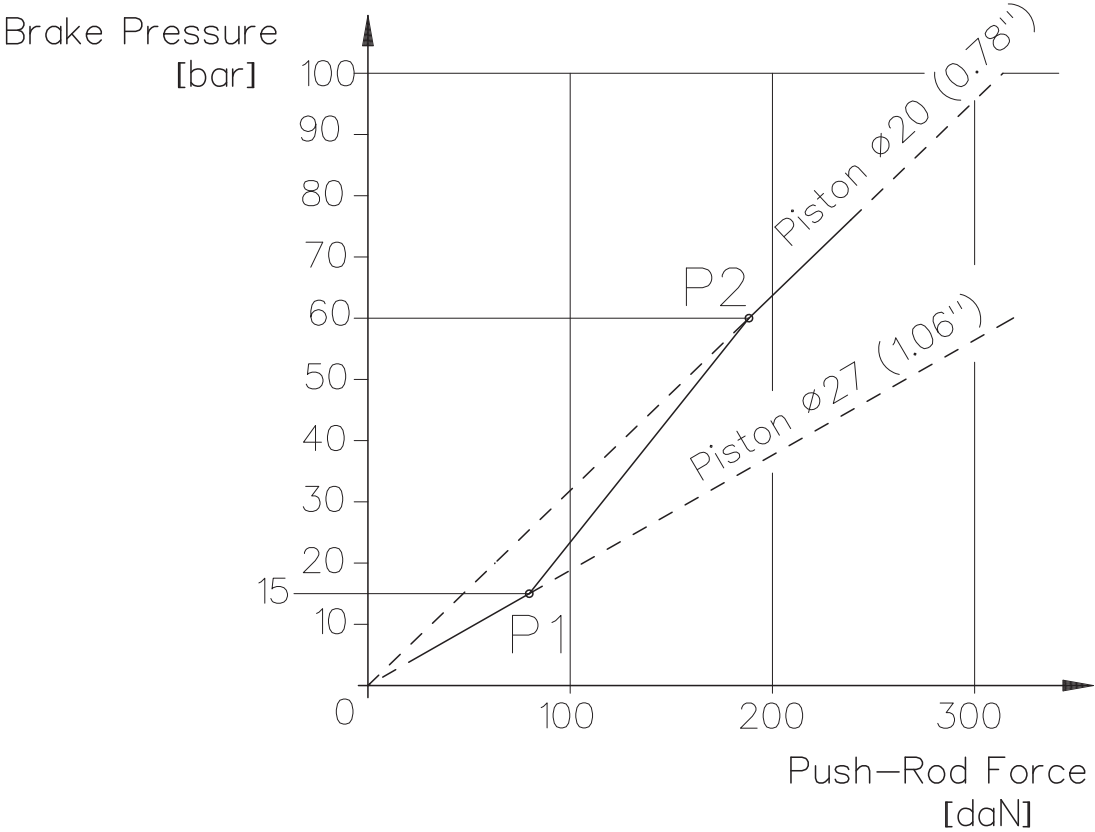


CONFRONT BETWEEN STEP BORE AND SINGLE BORE

The single bore master cylinders are usually simple and cheap.

The main advantages of the step bore master cylinders are a big displacement and the high braking pressures even without booster feeding. For this reason, they are much appreciated, as they enable to avoid the installation of hydraulic accumulators or other emergency devices working when the engine is off. In brake systems requiring a big displacement before starting to brake, they enable to reduce the filling stroke and to increase the working stroke.

FUNCTION
SCHEME



STEP BORE MASTER CYLINDERS: SUMMARY

Filling Diameter / Brake Diameter [mm]	Total Displace- ment [cc] Min / Max	Master Cylinder Ref.	Push-Rod Stroke [mm]	1st Circuit Stroke [mm]	1st Circuit Displacement [cc] Min / Max	2nd Circuit Piston Diameter [mm]	2nd Circuit Stroke [mm]	2nd Circuit Displacement [cc]	Max Pressure [bar]	Page
22,2/15,6	6,4/13	021688	34,5	34,5	6,4/13	/	/	/	150	040.010
25,4/18	8,6/17,2	022291	35	35	8,6/17,2	/	/	/	150	040.020
27/20	10,7/19,5	021287	35	35	10,7/19,5	/	/	/	150	040.030
27/23	14,5/19,5	023138	36	36	14,5/19,5	/	/	/	150	060.010
31,75/20	11,5/29	023488	37,5	37,5	11,5/29	/	/	/	150	040.040
31,75/20	11,5/29	023394	37,5	37,5	11,5/29	/	/	/	150	060.020
31,75/23	14,5/27	022196	36	36	14,5/27	/	/	/	150	040.050
31,75/23	14,5/27	022159	36	36	14,5/27	/	/	/	150	060.030
35/20	11/33,6	023105	36	36	11/33,6	/	/	/	150	040.060
35/20	11/33,6	022976	36	36	11/33,6	/	/	/	150	040.070
35/23	16,2/37,5	023379	40	40	16,2/37,5	/	/	/	150	040.080
35/23	29/67,4	023013	36	36	14,5/33,7	/	/	/	150	060.040
38/25	19,1/44,2	021255	40	40	19,1/44,2	/	/	/	150	040.090
38/25	18,3/43,4	031254	40	22	4,8/29,9	31,75	18	13,5	150	050.010
40/30	27,6/49	021289	40	40	27,6/49	/	/	/	150	040.100
40/30	26,6/48	031288	40	20	8,4/29,8	35	20	18,2	150	050.020

MASTER CYLINDER SELECTION

This section defines a methodology for the selection of Brake actuator system, comprising Master Cylinder and Pedal Mechanism.

The variables are shown in the table below.

Name	Description	Unit	Expression / Value
B	Master Cylinder Diameter	mm	GIVEN
A	Master Cylinder Active Section	mm ²	$(B^2/4) \cdot 3.14$
S _{CYL}	Master Cylinder Stroke	mm	GIVEN
Sc	Lost Travel from Pressure Seal	mm	1 - 1.5
S _{EFF}	Effective Master Cylinder Stroke	mm	$S_{CYL} - S_c$
D _{MIN}	For stepped bore, the displacement when the smaller piston works along all the stroke	cc	GIVEN
D _{MAX}	For stepped bore, the displacement when the larger piston works along all the stroke	cc	GIVEN
D _{CYL}	Master Cylinder Displacement	cc	Single Diameter : $A \cdot S_{EFF}$ (GIVEN)
			Stepped Bore : See next pages
D _B	Total Brake Displacement	cc	GIVEN
P _B	Brake Pressure	bar	GIVEN
F _B	Push-Rod Force	daN	GIVEN (see FUNCTION DIAGRAM)
L	Pedal Lever Length	mm	GIVEN
L ₁	Push-Rod Lever Length	mm	GIVEN
R	Pedal Ratio		L/L_1
S _p	Pedal Stroke	mm	$(D_B/D_{CYL}) \cdot S_{CYL} \cdot R \cdot 1.1$
F _p	Pedal Force	daN	F_B / R
S _{PREF}	Desired value of pedal stroke	mm	GIVEN
F _{PREF}	Desired value of pedal force	daN	GIVEN

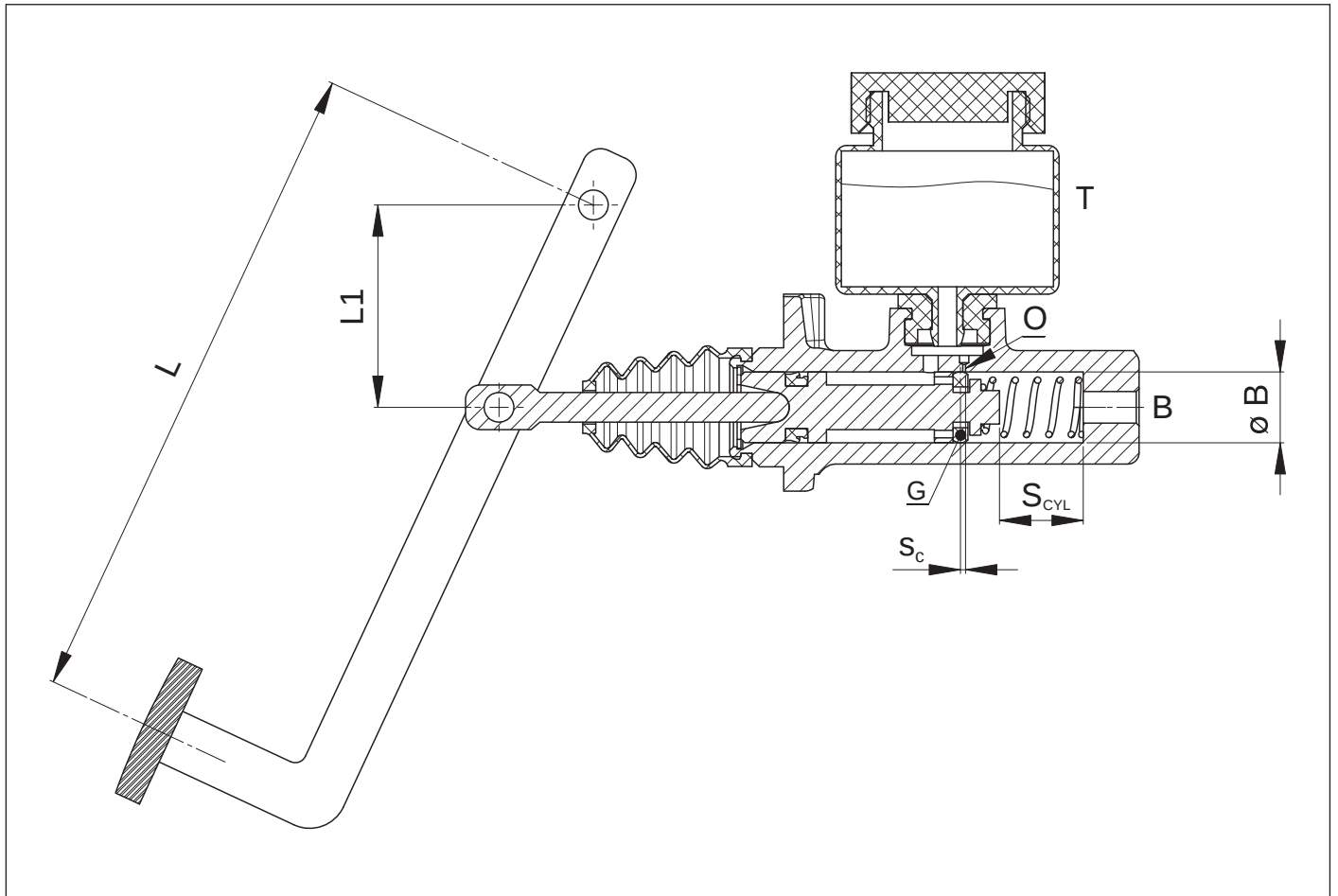
1. MASTER CYLINDER OPERATION

A section of a simple Master Cylinder is shown in the picture below : when the pedal at rest, the brake port B is connected to tank T through orifice O. When the pedal is applied, seal G traverses orifice O (after stroke), and brake operation starts.

A Master Cylinder's active section
(defined by Bore $\varnothing B$)

$S_{EFF} = S_{CYL} - S_C$ Master Cylinder stroke
($s_c \approx 1\text{mm} \div 1.5\text{mm}$)

$D_{CYL} = A \cdot S_{EFF}$ Master Cylinder Displacement



D_{CYL} and S_{CYL} are given in the datasheet for every Master Cylinder.

In a stepped-bore Master Cylinder the displacement is not fixed, because it can vary according to the brake design and the pressure drop in the hydraulic system.

As the first step in the selection process, use :

$$D_{CYL} = \frac{D_{MIN} + D_{MAX}}{2} \quad (D_{MIN} \text{ and } D_{MAX} \text{ are given in the datasheet})$$

The Master Cylinder displacement must always be higher than the total Brake Volume Displacement D_{Bf} to ensure the braking action in every condition with a safety margin.

The standard dimensioning is :

$$D_{CYL} = 1.4 \cdot D_B$$

This gives the minimum displacement to be provided by the master cylinder.

The next condition considers the system forces, hence the type of master cylinder and pedal ratio.

Geometrically, the pedal mechanism is defined by its ratio :

$$R = \frac{L}{L_1}$$

This value also defines the ratio between the Push-Rod Force F_B and the Pedal Force F_P :

$$R = \frac{F_B}{F_P}$$

2.TYPE OF MASTER CYLINDER : SINGLE OR STEP BORE?

The Braking requirements are usually assigned, and the starting data to be considered are :

D_B Total Brake Volume Displacement

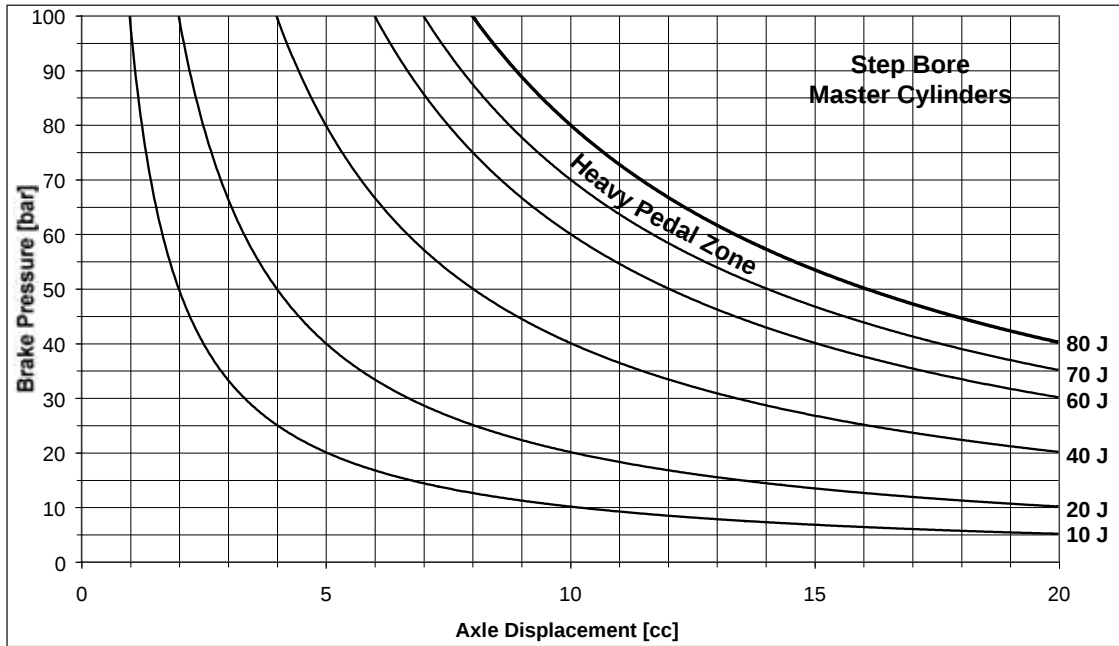
P_B Brake Pressure

In the previous section, we identified some master cylinders compatible by displacement to the braking axle.

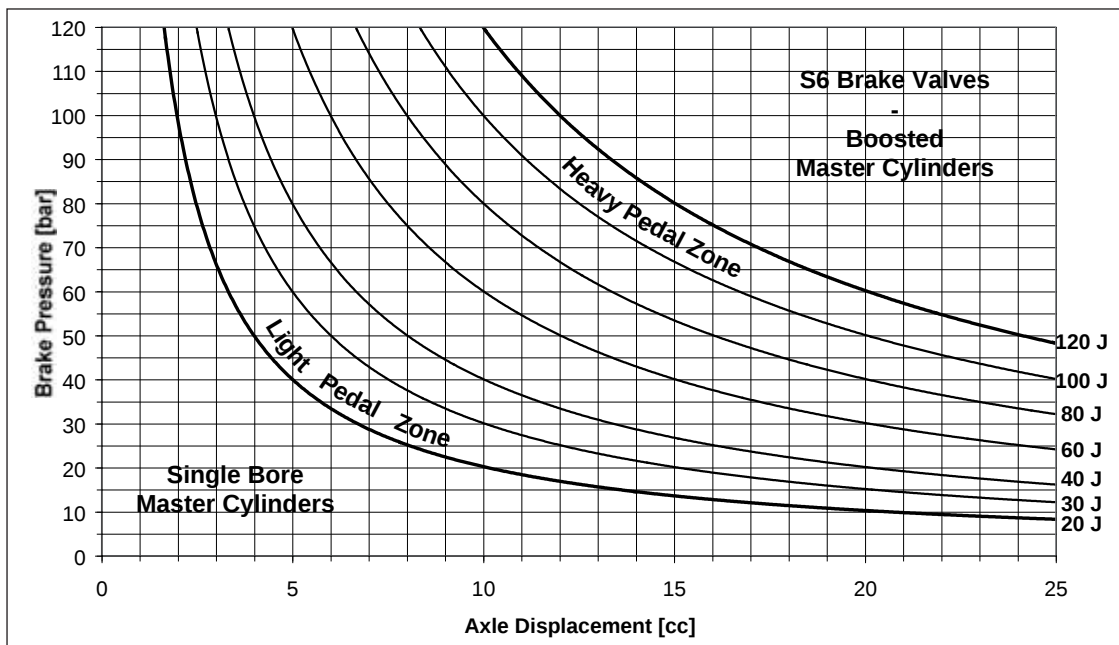
This second step depends on the application: Stepped Bore Master Cylinders are required for applications that need high displacements and high brake pressures without excessive pedal efforts.

For this evaluation there aren't fixed values, because they depend on the application : for example, you may allow higher pedal effort and stroke for an earth-moving machine compared with a fork-lift truck which needs lower pedal effort and stroke, similar to an automotive application.

From the following graphs, using the known brake pressure and displacement you can define the most suitable system.



SINGLE BORE MASTER CYLINDERS: ENERGY FOR BRAKING



STEP-BORE MASTER CYLINDERS: ENERGY FOR BRAKING

The curves in the graphs are iso-energetical; a high energy value can correspond to a high pedal force, or to a high pedal stroke, or both.

The two zones, Heavy pedal and Light pedal, define the limits where you need to change actuation technology.

If the result is in the Heavy Pedal Zone then pedal force or pedal stroke is too high;

Similarly, in the light pedal energy zone, the pedal characteristics are low forces and low strokes.

Typical values for braking energy are :

80J Earth-moving machines

50J Fork-lift and Material handling machines

NB : These energy values are not real values, but referring values for identify a category of braking system. The real value of braking energy in fact depends on the braking axle characteristic.

The referring energy value E_{REF} can be obtained from Force and Stroke, or from Pressure and Displacement :

$$E_{REF}[J] = \frac{P_B \cdot D_B}{10} = \frac{F_p \cdot S_p}{100}$$

3. PEDAL MECHANISM

The Pedal Mechanism, along with the Master Cylinder, defines the characteristic of the entire braking operation.
Like the previous point, this characteristic is a function of the application.
Common values for forces and strokes on pedal are given in the table below.

Graph zone	FP REF	SP REF
Heavy Pedal	50 daN	220 mm
Light Pedal	40 daN	125 mm

DESIGN OF THE PEDAL MECHANISM

The Pedal Ratio is calculated by comparison between the value of the Push-Rod Force given by the function diagram F_B and the required Force on pedal F_{PREF}

$$R = \frac{F_B}{F_{PREF}}$$

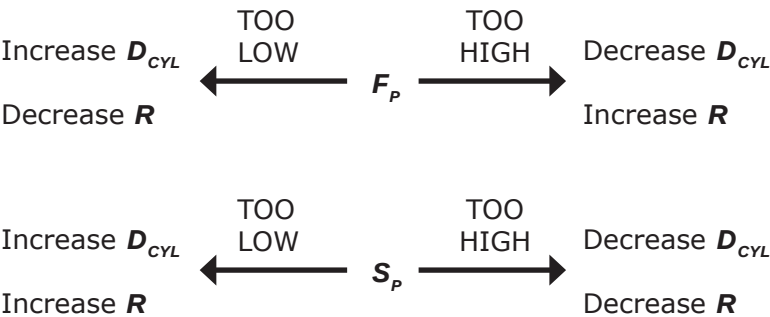
The resulting pedal stroke is :

$$S_P = \frac{D_B}{D_{CYL}} \cdot S_{CYL} \cdot R \cdot 1.1 \approx S_{PREF}$$

Where the value 1.1 is a correction factor that takes into account clearances in the push rod and master cylinder.
 F_{PREF} and S_{PREF} are the desired pedal stroke and pedal force values.
If the values given by the expressions are not close to the desired results, you can make changes to the Master Cylinder or pedal ratio specifications, or both (See point 4.)

4. ITERATIVE METHOD

The desired braking characteristic is not always reached at the first calculation, so it may be necessary to vary some parameters, either of the Master Cylinder that of the Pedal Mechanism, if not yet defined.
The method is summarised below :



5. APPLICATION EXAMPLE

A braking axle has the following characteristics :

$$D_B = 11 \text{ cc}$$

$$P_B = 50 \text{ bar}$$

The first calculation specifies the minimum master cylinder displacement :

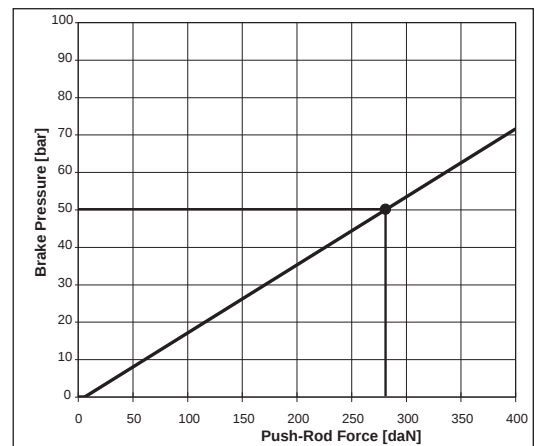
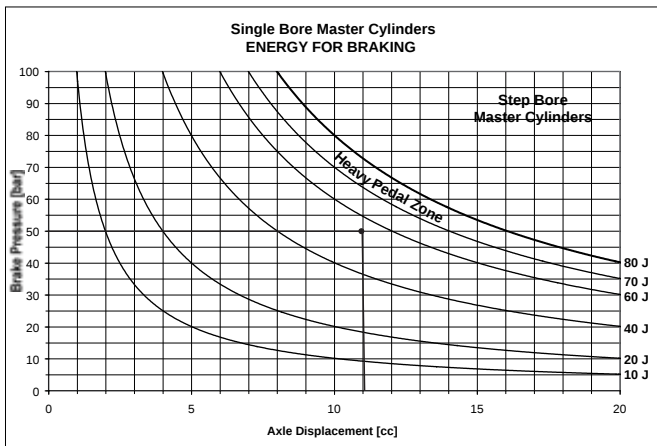
$$F_{CYLMIN} = 1.4 \cdot D_B = 15.4 \text{ cc}$$

HEAVY / MEDIUM PEDAL REQUIRED

From the graph, it appears that a simple master cylinder is enough.

From the catalogue, a suitable master cylinder is 021266 (17.5cc).

In this master cylinder, 50 bar corresponds to 280 daN of Push-Rod Force (FUNCTION DIAGRAM).



Our application requires a brake pedal with

$$F_{PREF} = 50 \text{ daN}$$

The pedal ratio is therefore

$$R = \frac{280}{50} = 5.6$$

The pedal stroke is

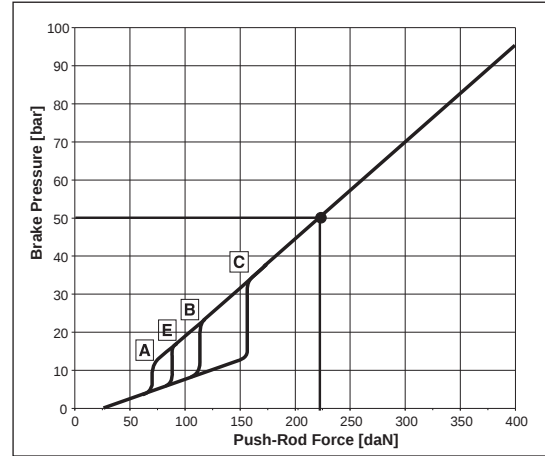
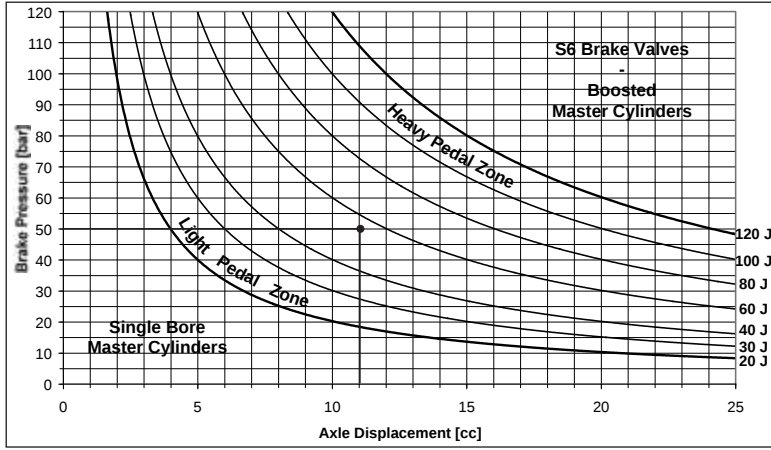
$$S_P = \frac{11}{17.5} \cdot 36 \cdot 5.6 \cdot 1.1 = 139.4 \text{ mm}$$

If these value are OK for our application, the master cylinder and the pedal ratio are chosen.

LIGHT PEDAL REQUIRED

If we want a lighter pedal (for example 40 daN), we can try with a stepped bore master cylinder. From the catalogue, we find the 023488, that has a displacement

$$D_{CYL} = \frac{11.5 + 29}{2} = 20.25 \text{ cc}$$



In this master cylinder, 50 bar correspond to 235 daN of Push-Rod Force (FUNCTION DIAGRAM). The results are:

$$R = \frac{235}{40} = 5.875$$

$$S_p = \frac{11}{20.25} \cdot 37.5 \cdot 5.875 \cdot 1.1 = 131 \text{ mm}$$

By specifying a stepped bore master cylinder, we have obtained a lighter pedal with lower stroke. In reality, as in this example, there are cases where it is possible to use either a stepped bore or simple master cylinder.

The application and the desired pedal characteristics define which it's better to use.

More often the choice is a stepped bore master cylinder, because it allows a decrease in forces and strokes without changes to the hydraulic system.

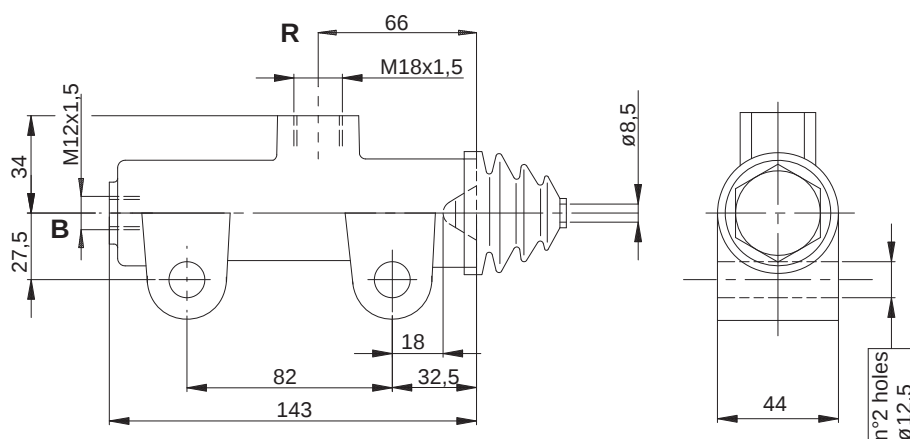
A stepped bore Master Cylinder gives best performance only when it is chosen and optimized for the hydraulic system and the type of brake it is matched with.

For this reason this section suggests only a first choice, and for the final definition of the Master Cylinder is necessary to know the pressure / displacement characteristic of the brakes, or at least the brake threshold pressure value; the length and the section of the brake hoses are also important, as is the oil specification as they can influence the characteristic of braking operation.

cod. 0 21119

Master cylinders without hydraulic booster

Single Circuit Master Cylinder $\varnothing 1\frac{1}{4}$



CONNECTIONS

R	Master Cylinder filling	M18x1.5
B	Brakes	M12x1.5

TECHNICAL FEATURES

Piston diameter	31.75 mm
Stroke	36 mm
Displacement	27 cm ³

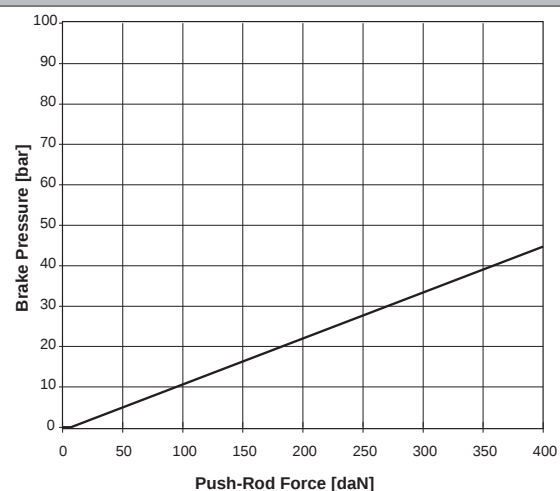
WORKING CONDITIONS

Max pressure	120 bar
Oil temperature range (brake fluid)	-30°C ÷ +100°C
Oil temperature range (mineral oil)	-20°C ÷ +90°C

ASSEMBLY POSITIONS

	OK
	OK
	OK
	NO

FUNCTION DIAGRAM

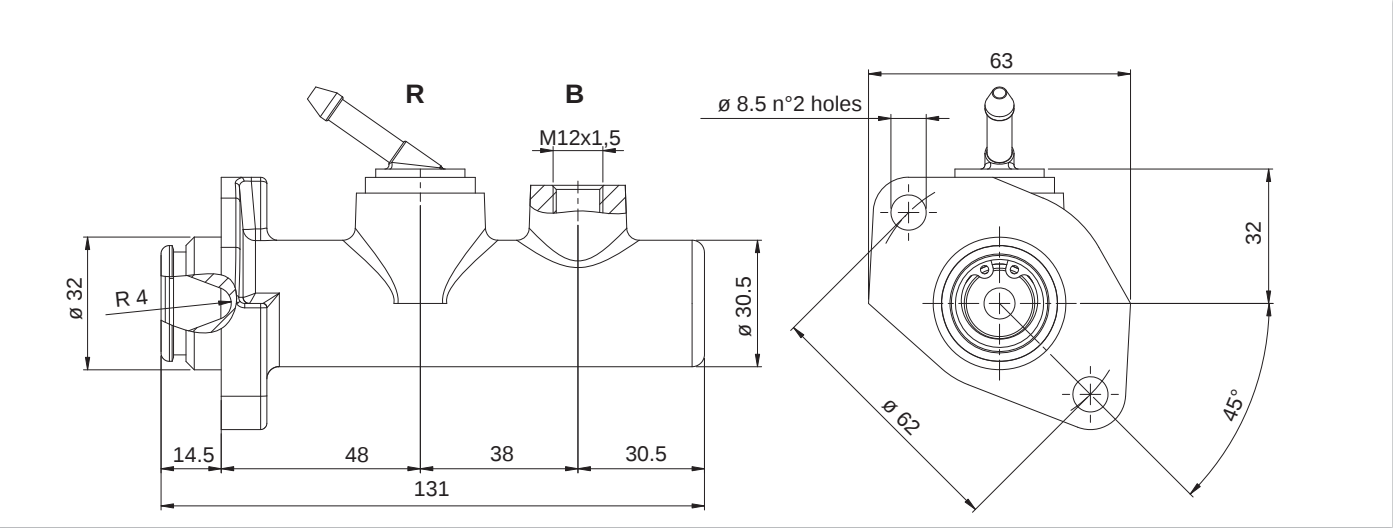


ORDER PART NUMBER

02	1119	MN
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FN	Brake fluid DOT 3-4
MN	Mineral oil

cod. 0 21279 Master cylinders without hydraulic booster
ø 3 / 4" Single Circuit Flanged Master Cylinder



CONNECTIONS

R	Master Cylinder filling	See table
B	Brakes	M12x1.5

TECHNICAL FEATURES

Piston diameter	19 mm
Stroke	29 mm
Displacement	8.2 cm ³

WORKING CONDITIONS

Max pressure	120 bar
Oil temperature range (brake fluid)	-30°C ÷ +100°C
Oil temperature range (mineral oil)	-20°C ÷ +90°C

RESERVOIR JOINT TYPE

Type "F1"	Type "F4"	Type "F3"

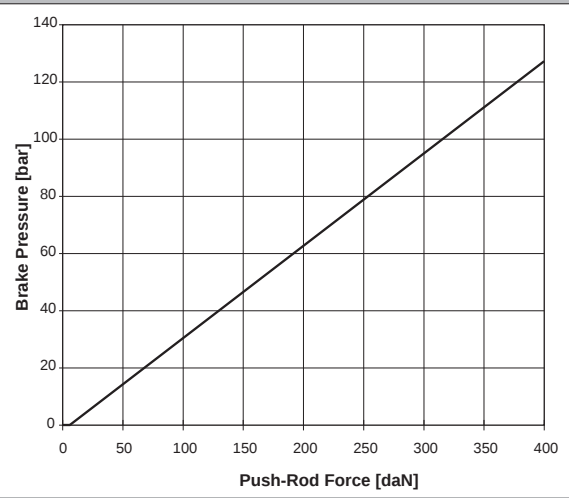
ORDER PART NUMBER

02	1279	MN	/	9
FN	Brake fluid DOT 3-4			
MN	Mineral oil			
		Reservoir Joint Diameter	Reservoir Joint Type	
		-	13	F4
		7	13	F1
		9	13	F3

ASSEMBLY POSITIONS

	OK
	OK
	NO
	NO

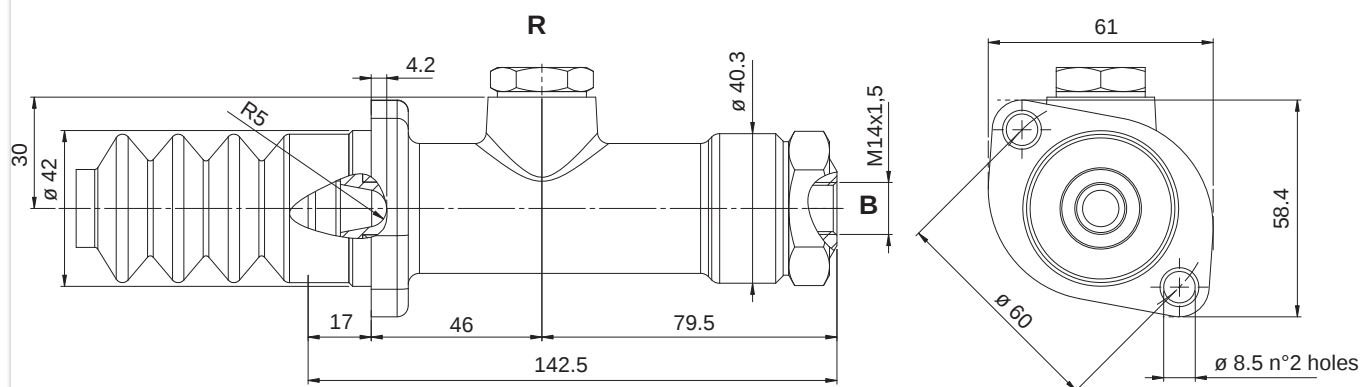
FUNCTION DIAGRAM



cod. 022164

Master cylinders without hydraulic booster

ø 7/8" Single Circuit Flanged Master Cylinder



CONNECTIONS

R	Master Cylinder filling	See table
B	Brakes	M14x1.5

TECHNICAL FEATURES

Piston diameter	22.2 mm
Stroke	36 mm
Displacement	13.5 cm ³

WORKING CONDITIONS

Max pressure	120 bar
Oil temperature range (brake fluid)	-30°C ÷ +100°C
Oil temperature range (mineral oil)	-20°C ÷ +90°C

RESERVOIR JOINT TYPE

Threaded hole	Type "F2"	Type "F1"

ORDER PART NUMBER

02 2164 MN / 5

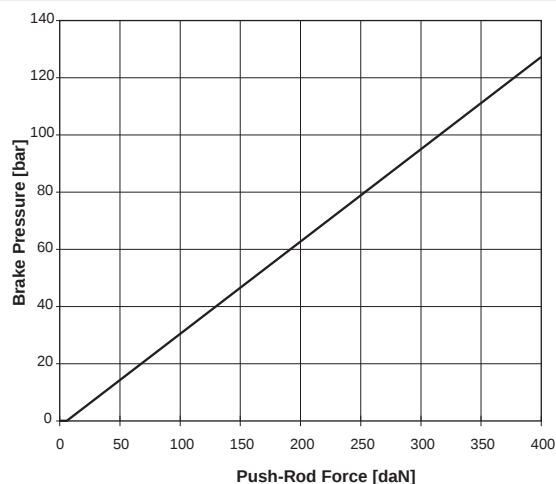
FN	Brake fluid DOT 3-4
MN	Mineral oil

	Reservoir Joint Diameter	Reservoir Joint Type
-	13	M12x1.5
5	13	F2
7	13	F1

ASSEMBLY POSITIONS

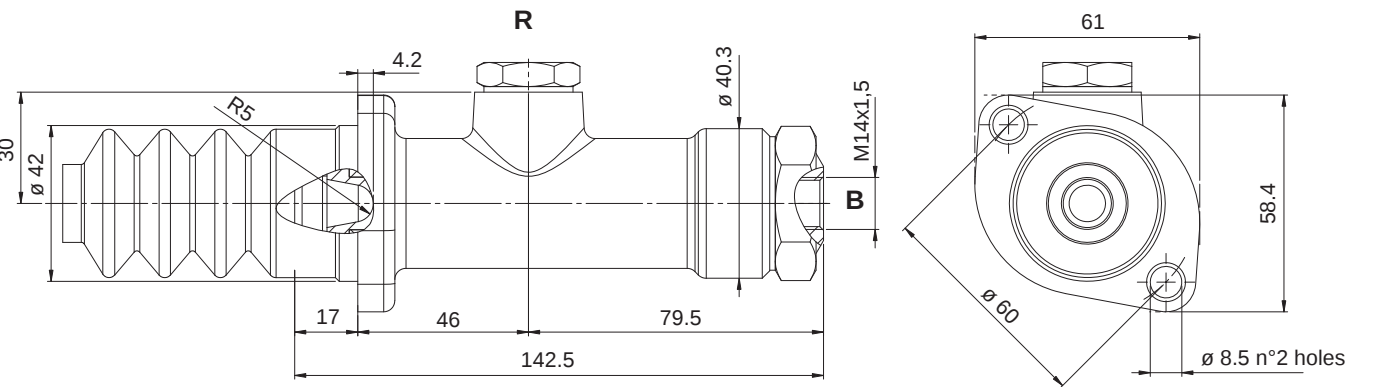
	OK
	OK
	OK
	NO

FUNCTION DIAGRAM



cod. 0 212 6 6

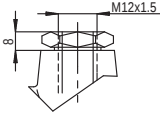
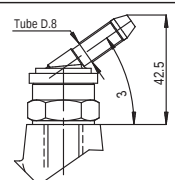
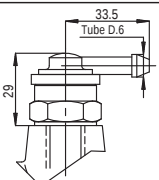
Master cylinders without hydraulic booster
ø 1" Single Circuit Flanged Master Cylinder



CONNECTIONS		
R	Master Cylinder filling	See table
B	Brakes	M14x1.5

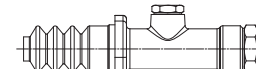
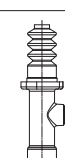
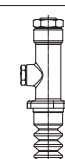
TECHNICAL FEATURES	
Piston diameter	25.4 mm
Stroke	36 mm
Displacement	17.5 cm ³

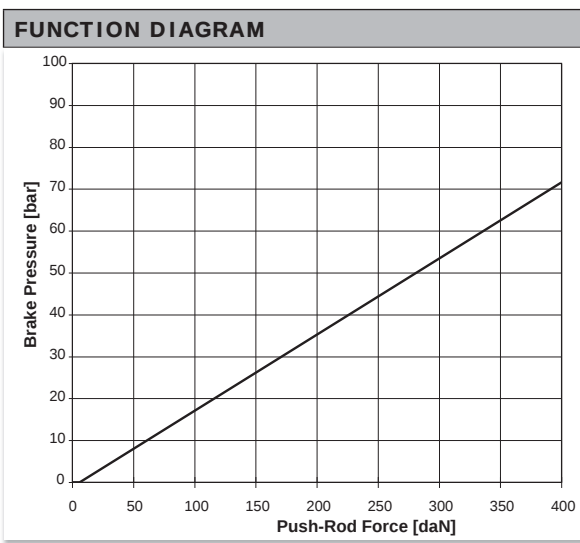
WORKING CONDITIONS	
Max pressure	120 bar
Oil temperature range (brake fluid)	-30°C ÷ +100°C
Oil temperature range (mineral oil)	-20°C ÷ +90°C

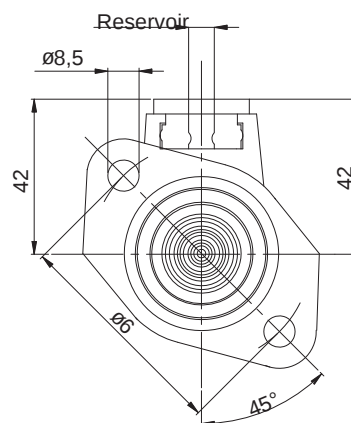
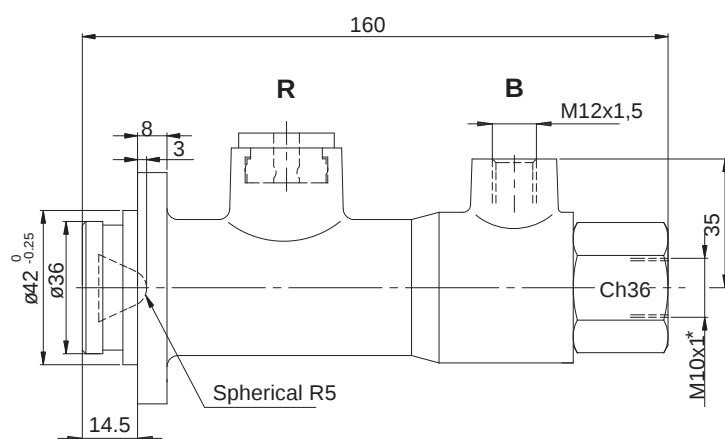
RESERVOIR JOINT TYPE		
Threaded hole	Type "F2"	Type "F1"
		

ORDER PART NUMBER

02		1266		MN		/		5	
FN		Brake fluid DOT 3-4				Reservoir Joint Diameter		Reservoir Joint Type	
MN		Mineral oil				-		13	
						5		13	
						7		13	

ASSEMBLY POSITIONS	
	OK
	OK
	OK
	NO



cod. 022261**Master cylinders without hydraulic booster
ø 27 Single Circuit Flanged Master Cylinder****CONNECTIONS**

R	Master Cylinder filling	See table
B	Brakes	M12x1.5

TECHNICAL FEATURES

Piston diameter	27 mm
Stroke	35 mm
Displacement	19.4 cm ³

WORKING CONDITIONS

Max pressure	120 bar
Oil temperature range (brake fluid)	-30°C ÷ +100°C
Oil temperature range (mineral oil)	-20°C ÷ +90°C

RESERVOIR JOINT TYPE

Threaded hole	Type "F2"	Type "F1"

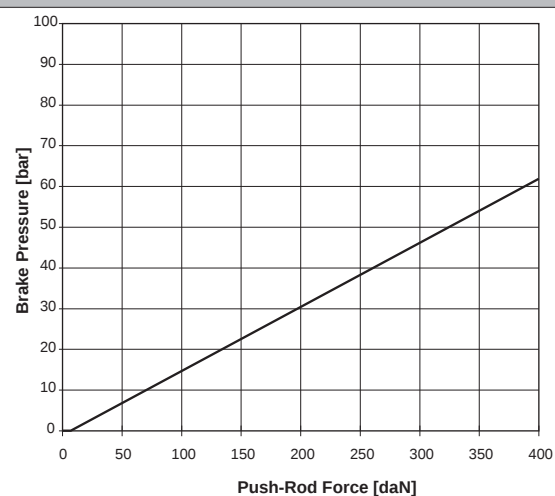
ORDER PART NUMBER**02 2261 MN / 1**

FN	Brake fluid DOT 3-4
MN	Mineral oil

	Pressure Switch Port		Reservoir Joint Diameter	Reservoir Joint Type
	Thread Hole	Plug M10x1		
1	M10x1	-	ø 8	-
*	-	-	ø 8	-
2	M10x1	-	ø 13	-
3	-	-	ø 13	-
4	M10x1	-	ø 13	F2
5	-	-	ø 13	F2
6	M10x1	-	ø 13	F1
7	-	-	ø 13	F1
8	M10x1	-	ø 13	F3
9	-	-	ø 13	F3
10	M10x1	si	ø 8	-

ASSEMBLY POSITIONS

	OK
	OK
	OK (with bleeding screw)
	NO

FUNCTION DIAGRAM

020



TECHNICAL FEATURES

ASSEMBLY POSITIONS

WORKING CONDITIONS

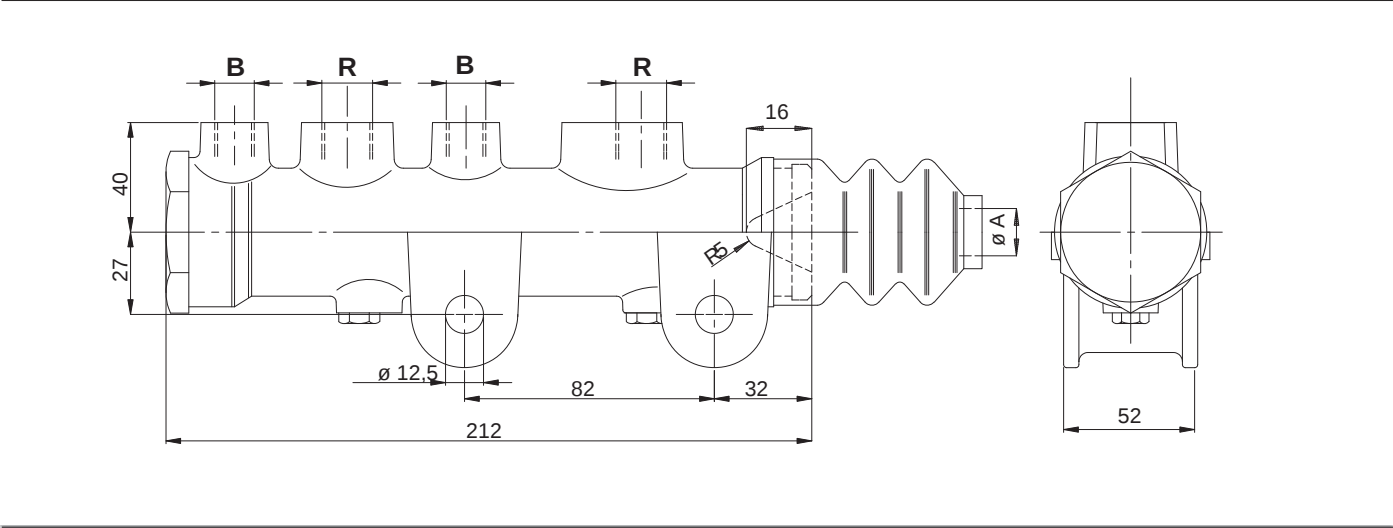
FUNCTION DIAGRAM



FN	Brake fluid DOT 3-4
MN	Mineral oil

cod. 0 21115

MASTER CYLINDERS WITHOUT HYDRAULIC BOOSTER
ø1" Dual Circuit Master Cylinder



CONNECTIONS		
B	Brakes	M12x1.25
R	Master Cylinder filling	M18x1,5
A	Hole for Push-Rod	D.12,5 mm

TECHNICAL FEATURES	
1st and 2nd Circuit Piston Diameter	25.4 mm
1st Circuit's Piston Stroke	19 mm
2nd Circuit's Piston Stroke	17 mm
Total stroke	36 mm
1st Circuit's Displacement	9.2 cm ³
2nd Circuit's Displacement	7.3 cm ³
Total Displacement	16.5 cm ³

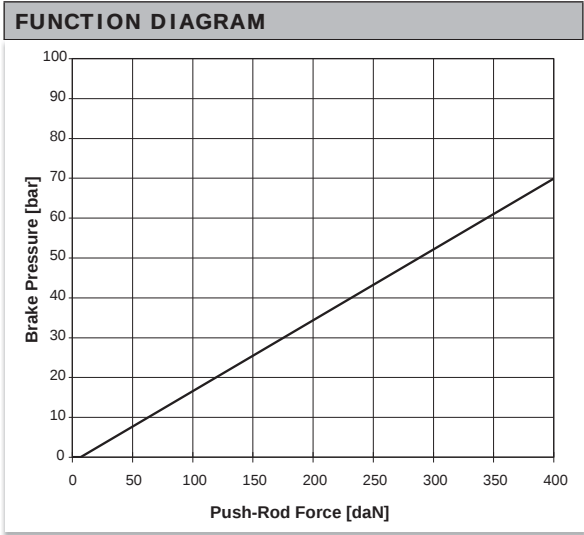
WORKING CONDITIONS	
Max pressure	150 bar
Oil temperature range (brake fluid)	-30°C ÷ +100°C
Oil temperature range (mineral oil)	-20°C ÷ +90°C

ASSEMBLY POSITIONS	
	OK
	OK (with blee- ding screw)
	Possible (*)
	NO

* Contact our technical department

ORDER PART NUMBER

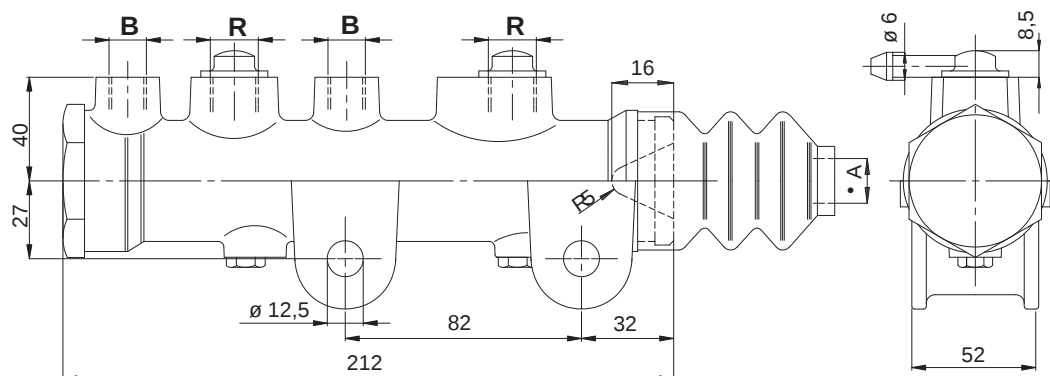
02	1115	MN
FN	Brake fluid DOT 3-4	
MN	Mineral oil	



cod. 0 21116

MASTER CYLINDERS WITHOUT HYDRAULIC BOOSTER

Ø1" ¼ Dual Circuit Master Cylinder



CONNECTIONS

B	Brakes	M12x1.5
R	Master Cylinder filling	See drawing
A	Hole for Push-Rod	D.18,5 mm

TECHNICAL FEATURES

1st and 2nd Circuit Piston Diameter	31.75 mm
1st Circuit's Piston Stroke	15.5 mm
2nd Circuit's Piston Stroke	15.5 mm
Total stroke	31 mm
1st Circuit's Displacement	11 cm ³
2nd Circuit's Displacement	11 cm ³
Total Displacement	22 cm ³

WORKING CONDITIONS

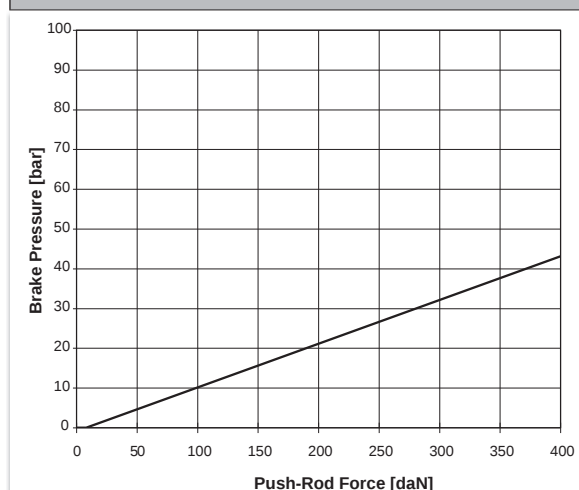
Max pressure	150 bar
Oil temperature range (brake fluid)	-30°C ÷ +100°C
Oil temperature range (mineral oil)	-20°C ÷ +90°C

ASSEMBLY POSITIONS

	OK
	OK (with bleeding screw)
	Possible (*)
	NO

* Contact our technical department

FUNCTION DIAGRAM

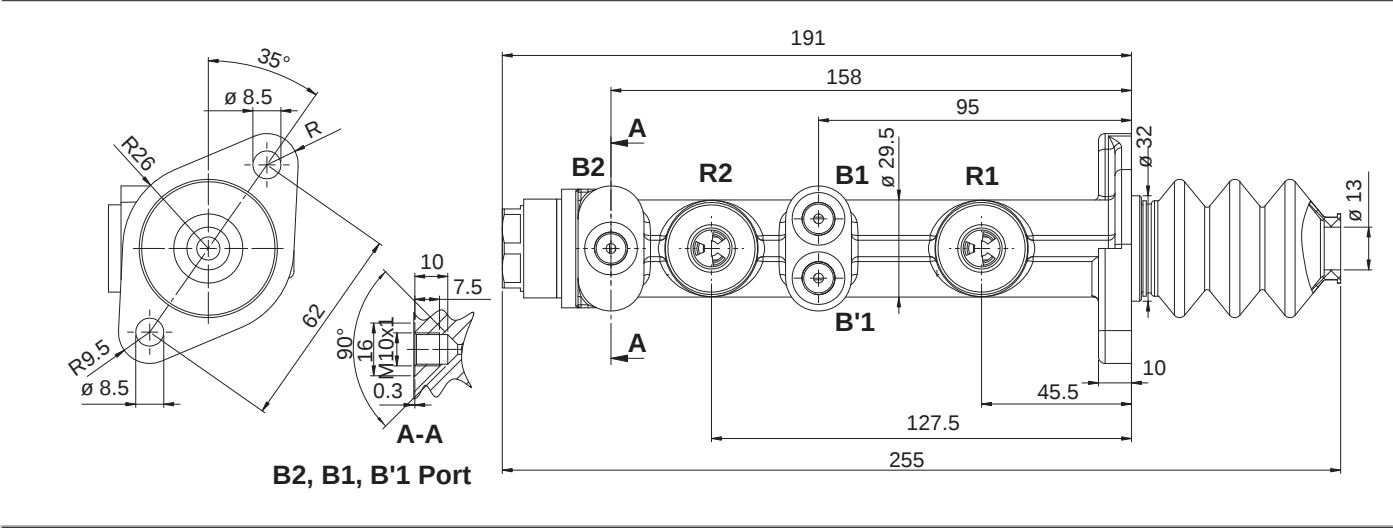


ORDER PART NUMBER

02	1116	MN
FN	Brake fluid DOT 3-4	
MN	Mineral oil	

cod. 023295

MASTER CYLINDERS WITHOUT HYDRAULIC BOOSTER
Ø19.05 Dual Circuit Flanged Master Cylinder



CONNECTIONS		
B1,B'1	Brakes	M10x1
B2	Brakes	M10x1
R1	Master Cylinder filling	See table
R2	Master Cylinder filling	See table

TECHNICAL FEATURES	
1st and 2nd Circuit Piston Diameter	19.05 mm
1st Circuit's Piston Stroke	15.5 mm
2nd Circuit's Piston Stroke	14 mm
Total stroke	29.5 mm
1st Circuit's Displacement	4.1 cm³
2nd Circuit's Displacement	3.7 cm³
Total Displacement	7.8 cm³

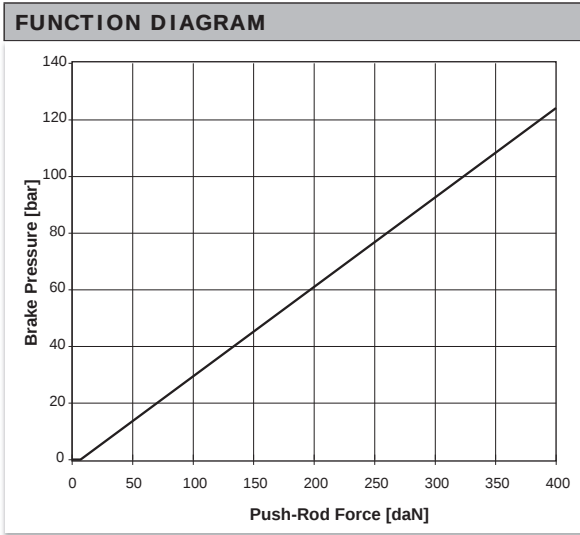
WORKING CONDITIONS	
Max pressure	100 bar
Oil temperature range (brake fluid)	-30°C ÷ +90°C
Oil temperature range (mineral oil)	-20°C ÷ +80°C

RESERVOIR JOINT TYPE		
Type "F1"	Type "F2"	Type "F3"

ORDER PART NUMBER				
02	3295	MN	/	5
FN	Brake fluid DOT 3-4		Reservoir Joint Type	
MN	Mineral oil			
5			F2	
7			F1	
9			F3	

ASSEMBLY POSITIONS	
	OK
	Possible (*)
	OK (with bleeding screw)
	NO

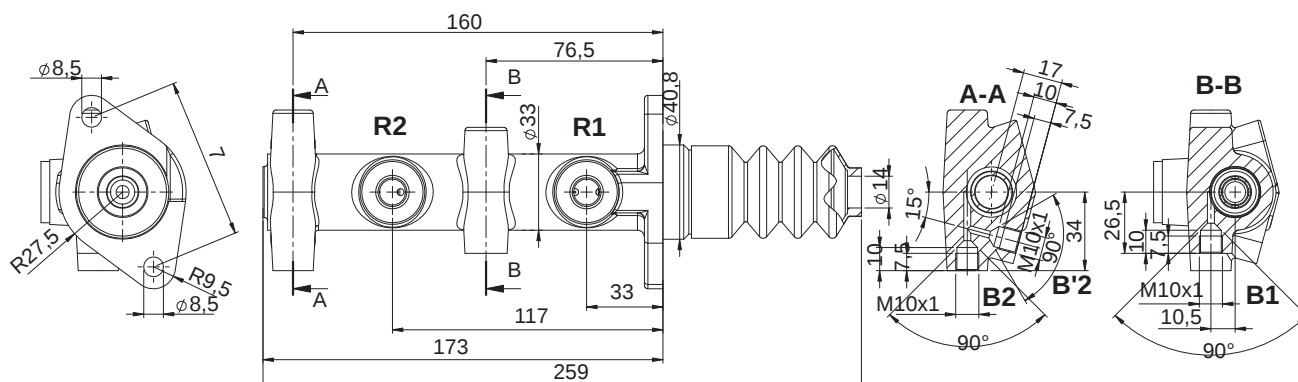
* Contact our technical department



cod. 023300

MASTER CYLINDERS WITHOUT HYDRAULIC BOOSTER

ø22.2 Dual Circuit Flanged Master Cylinder



CONNECTIONS

B1	Brakes	M10x1
B2,B'2	Brakes	M10x1
R1	Master Cylinder filling	See table
R2	Master Cylinder filling	See table

TECHNICAL FEATURES

1st and 2nd Circuit Piston Diameter	22 mm
1st Circuit's Piston Stroke	12.5 mm
2nd Circuit's Piston Stroke	19.1 mm
Total stroke	31.6 mm
1st Circuit's Displacement	4.4 cm ³
2nd Circuit's Displacement	7 cm ³
Total Displacement	11.4 cm ³

WORKING CONDITIONS

Max pressure	100 bar
Oil temperature range (brake fluid)	-30°C ÷ +90°C
Oil temperature range (mineral oil)	-20°C ÷ +80°C

RESERVOIR JOINT TYPE

Type "F1"	Type "F2"	Type "F3"

ORDER PART NUMBER

02	3300	MN	/	5
FN	Brake fluid DOT 3-4	Reservoir Joint Type		
MN	Mineral oil			
5	F2			
7	F1			
9	F3			

ASSEMBLY POSITIONS

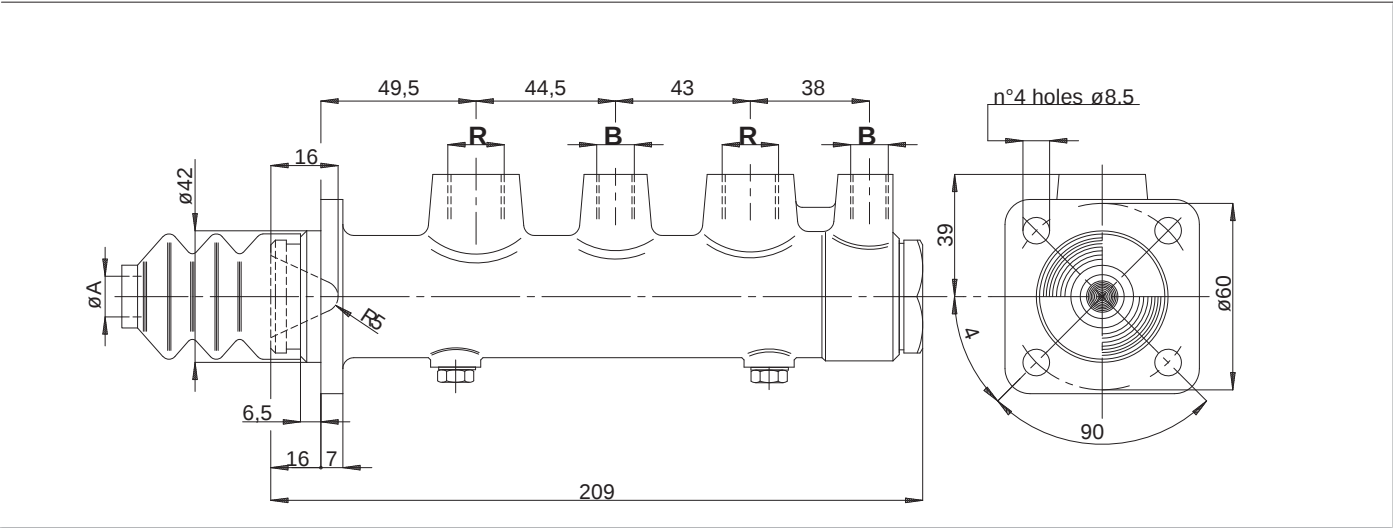
	OK
	Possible (*)
	NO
	NO

* Contact our technical department

FUNCTION DIAGRAM

cod. 021499

MASTER CYLINDERS WITHOUT HYDRAULIC BOOSTER
ø1" Dual Circuit Flanged Master Cylinder



CONNECTIONS		
B	Brakes	M12x1.5
R	Master Cylinder filling	M18x1,5
A	Hole for Push-Rod	D.13 mm

TECHNICAL FEATURES	
1st and 2nd Circuit Piston Diameter	25.4 mm
1st Circuit's Piston Stroke	19 mm
2nd Circuit's Piston Stroke	14 mm
Total stroke	33 mm
1st Circuit's Displacement	9.2 cm ³
2nd Circuit's Displacement	6.5 cm ³
Total Displacement	15.7 cm ³

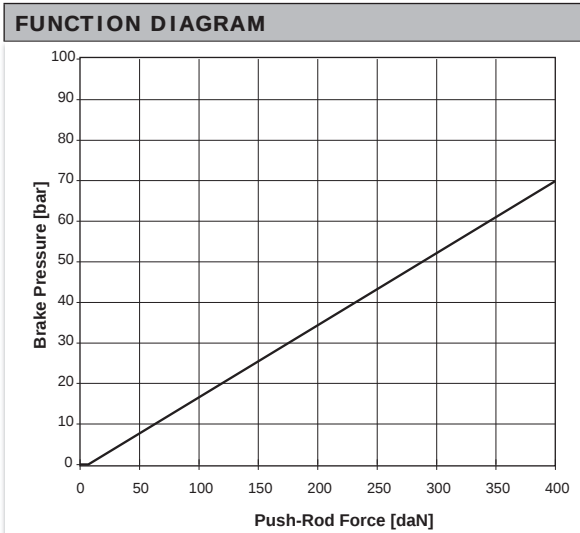
WORKING CONDITIONS	
Max pressure	150 bar
Oil temperature range (brake fluid)	-30°C ÷ +100°C
Oil temperature range (mineral oil)	-20°C ÷ +90°C

ASSEMBLY POSITIONS	
	OK
	Possible (*)
	OK (with bleeding screw)
	NO

* Contact our technical department

ORDER PART NUMBER

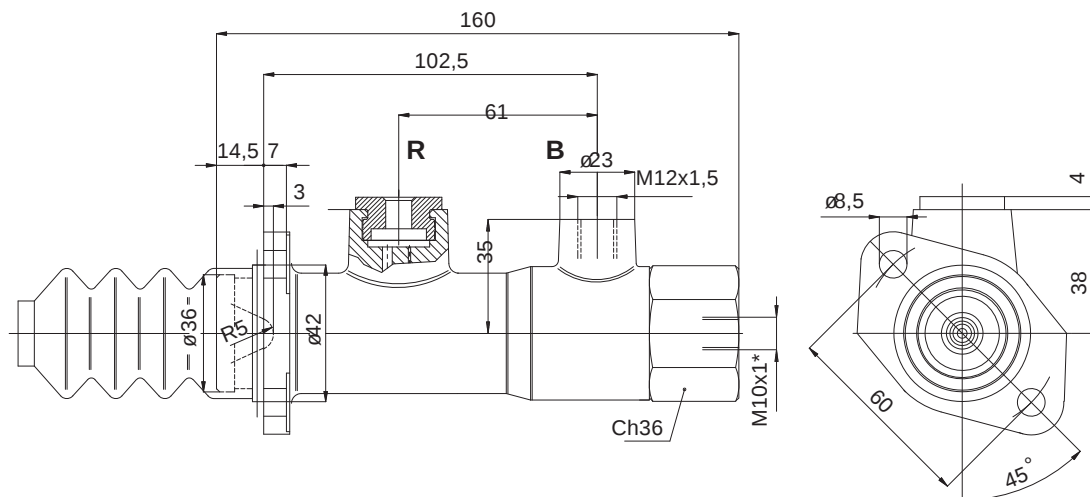
02	1499	MN
FN	Brake fluid DOT 3-4	
MN	Mineral oil	



cod. 022291

MASTER CYLINDERS WITHOUT BOOSTER

ø25.4 - ø18 Step Bore SINGLE CIRCUIT Master Cylinder



CONNECTIONS

R	Master Cylinder filling	See table
B	Brakes	M12x1.5

TECHNICAL FEATURES

Piston Diameter	25.4 / 18 mm
Push-rod Stroke	35 mm
Displacement (min / max)	8.6 / 17.2 cm ³

WORKING CONDITIONS

Max pressure	150 bar
Oil temperature range (brake fluid)	-30°C ÷ +100°C
Oil temperature range (mineral oil)	-20°C ÷ +90°C

RESERVOIR JOINT TYPE

Type "F1"	Type "F2"	Type "F3"

ORDER PART NUMBER

02 1688 MN / A 1

FN	Brake fluid DOT 3-4
MN	Mineral oil

P1 [bar]	Spring Type
5	A
7	E
10	B
15	C (**)
20	D

** Standard Configuration

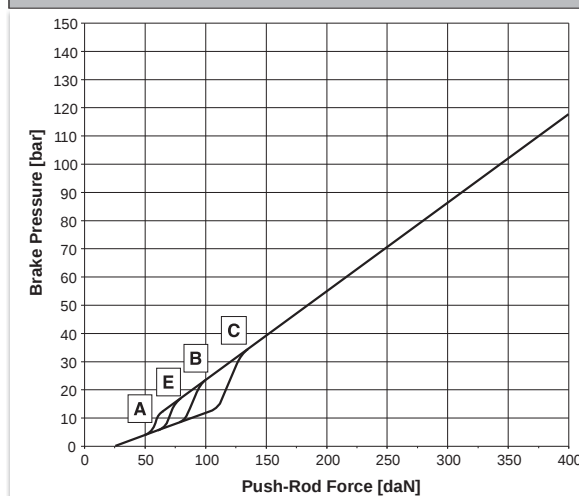
	Pressure Switch Port		Reservoir Joint Diameter	Reservoir Joint Type
	Thread Hole	Plug M10x1		
1	M10x1	-	ø8	-
*	-	-	ø8	-
2	M10x1	-	ø13	-
3	-	-	ø13	-
4	M10x1	-	ø13	F2
5	-	-	ø13	F2
6	M10x1	-	ø13	F1
7	-	-	ø13	F1
8	M10x1	-	ø13	F3
9	-	-	ø13	F3
10	M10x1	si	ø8	-
11	M10x1	si	ø13	F2

ASSEMBLY POSITIONS

	OK
	Possible (*)
	OK (with bleeding screw)
	NO

* Contact our technical department

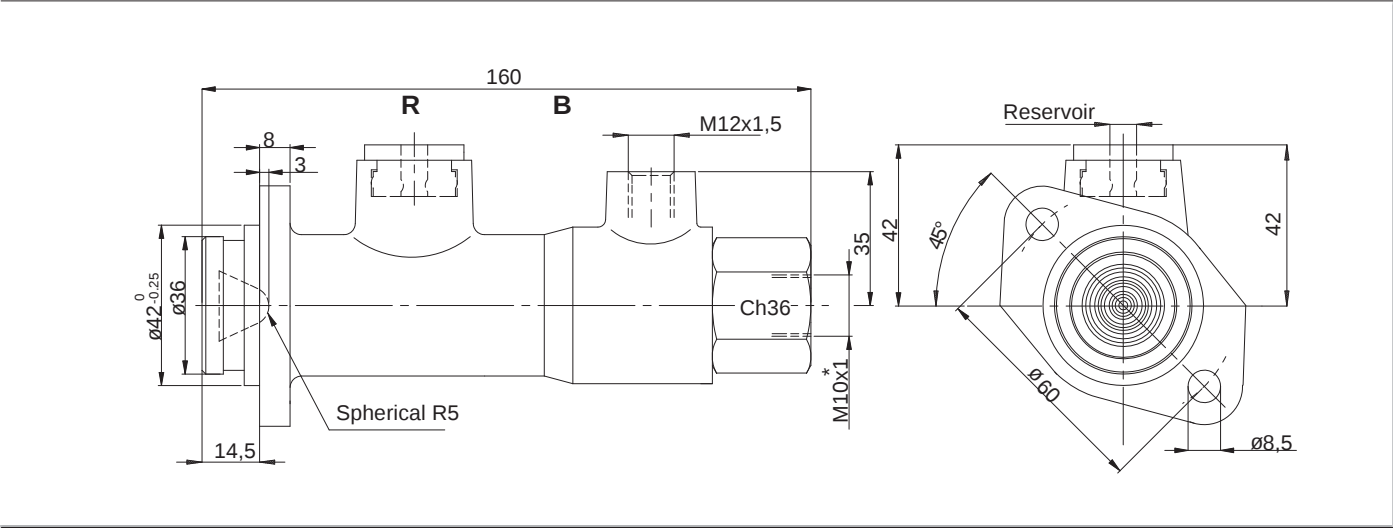
FUNCTION DIAGRAM



cod. 021287

MASTER CYLINDERS WITHOUT BOOSTER

27 - 20 Step Bore SINGLE CIRCUIT Master Cylinder



CONNECTIONS

R	Master Cylinder filling	See table
B	Brakes	M12x1.5

TECHNICAL FEATURES

Piston Diameter	27 / 20 mm
Push-rod Stroke	35 mm
Displacement (min / max)	10.7 / 19.5 cm ³

WORKING CONDITIONS

Max pressure	150 bar
Oil temperature range (brake fluid)	-30°C ÷ +100°C
Oil temperature range (mineral oil)	-20°C ÷ +90°C

ORDER PART NUMBER

Type "F1"	Type "F2"	Type "F3"

ORDER PART NUMBER

02	1287	MN	/	A	1
----	------	----	---	---	---

FN	Brake fluid DOT 3-4
MN	Mineral oil

P1 [bar]	Spring Type
5	A
7	E
10	B
15	C (**)
20	D

** Standard Configuration

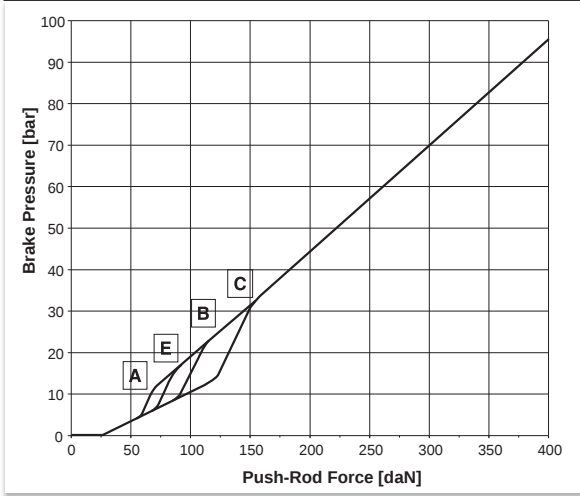
	Pressure Switch Port		Reservoir Joint Diameter	Reservoir Joint Type
	Thread Hole	Plug M10x1		
1	M10x1	-	ø8	-
*	-	-	ø8	-
2	M10x1	-	ø13	-
3	-	-	ø13	-
4	M10x1	-	ø13	F2
5	-	-	ø13	F2
6	M10x1	-	ø13	F1
7	-	-	ø13	F1
8	M10x1	-	ø13	F3
9	-	-	ø13	F3
10	M10x1	si	ø8	-
11	M10x1	si	ø13	F2

ASSEMBLY POSITIONS

	OK
	Possible (*)
	OK (with bleeding screw)
	NO

* Contact our technical department

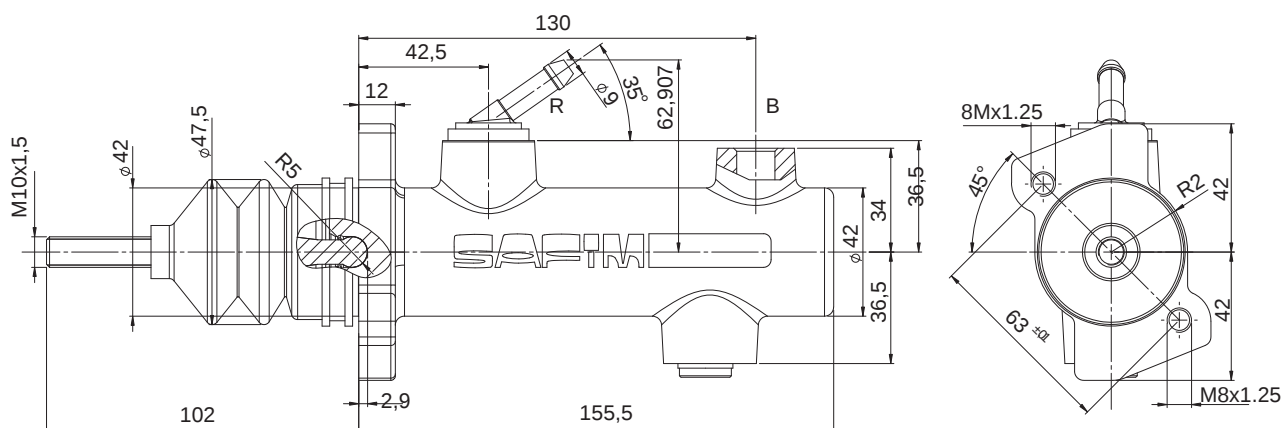
FUNCTION DIAGRAM



cod. 023488

MASTER CYLINDERS WITHOUT BOOSTER

31.75 - 20 Step Bore SINGLE CIRCUIT Master Cylinder



CONNECTIONS

R	Master Cylinder filling	See table
B	Brakes	M14x1.5

TECHNICAL FEATURES

Piston Diameter	31.75 / 20 mm
Push-rod Stroke	37.5 mm
Displacement (min / max)	11.5 / 29 cm ³

WORKING CONDITIONS

Max pressure	150 bar
Oil temperature range (brake fluid)	-30°C ÷ +100°C
Oil temperature range (mineral oil)	-20°C ÷ +90°C

RESERVOIR JOINT TYPE

Type "F1"	Type "F2"	Type "F3"

ORDER PART NUMBER

02 3488 MN / A 5 P

FN	Brake fluid DOT 3-4
MN	Mineral oil

FASTENING BORING

**	2 holes ø 8,5
P	2 holes M8x1,25

**** Standard Configuration**

P1 [bar]	Spring Type
5	A
7	E
10	B
15	C

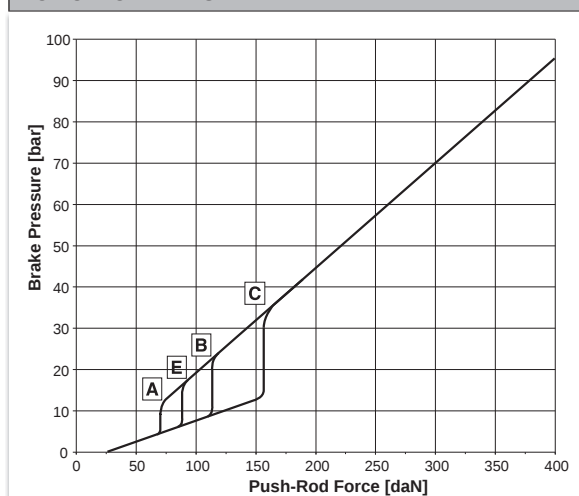
	Pressure Switch Port		Reservoir Joint Diameter	Reservoir Joint Type
	Thread Hole	Plug M10x1		
1	M10x1	-	ø8	-
*	-	-	ø8	-
2	M10x1	-	ø13	-
3	-	-	ø13	-
4	M10x1	-	ø13	F2
5	-	-	ø13	F2
6	M10x1	-	ø13	F1
7	-	-	ø13	F1
8	M10x1	-	ø13	F3
9	-	-	ø13	F3
10	M10x1	si	ø8	-

ASSEMBLY POSITIONS

	OK
	Possible (*)
	Possible (*)
	NO

* Contact our technical department

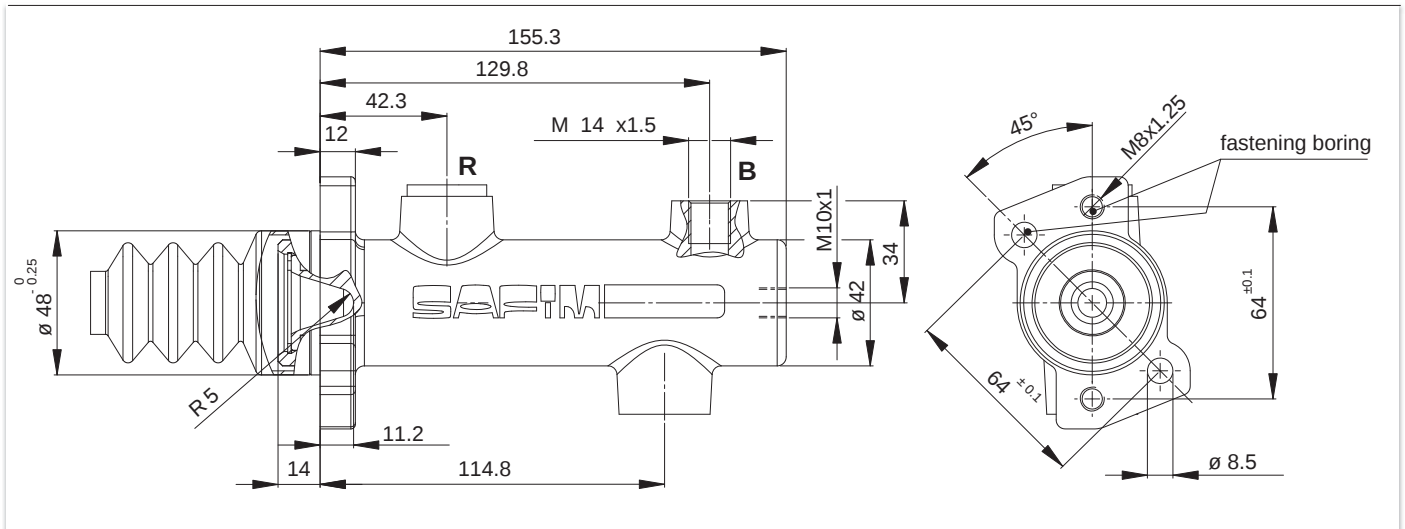
FUNCTION DIAGRAM



cod. 022196

MASTER CYLINDERS WITHOUT BOOSTER

31.75 - 23 Step Bore SINGLE CIRCUIT Master Cylinder



CONNECTIONS

R	Master Cylinder filling	See table
B	Brakes	M14x1.5

TECHNICAL FEATURES

Piston Diameter	31.75 / 23 mm
Push-rod Stroke	36 mm
Displacement (min / max)	14.5 / 27 cm ³

WORKING CONDITIONS

Max pressure	150 bar
Oil temperature range (brake fluid)	-30°C ÷ +100°C
Oil temperature range (mineral oil)	-20°C ÷ +90°C

RESERVOIR JOINT TYPE

Type "F1"	Type "F2"	Type "F3"

ORDER PART NUMBER

02	2196	MN	/	A	5	P
----	------	----	---	---	---	---

FN	Brake fluid DOT 3-4
MN	Mineral oil

FASTENING BORING	
**	2 holes $\varnothing 8,5$
P	2 holes M8x1,25

P1 [bar]	Spring Type
5	A
5	AA
7	E
7	EE (**)
10	B
10	BB
15	C
15	CC
20	D
20	DD

** Standard Configuration

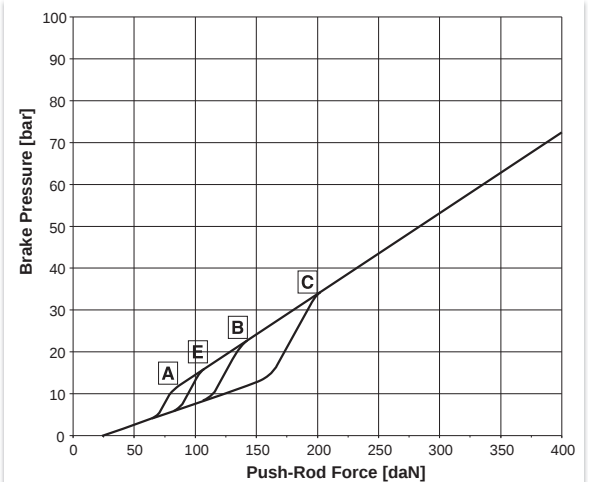
	Pressure Switch Port		Reservoir Joint Diameter	Reservoir Joint Type
	Thread Hole	Plug M10x1		
1	M10x1	-	$\varnothing 8$	-
*	-	-	$\varnothing 8$	-
2	M10x1	-	$\varnothing 13$	-
3	-	-	$\varnothing 13$	-
4	M10x1	-	$\varnothing 13$	F2
5	-	-	$\varnothing 13$	F2
6	M10x1	-	$\varnothing 13$	F1
7	-	-	$\varnothing 13$	F1
8	M10x1	-	$\varnothing 13$	F3
9	-	-	$\varnothing 13$	F3
10	M10x1	sì	$\varnothing 8$	-
11	M10x1	sì	$\varnothing 13$	F2

ASSEMBLY POSITIONS

	OK
	Possible (*)
	OK (with bleeding screw)
	NO

* Contact our technical department

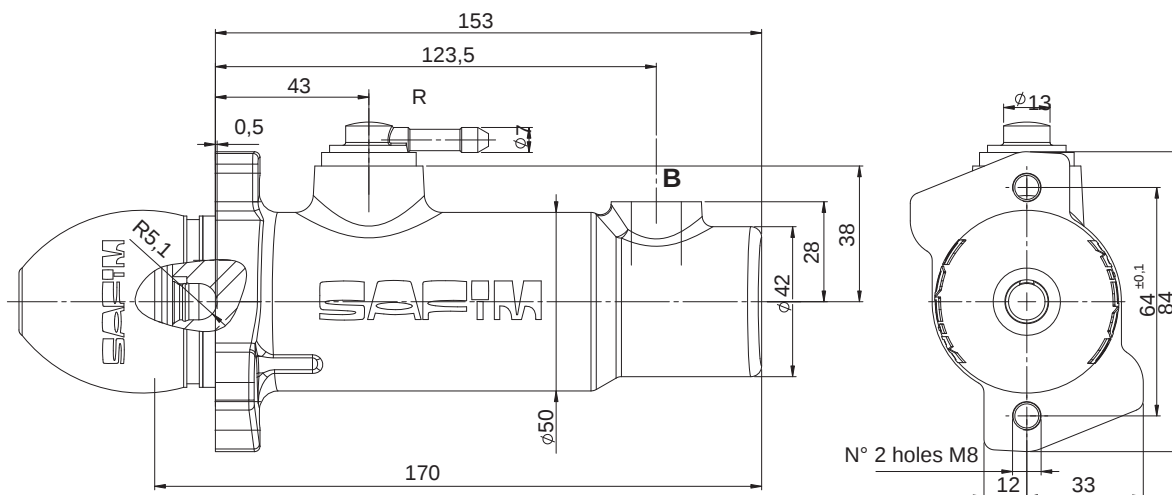
FUNCTION DIAGRAM



cod. 023105

MASTER CYLINDERS WITHOUT BOOSTER

35 - 20 Step Bore SINGLE CIRCUIT Master Cylinder



CONNECTIONS

R	Master Cylinder filling	See table
B	Brakes	M14x1.5 DIN 3852-1X

TECHNICAL FEATURES

Piston Diameter	35 / 20 mm
Push-rod Stroke	36 mm
Displacement (min / max)	11 / 33.6 cm ³

WORKING CONDITIONS

Max pressure	150 bar
Oil temperature range (brake fluid)	-30°C ÷ +100°C

RESERVOIR JOINT TYPE

Type "F1"	Type "F2"	Type "F3"

ORDER PART NUMBER

02	3105	FN	/	E	7	P
-----------	-------------	-----------	----------	----------	----------	----------

FN	Brake fluid DOT 3-4
MN	Mineral oil

FASTENING BORING	
**	2 holes ø 8,5
P	2 holes M8x1,25

**** Standard Configuration**

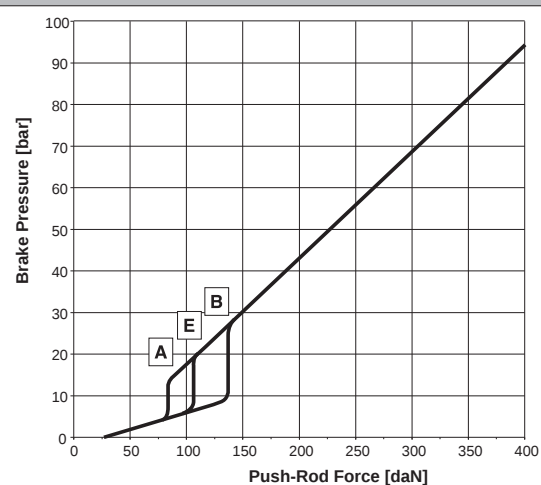
P1 [bar]	Spring Type	Reservoir Joint Diameter	Reservoir Joint Type
5	A	3	ø13 -
7	E	5	ø13 F2
10	B	7	ø13 F1
		9	ø13 F3

ASSEMBLY POSITIONS

	OK
	Possible (*)
	Possible (*)
	NO

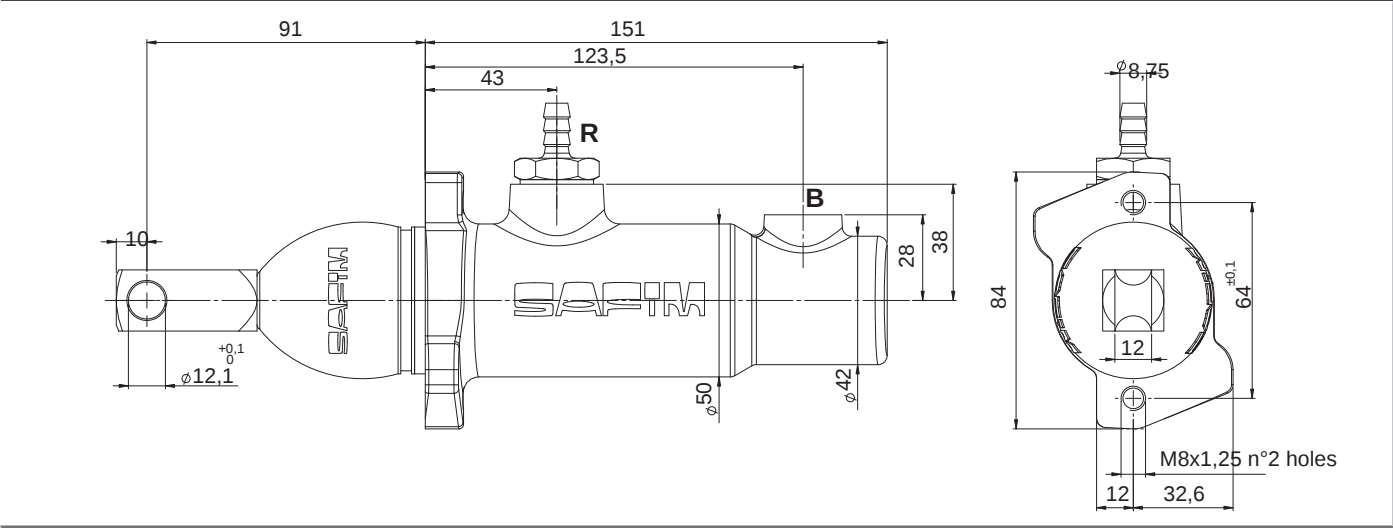
* Contact our technical department

FUNCTION DIAGRAM



cod. 022976

MASTER CYLINDERS WITHOUT BOOSTER
35 - 20 Step Bore SINGLE CIRCUIT Master Cylinder



CONNECTIONS		
R	Master Cylinder filling	See drawing
B	Brakes	M14x1.5 DIN 3852-1X

TECHNICAL FEATURES	
Piston Diameter	35 / 20 mm
Push-rod Stroke	36 mm
Displacement (min / max)	11 / 33.6 cm ³

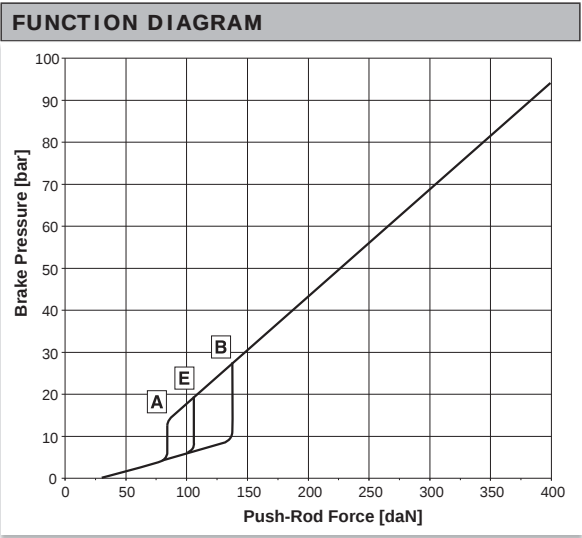
WORKING CONDITIONS	
Max pressure	150 bar
Oil temperature range (brake fluid)	-30°C ÷ +100°C
Oil temperature range (mineral oil)	-20°C ÷ +90°C

ORDER PART NUMBER

02	2976	FN	/	E
		FN	Brake fluid DOT 3-4	
		MN	Mineral oil	
		P1 [bar]	Spring Type	
		5	A	
		7	E	
		10	B	

ASSEMBLY POSITIONS	
	OK
	Possible (*)
	Possible (*)
	NO

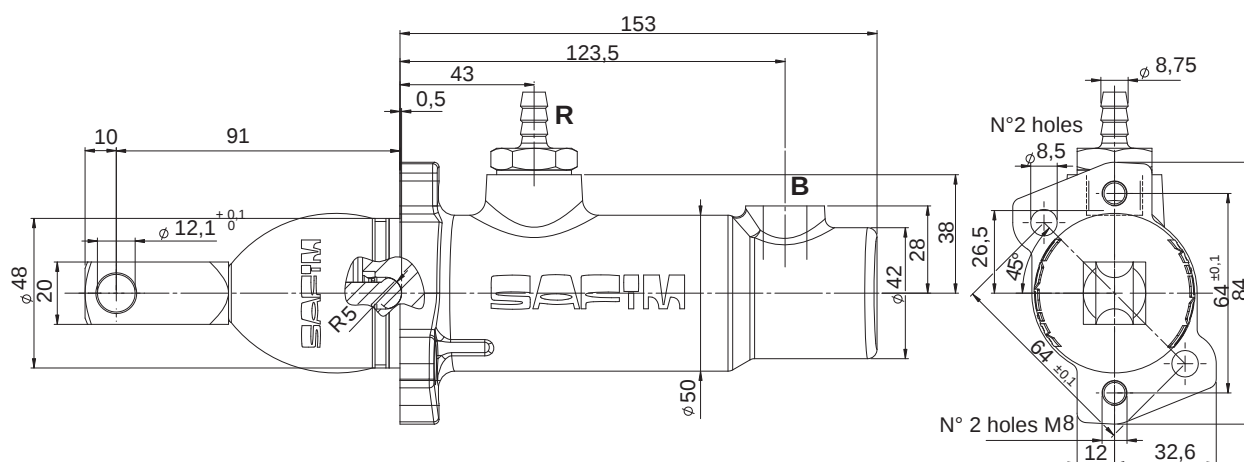
* Contact our technical department



cod. 023379

MASTER CYLINDERS WITHOUT BOOSTER

35 - 23 Step Bore SINGLE CIRCUIT Master Cylinder



CONNECTIONS

R	Master Cylinder filling	See drawing
B	Brakes	M14x1.5 DIN 3852-1X

TECHNICAL FEATURES

Piston Diameter	35 / 23 mm
Push-rod Stroke	40 mm
Displacement (min / max)	16.2 / 37.5 cm ³

WORKING CONDITIONS

Max pressure	150 bar
Oil temperature range (brake fluid)	-30°C ÷ +100°C
Oil temperature range (mineral oil)	-20°C ÷ +90°C

ORDER PART NUMBER

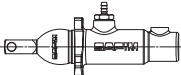
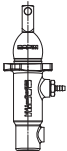
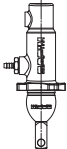
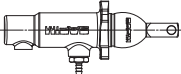
02	3379	FN	/	E
----	------	----	---	---

FN	Brake fluid DOT 3-4
MN	Mineral oil

P1 [bar]	Spring Type
5	A
5	AA (**)
7	E
7	EE (**)
10	B
10	BB (**)

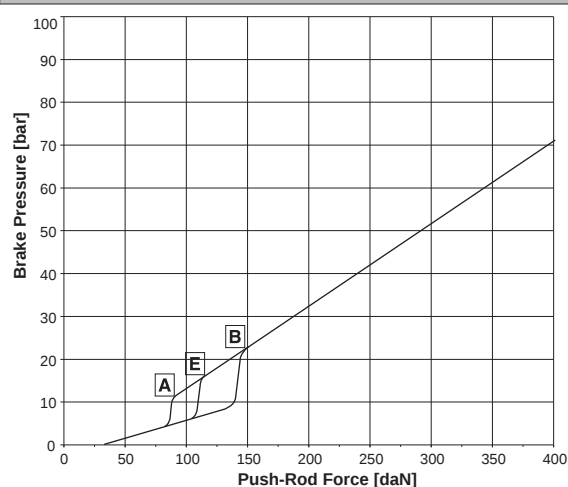
**** Only for MN type**

ASSEMBLY POSITIONS

	OK
	Possible (*)
	Possible (*)
	NO

* Contact our technical department

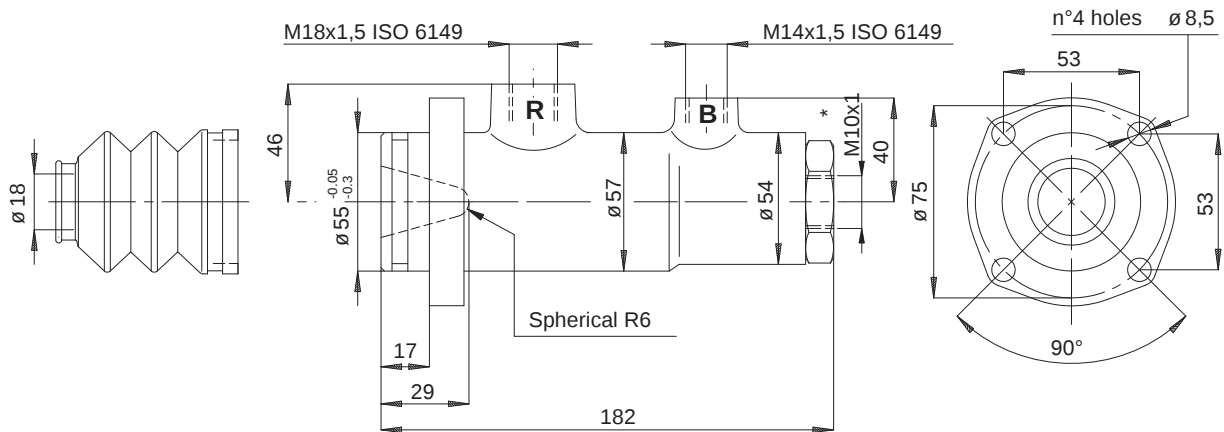
FUNCTION DIAGRAM



cod. 021255

MASTER CYLINDERS WITHOUT BOOSTER

38 - 25 Step Bore SINGLE CIRCUIT Master Cylinder



CONNECTIONS

R	Master Cylinder filling	M18x1,5 ISO 6149
B	Brakes	M14x1.5 ISO 6149

TECHNICAL FEATURES

Piston Diameter	38 / 25 mm
Push-rod Stroke	40 mm
Displacement (min / max)	19.1 / 44.2 cm ³

WORKING CONDITIONS

Max pressure	150 bar
Oil temperature range (brake fluid)	-30°C ÷ +100°C
Oil temperature range (mineral oil)	-20°C ÷ +90°C

ORDER PART NUMBER

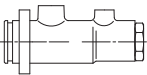
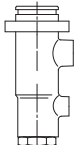
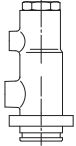
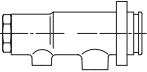
02	1255	MN	EE	/	D
----	------	----	----	---	---

FN	Brake fluid DOT 3-4
MN	Mineral oil

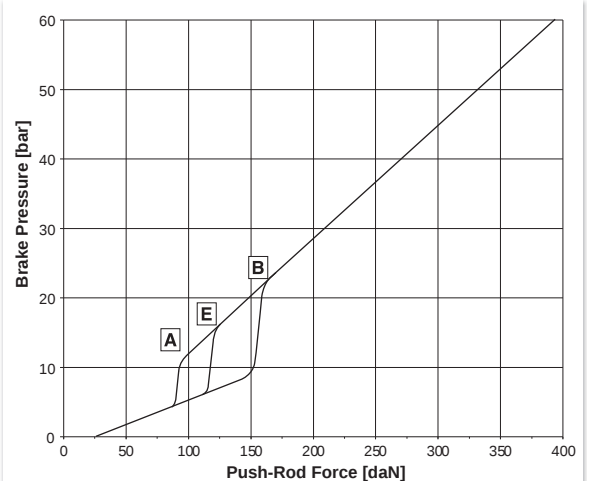
	Pressure Switch Port	
	Connec- tion	Plug M10x1
-	-	-
D	M10x1	-
G	M10x1	yes

P1 [bar]	Spring type
5	A
5	AA
7	E
7	EE
10	B
10	BB
15	C
15	CC
20	D
20	DD

ASSEMBLY POSITIONS

	OK
	NO
	OK (with bleeding screw)
	NO

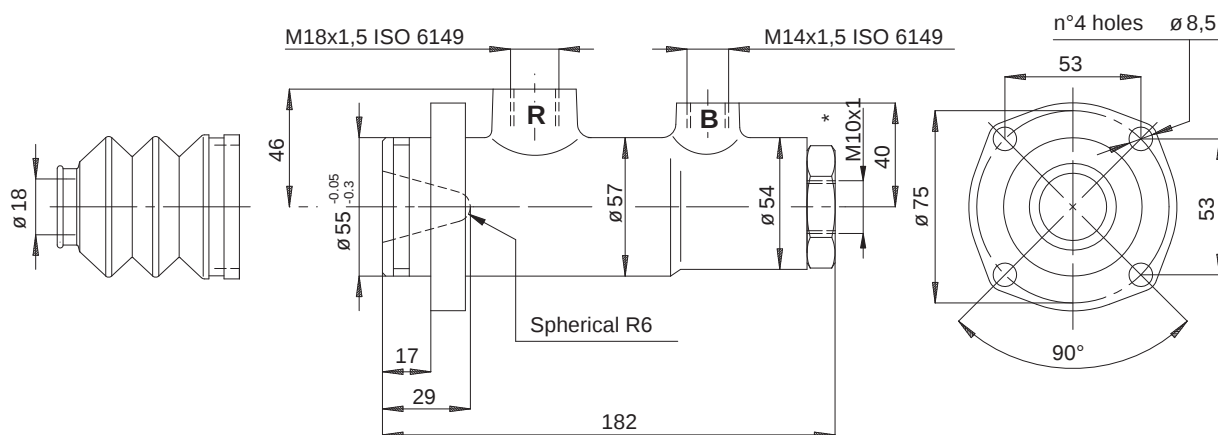
FUNCTION DIAGRAM



cod. 021289

MASTER CYLINDERS WITHOUT BOOSTER

40 - 30 Step Bore SINGLE CIRCUIT Master Cylinder



CONNECTIONS

R	Master Cylinder filling	M18x1,5 ISO 6149
B	Brakes	M14x1.5 ISO 6149

TECHNICAL FEATURES

Piston Diameter	40 / 30 mm
Push-rod Stroke	40 mm
Displacement (min / max)	27.6 / 49 cm ³

WORKING CONDITIONS

Max pressure	150 bar
Oil temperature range (brake fluid)	-30°C ÷ +100°C
Oil temperature range (mineral oil)	-20°C ÷ +90°C

ORDER PART NUMBER

02 1289 MN EE / D

FN	Brake fluid DOT 3-4
MN	Mineral oil

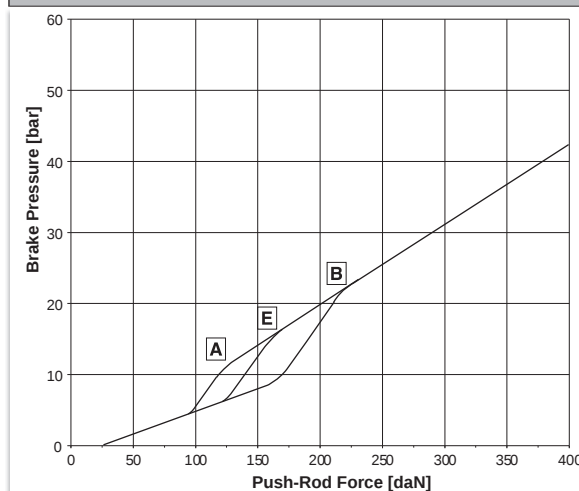
	Pressure Switch Port	
	Connec- tion	Plug M10x1
-	-	-
D	M10x1	-
G	M10x1	yes

P1 [bar]	Spring type
5	A
5	AA
7	E
7	EE
10	B
10	BB
15	C
15	CC
20	D
20	DD

ASSEMBLY POSITIONS

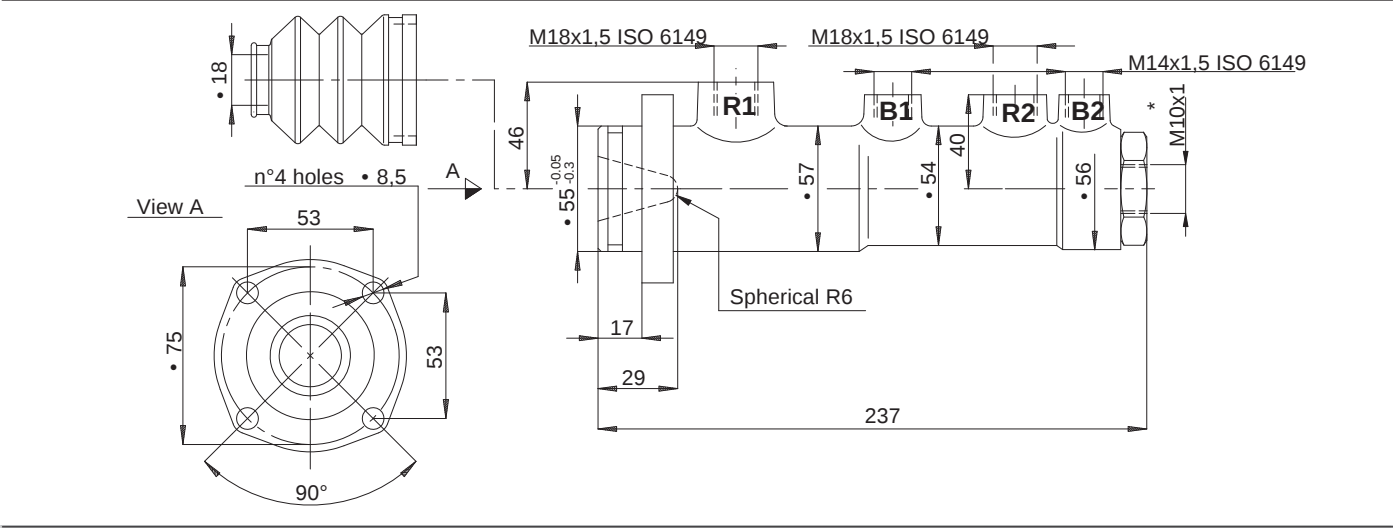
	OK
	NO
	OK (with bleeding screw)
	NO

FUNCTION DIAGRAM



cod. 031254

MASTER CYLINDERS WITHOUT HYDAULIC BOOSTER
ø38/25 - ø31.75 Step Bore Dual Circuit Master Cylinder



CONNECTIONS		
R1	Master Cylinder filling	M18x1,5 ISO 6149
B1	Brakes	M14x1,5 ISO 6149
R2	Master Cylinder filling	M18x1,5 ISO 6149
B2	Brakes	M14x1,5 ISO 6149

TECHNICAL FEATURES	
1st Circuit Piston Diameter	38/25 mm
2nd Circuit Piston Diameter	31.75 mm
1st Circuit's Piston Stroke	22 mm
2nd Circuit's Piston Stroke	18 mm
Total stroke	40 mm
1st Circuit's Displacement	4.8/29.9 cm ³
2nd Circuit's Displacement	13.5 cm ³
Total Displacement	43.4 cm ³

WORKING CONDITIONS	
Max pressure	150 bar
Oil temperature range (Mineral Oil)	-30°C ÷ +90°C
Oil temperature range (Brake Fluid)	-20°C ÷ +100°C

ORDER PART NUMBER

03

1254

MN

EE

/

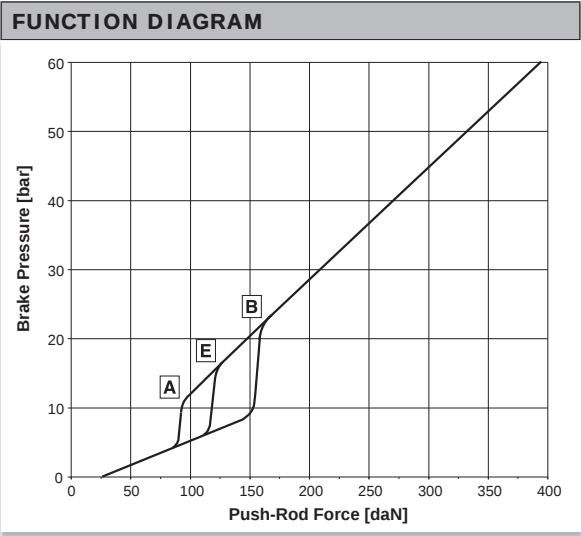
D

FN	Brake fluid DOT 3-4
MN	Mineral oil

P1 [bar]	Spring type
5	A
5	AA
7	E
7	EE
10	B
10	BB
15	C
15	CC
20	D
20	DD

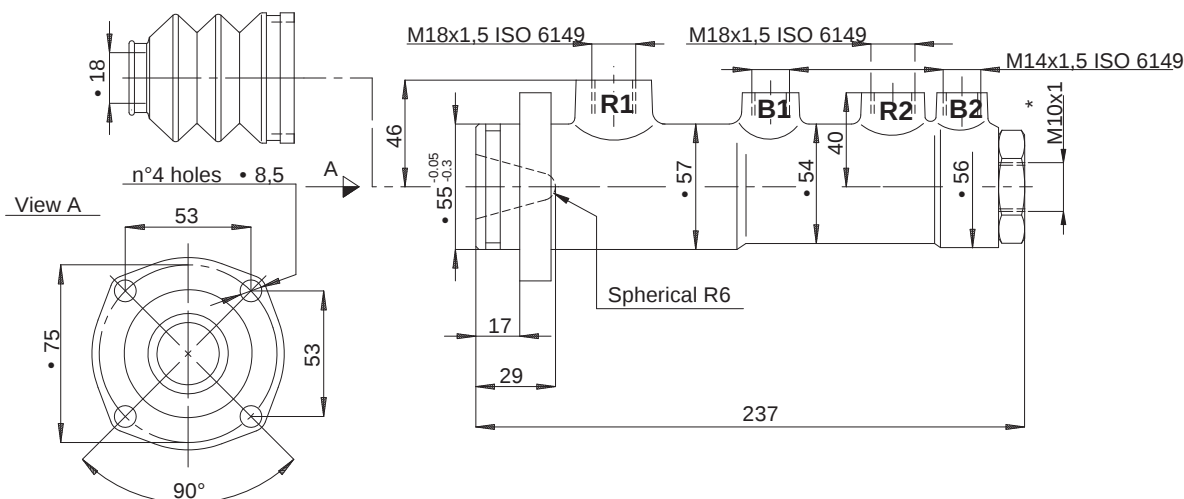
	Pressure Switch Port	
	Connec- tion	Plug M10x1
-	-	-
G	M10x1	yes

ASSEMBLY POSITIONS	
	OK
	NO
	OK (with bleeding screw)
	NO



cod. 031288

MASTER CYLINDERS WITHOUT HYDAULIC BOOSTER



CONNECTIONS

R1	Master Cylinder filling	M18x1,5 ISO 6149
B1	Brakes	M14x1,5 ISO 6149
R2	Master Cylinder filling	M18x1,5 ISO 6149
B2	Brakes	M14x1,5 ISO 6149

TECHNICAL FEATURES

1st Circuit Piston Diameter	40/30 mm
2nd Circuit Piston Diameter	35 mm
1st Circuit's Piston Stroke	20 mm
2nd Circuit's Piston Stroke	20 mm
Total stroke	40 mm
1st Circuit's Displacement	8.4/29.8 cm ³
2nd Circuit's Displacement	18.2 cm ³
Total Displacement	26.6/48 cm ³

WORKING CONDITIONS

Max pressure	150 bar
Oil temperature range (Mineral Oil)	-30°C ÷ +90°C
Oil temperature range (Brake Fluid)	-20°C ÷ +100°C

ORDER PART NUMBER

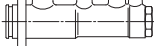
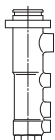
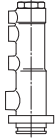
03	1288	MN	EE	/	D
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FN	Brake fluid DOT 3-4
MN	Mineral oil

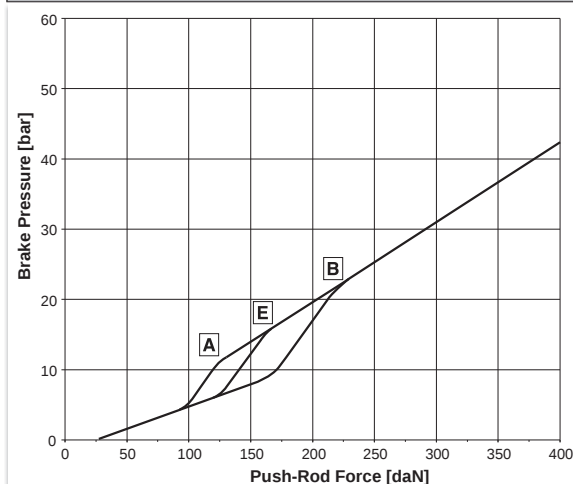
	Pressure Switch Port	
	Con- nection	Plug M10x1
-	-	-
G	M10x1	yes

P1 [bar]	Spring type
5	A
5	AA
7	E
7	EE
10	B
10	BB
15	C
15	CC
20	D
20	DD

ASSEMBLY POSITIONS

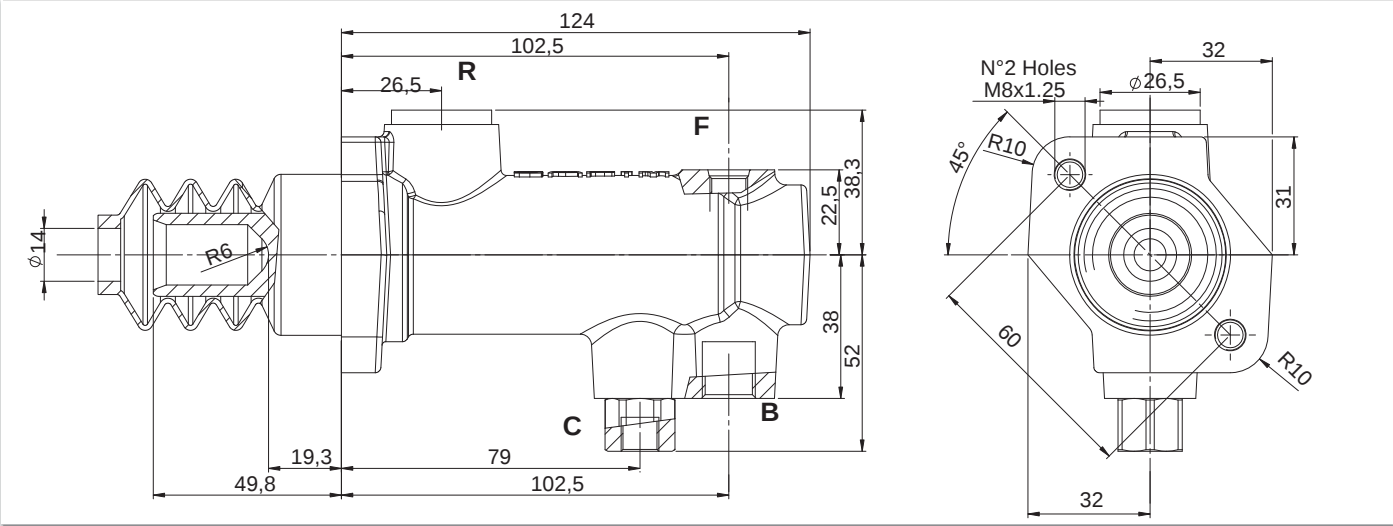
	OK
	NO
	OK (with bleed screw)
	NO

FUNCTION DIAGRAM



cod. 023138

MASTER CYLINDERS WITHOUT HYDAULIC BOOSTER
ø27-ø23 Step Bore Single Circuit Balanced Master Cylinder



CONNECTIONS		
R	Master Cylinder filling	Hole D.8
B	Brakes	M14x1,5 DIN 3852-1X
C	Brake Pressure Balancing	M10x1 DIN 3852-1X
F	Pressure Switch	M10x1 ISO 6149

TECHNICAL FEATURES	
Piston diameter	27 / 23 mm
Stroke	36 mm
Displacement (min / max)	14.5 / 19.5 cm³

WORKING CONDITIONS	
Max Pressure	150 bar
Oil temperature range (Mineral Oil)	-20°C ÷ +90°C

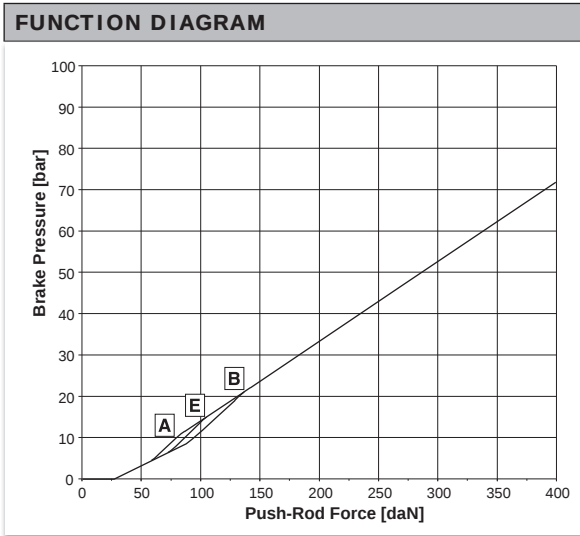
ASSEMBLY POSITIONS	
	OK
	NO
	Possible (*)
	NO

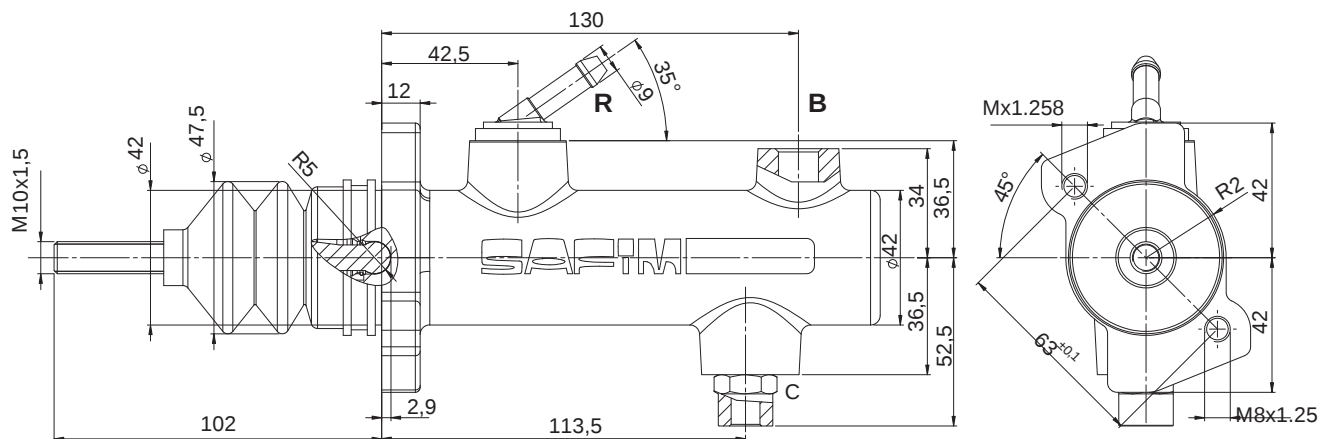
* Contact our technical department

ORDER PART NUMBER

02	3138	MN	/	E
FN	Brake fluid DOT 3-4	P1 [bar]	Spring type	
MN	Mineral oil	5	A	
		5	AA (**)	
		7	E	
		7	EE (**)	
		10	B	
		10	BB (**)	

** Only for MN type



cod. 023394**MASTER CYLINDERS WITHOUT HYDAULIC BOOSTER****ø31.75-ø20 Step Bore Single Circuit Balanced Master Cylinder****CONNECTIONS**

R	Master Cylinder filling	Joint D.9
B	Brakes	M14x1,5 DIN 3852-1X
C	Brake Pressure Balancing	M10x1 DIN 3852-1X

TECHNICAL FEATURES

Piston diameter	31.75 / 20 mm
Stroke	37.5 mm
Displacement (min / max)	11.5 / 29 cm ³

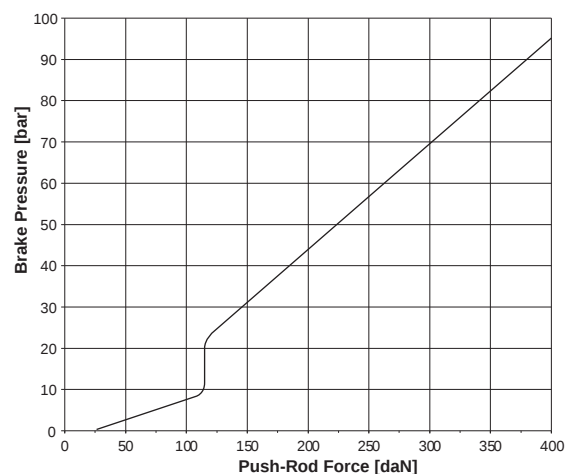
WORKING CONDITIONS

Max Pressure	150 bar
Oil temperature range (Mineral Oil)	-20°C ÷ +90°C

ASSEMBLY POSITIONS

	OK
	NO
	Possible (*)
	NO

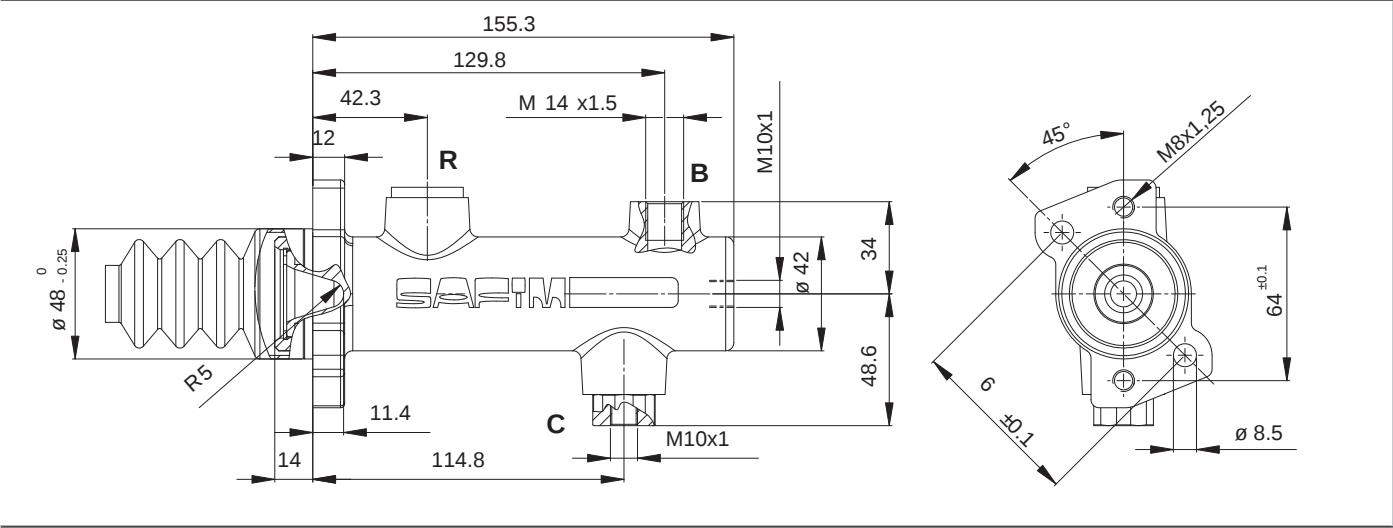
* Contact our technical department

FUNCTION DIAGRAM**ORDER PART NUMBER**

02	3394	MN	/	E
FN	Brake fluid DOT 3-4	P1 [bar]	Spring type	
MN	Mineral oil	8	A	
		5	E	
		7	B	
		10		

cod. 022159

MASTER CYLINDERS WITHOUT BOOSTER • 31.75 - 23 Step
Bore SINGLE CIRCUIT BALANCEDMaster Cylinder



CONNECTIONS		
R	Master Cylinder filling	See table
B	Brakes	M14x1.5
C	Brake pressure compensation	M10x1

TECHNICAL FEATURES	
Piston Diameter	31.75 / 23 mm
Push-rod Stroke	36 mm
Displacement (min / max)	14.5 / 27 cm ³

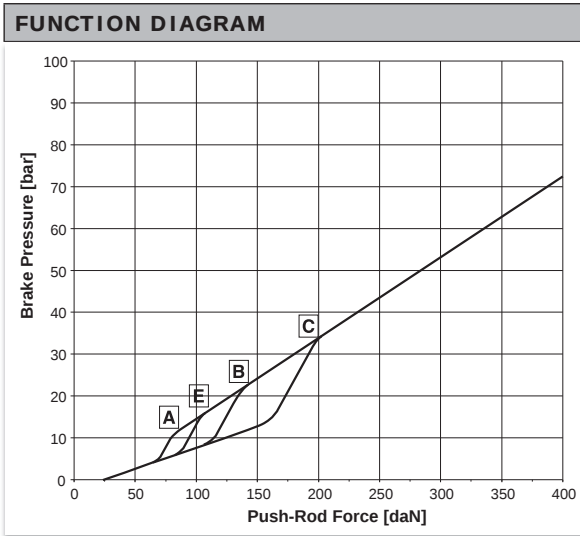
WORKING CONDITIONS	
Max pressure	150 bar
Oil temperature range (brake fluid)	-30°C ÷ +100°C
Oil temperature range (mineral oil)	-20°C ÷ +90°C

ASSEMBLY POSITIONS	
	OK
	Possible (*)
	OK (with bleeding screw)
	NO

ORDER PART NUMBER

02		2159		MN		/		A		5		P	
												FASTENING BORING	
FN		Brake fluid DOT 3-4											
MN		Mineral oil											

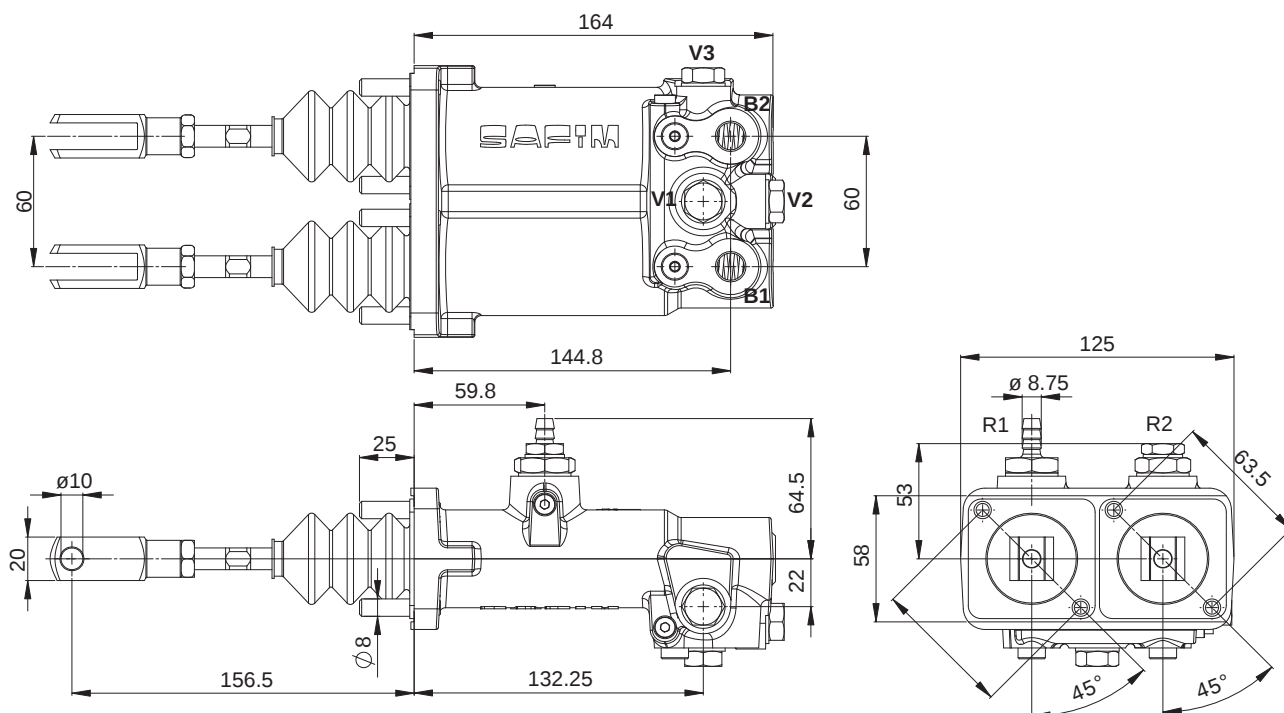
RESERVOIR JOINT TYPE		
Type "F1"	Type "F2"	Type "F3"



cod. 023013

MASTER CYLINDERS WITHOUT HYDAULIC BOOSTER

ø35-ø23 Step Bore Twin Circuit Balanced Master Cylinder



CONNECTIONS

R1	Master Cylinder filling	Joint D.8
B1,B2	Brakes	M14x1,5 DIN 3852-1X
V1,V2,V3	Brake Pressure Balancing	M14x1,5 DIN 3852-1X
R2	Bleeding hole (closed)	M12x1 DIN 74235

TECHNICAL FEATURES

Piston diameter	35/23 mm
Stroke	36 mm
Displacement (min / max)	14.5 / 33.7 cm ³

WORKING CONDITIONS

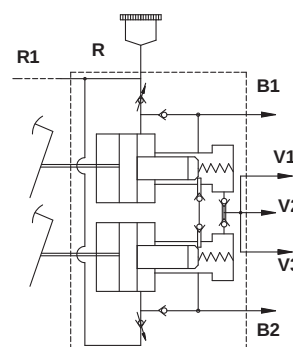
Max Pressure	150 bar
Oil temperature range (Mineral Oil)	-20°C ÷ +90°C

ASSEMBLY POSITIONS

	OK
	NO
	Possible (*)
	NO

* Contact our technical department

FUNCTION DIAGRAM

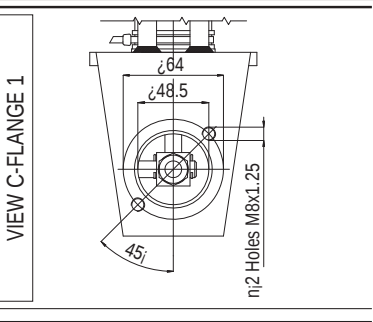


ORDER PART NUMBER

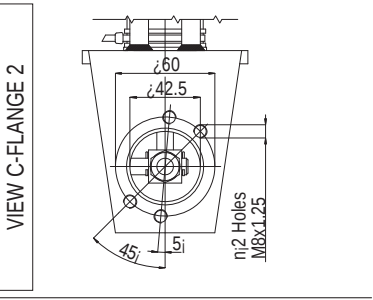
02	3013	MN
MN	Mineral oil	

HORIZONTAL PEDAL BRACKET FOR FLANGED MASTER CYLINDER

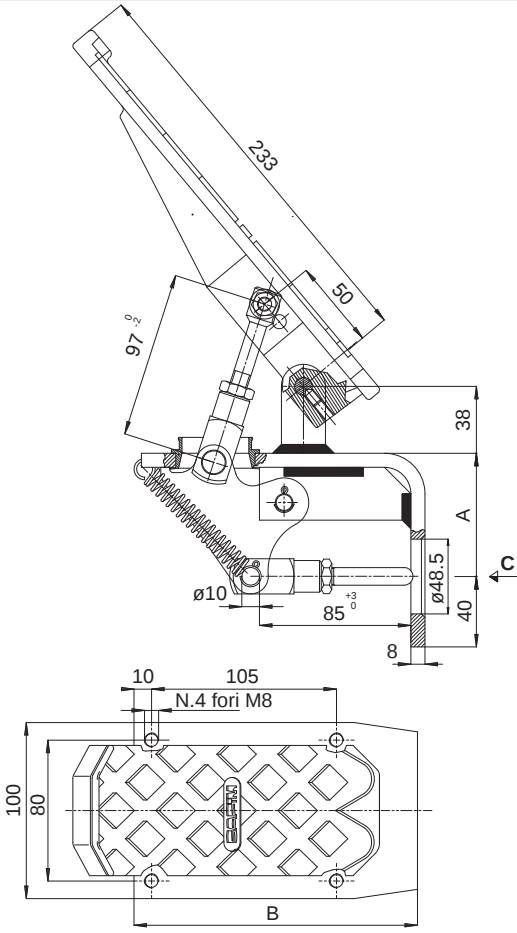
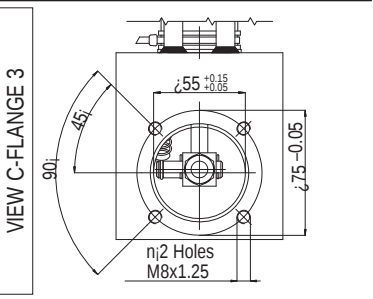
Cod. 022461	
A	70
B	161



Cod. 021466	
A	70
B	161



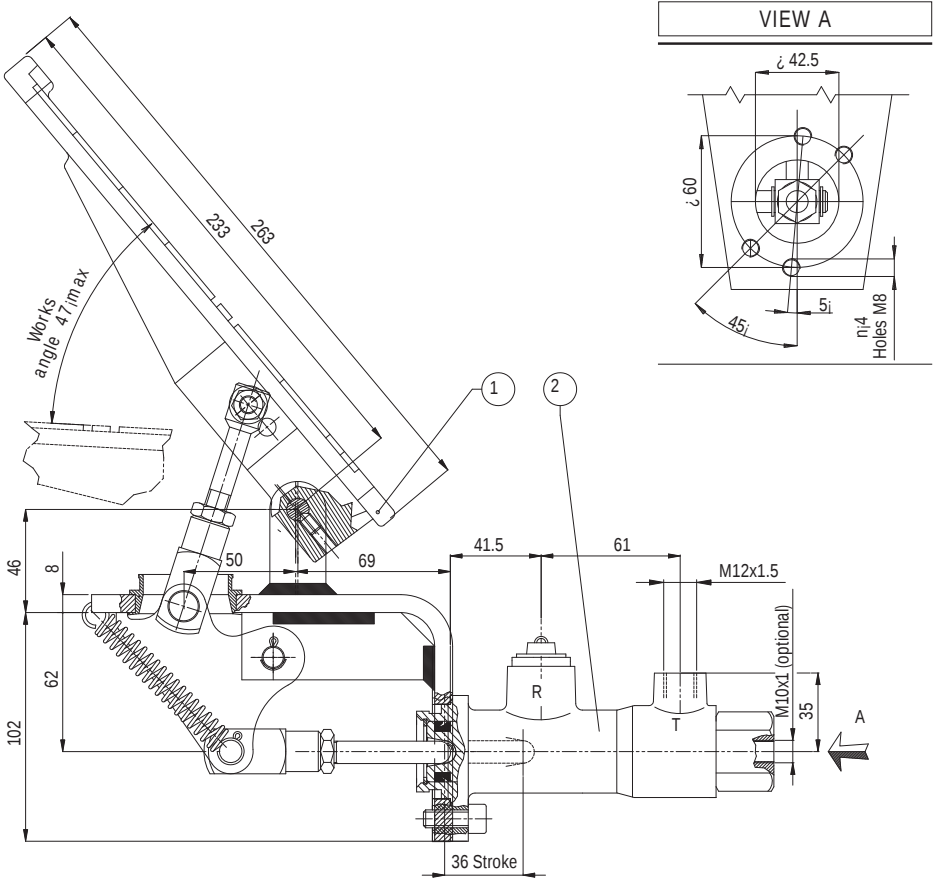
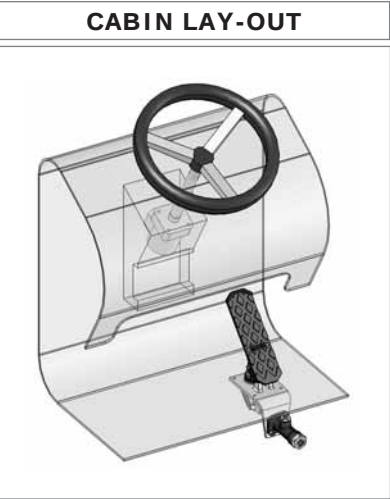
Cod. 022246	
A	72
B	161



cod.
021425 MN/4

HORIZONTAL PEDAL BRACKET WITH MASTER CYLINDER

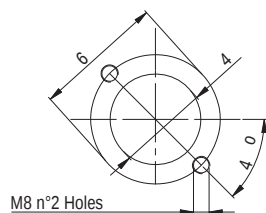
1	Bracket with pedal	cod. 021466
2	Master cylinder	cod. 021287 MN/4



VERTICAL PEDAL BRACKET FOR FLANGED MASTER CYLINDER

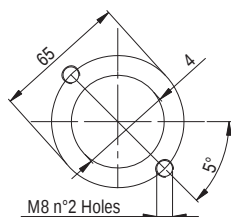
Cod.	021219
A	50
Ratio	1:3,9

VIEW "X"



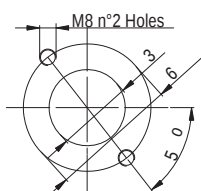
Cod.	021262
A	37
Ratio	1:5,3

VIEW "X"



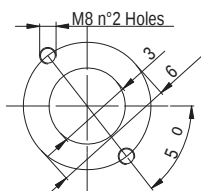
Cod.	021281
A	50
Ratio	1:3,9

VIEW "X"



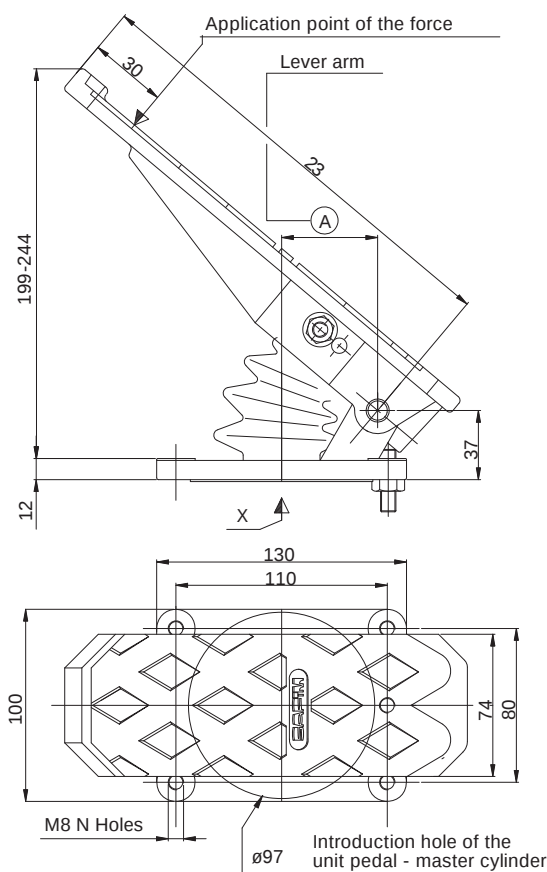
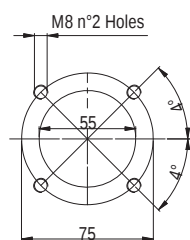
Cod.	021262
A	37
Ratio	1:5,3

VIEW "X"



Cod.	021281
A	50
Ratio	1:3,9

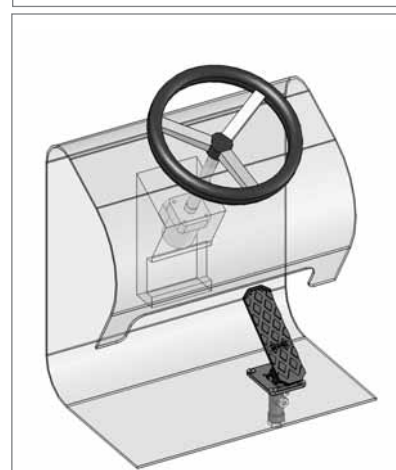
VIEW "X"



PEDAL CHARACTERISTICS

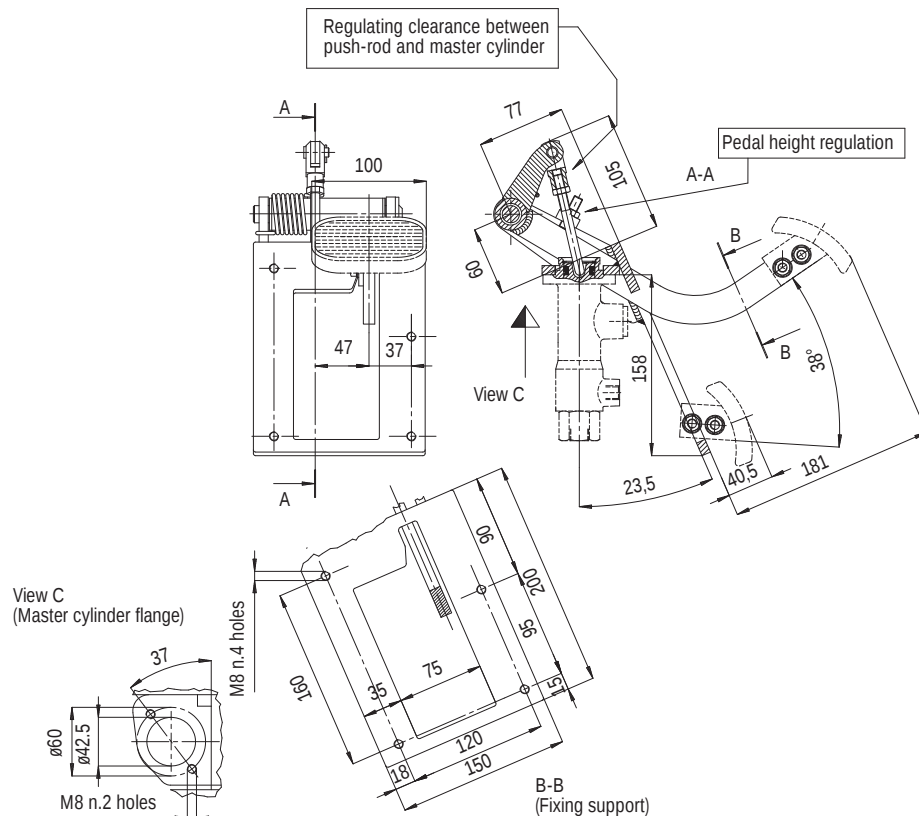
RATIO	STROKE [mm]	ROTATION
1:3,9	29÷40	45°÷54°
1:5,3	29÷40	54,5°÷60°

CABIN LAY-OUT

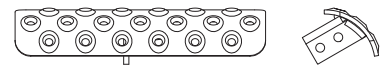


cod. 022774**VERTICAL PEDAL BRACKETS FOR FLANGED MASTER CYLINDER**

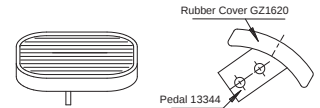
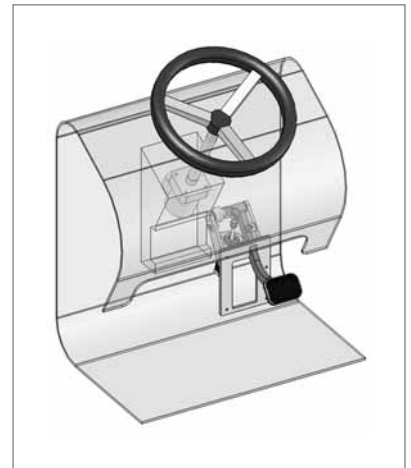
WITHOUT PEDAL

Order example: **022774+13344+GZ16201**

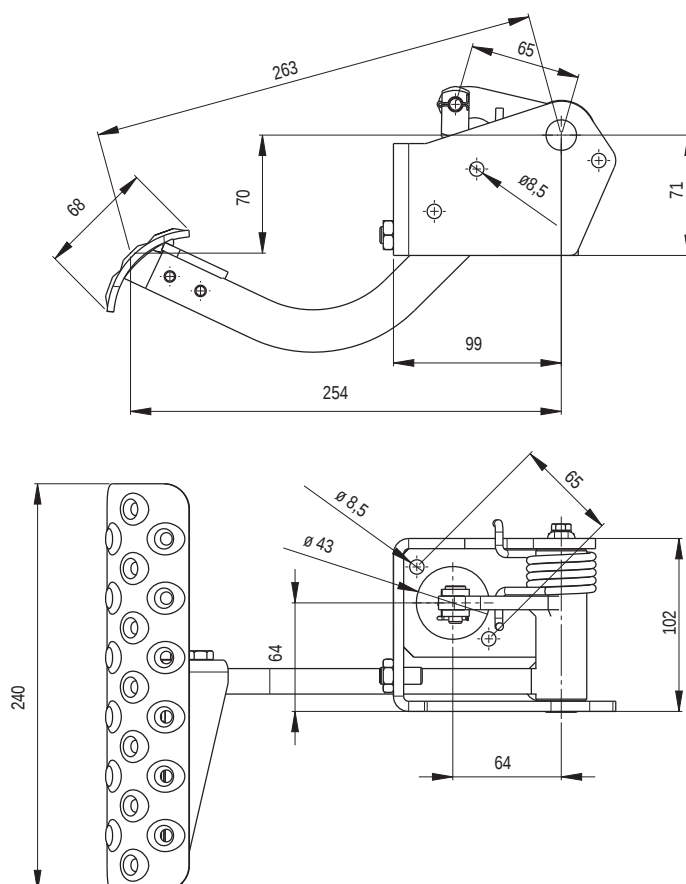
SHEET METAL PEDAL cod. 25142



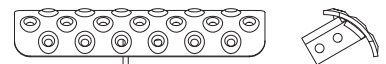
STANDARD PEDAL cod. 13344 + GZ16201

**CABIN LAY-OUT****cod. 023697****VERTICAL PEDAL BRACKETS FOR FLANGED MASTER CYLINDER**

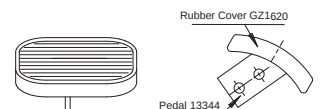
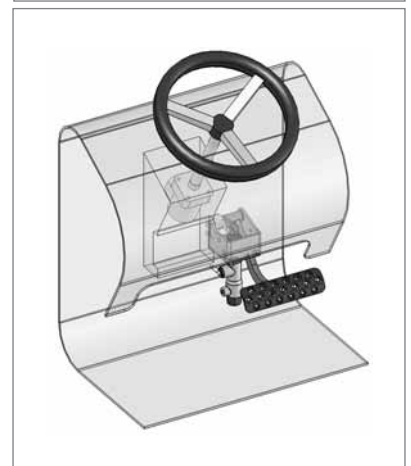
WITHOUT PEDAL

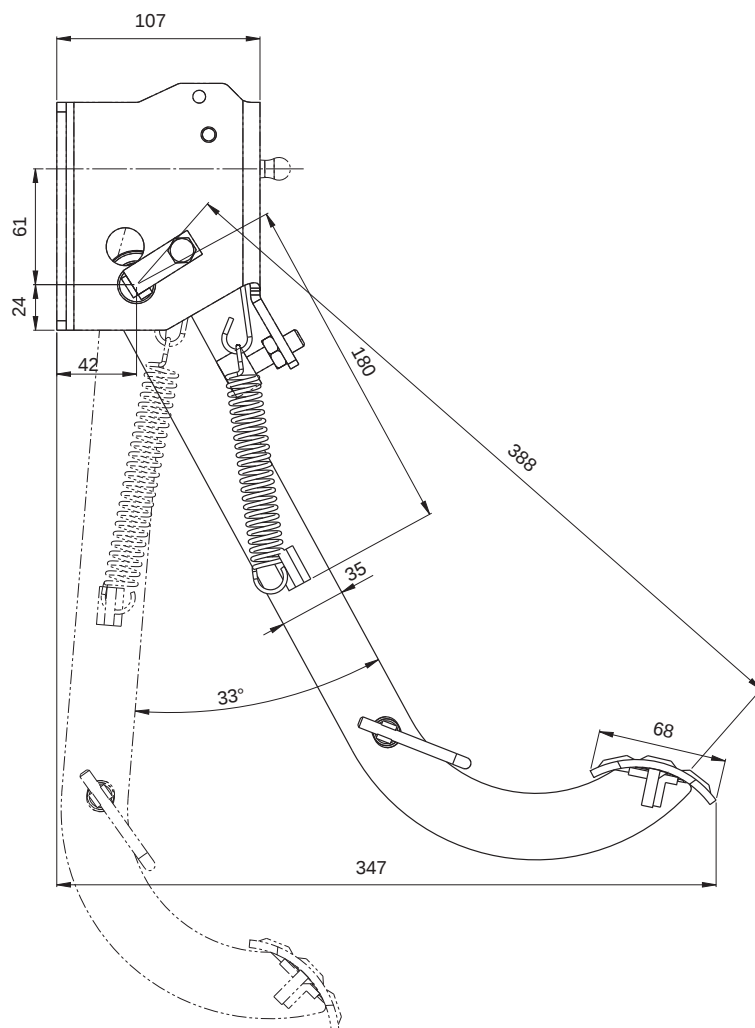
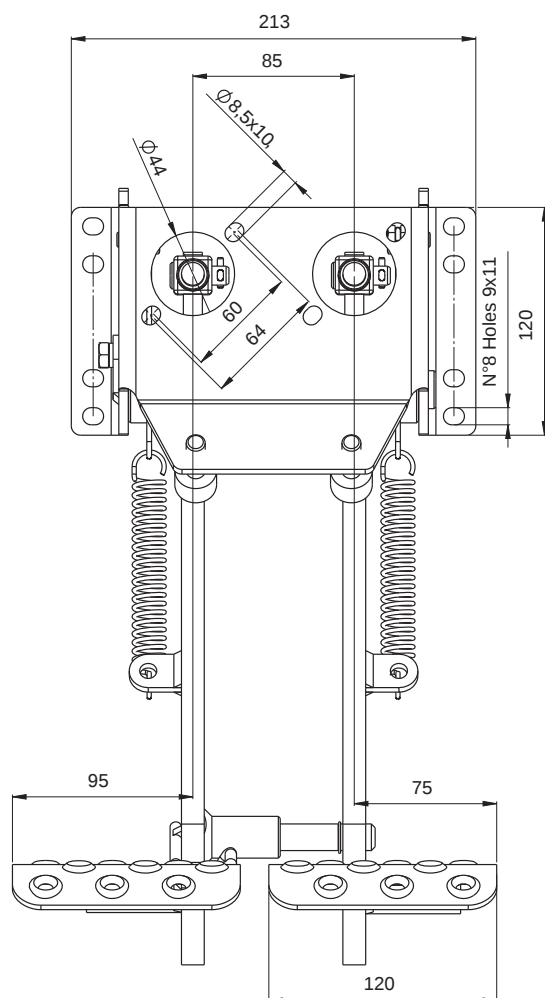
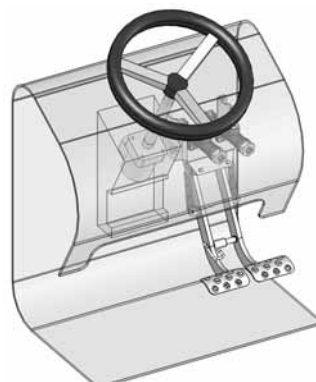


SHEET METAL PEDAL cod. 25142



STANDARD PEDAL cod. 13344 + GZ16201

**CABIN LAY-OUT**Order example: **023697+25142**

cod. 023511C TWIN MASTER CYLINDERS PEDAL BRACKET

CABIN LAY-OUT


OTHER PEDAL ASSEMBLIES ARE AVAILABLE

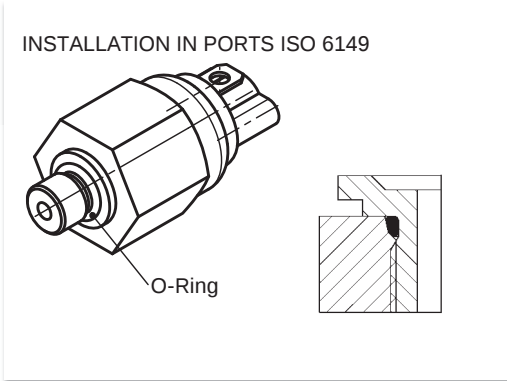
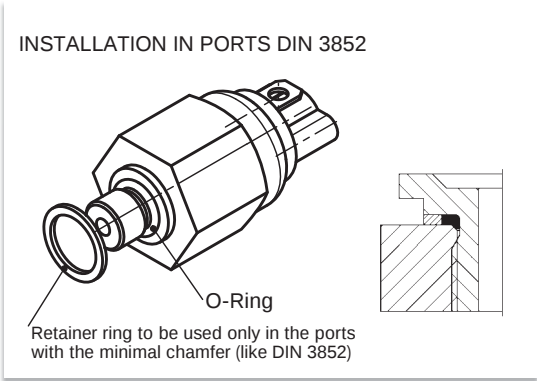
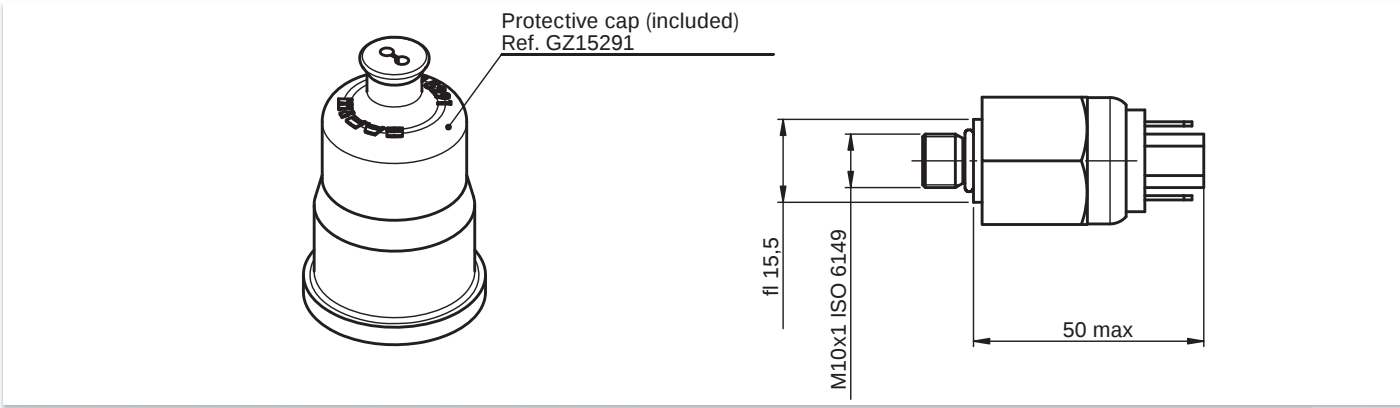
Contact SAFIM for informations

STOP-LIGHT PRESSURE SWITCHES

To adjust the pressure to be checked, use a small screwdriver and turn the adjustment screw, being careful not to fully compress the spring.

The position of the electrical contacts is normally open in refers to the stable state, i.e. with no pressure.

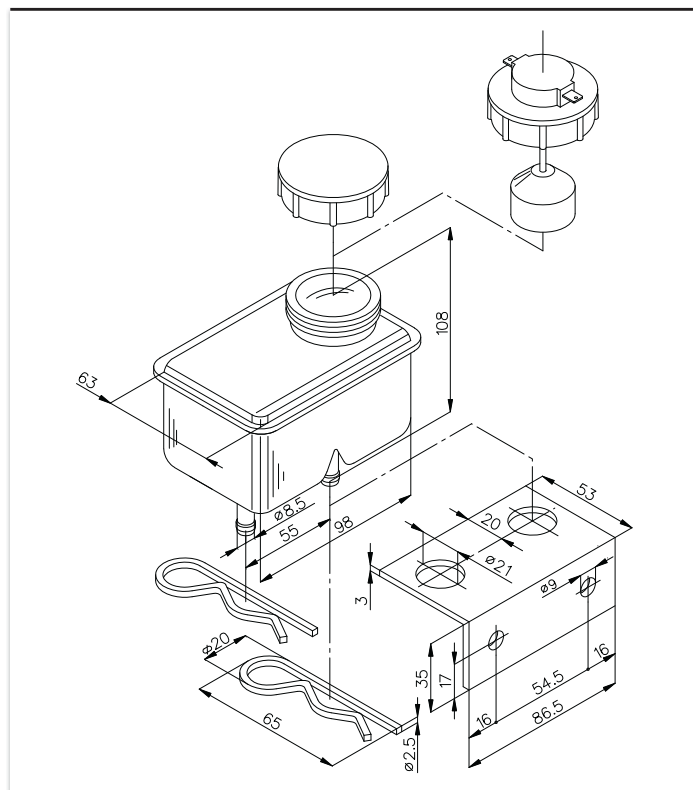
It is recommended to protect the electrical connections and the internal parts against the penetration of dampness, dust, solvents, paints, etc. with the protective cap.



ORDER PART NUMBER				
Type of oil	Order Part Number (**)	Pressure setting (bar)	Actuation tolerance range at 20°C (bar)	Max static pressure limit
MINERAL OIL	MO17069 / 3	3	±0,5	300
BRAKE FLUID DOT 3-4	MO17071 / 3	3	±0,5	300

(**) The pressure switch includes protection cap

For other informations contact our technical department.



RO15319

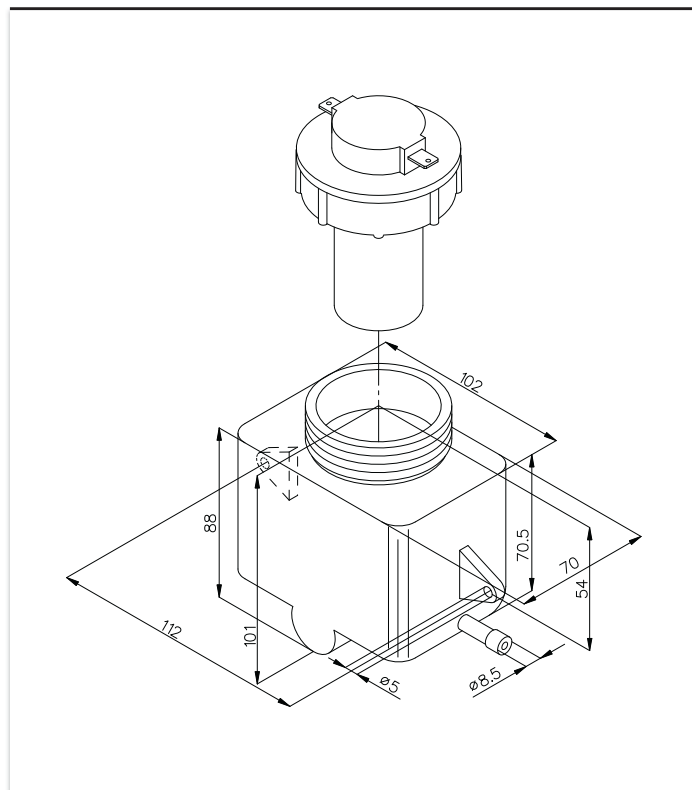
Capacity	250 cc
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ACCESSORIES

Cap for electric check	Cod. RO15432
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Support	Cod. 12200
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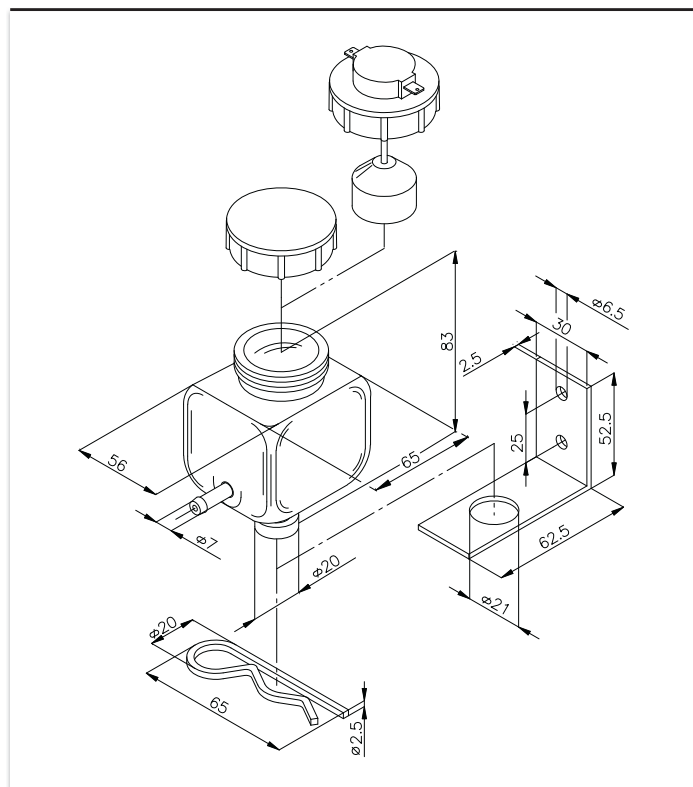
Retaining springs Cod. BL15419



Type of oil	Mineral oil DEXTRON - LHM	022564MN
	Brake fluid DOT 3-4	022564FN

Max capacity	350 cc
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Min level	190 cc
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RO15425

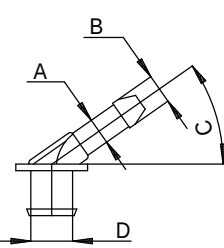
Capacity	160 cc
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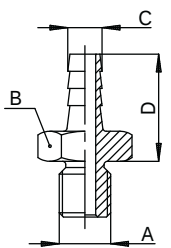
ACCESSORIES

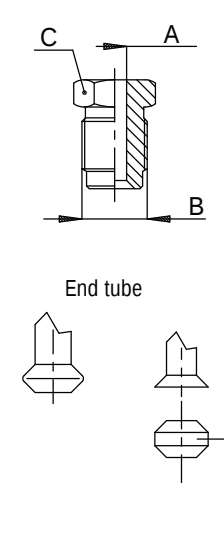
Cap for electric check	Cod. RO15432
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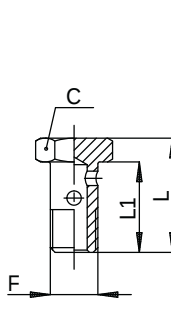
Support	Cod. 11807
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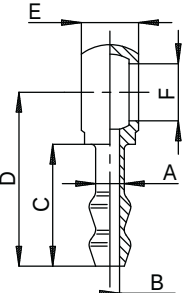
Retaining springs Cod. BL15419

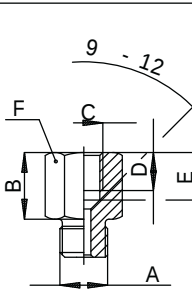
	Measurements				Order part number
	A	B	C	D	
	6	7	0	12.5	RO15374
	8	9	35	12.5	RO15645
	8	8.5	90	12	11269

	Measurements				Order part number
	A	B	C	D	
	M12x1.5	19	8	25	RO15215
	M18x1.5	24	8	25	RO15216

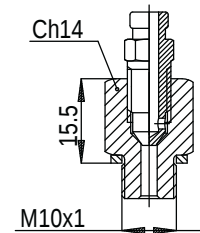
	Measurements			Order part number
	A	B	C	
	5.1	M10x1	13	RO15958
	5.1	M10x1.25	13	RO15176
	6.1	M12x1	13	RO15294
	6.1	M12x1.25	13	BL15594
	6.1	M12x1.5	12	RO15175
	6.1	1/4"	13	11637
BICONICAL ADAPTER REF. BL15217 To be used when the tube end has only one countersunk profile				

	Measurements				Order part number
	F	L1	L	C	
	M10x1	21	26	14	BL15495
	M10x1	33	38	14	12465
	M10x1.25	21	26	14	RO15293
	M12x1.25	23	29	17	11514
	M12x1.5	23	28	17	BL15737
	M14x1.5	30	38	19	BL15730
	M18x1.5	25.5	32	27	RO15777

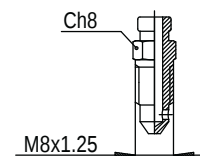
	Measurements						Order part number
	A	B	C	D	E	F	
	6	4	16	28	10	10	RO15770
	6	4	16	32	12	12	RO15739
	8	5	18	31	12	12	RO15738
	8	5	23	37	12	18	12458

	Measurements						Order part number
	A	B	C	D	E	F	
	M10x1	14	M8x1,25	8	10	14	11993
	M10x1	17	M12x1,5	12	13	19	12832
	M10x1.25	18	M12x1,5	9.5	12.5	17	BL15277
	M12x1.5	16	M10x1,25	7.5	10	19	BL15278
	M14x1.5	17	M10x1	12	14	19	RO16182
	M14x1.5	17	M12x1.5	12	15	19	12592
	M16x1.5	17	M12x1.5	13	15	22	13291
	3/8"	22	1/4"	14	17	22	BL16040

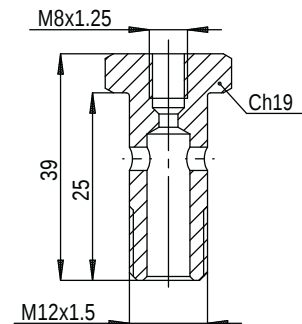
BLEEDER SCREW UNIT REF. 021630



BLEEDER SCREW UNIT REF. RO15154



BORED BOLT WITH HOLE FOR BLEEDER SCREW REF. 12591



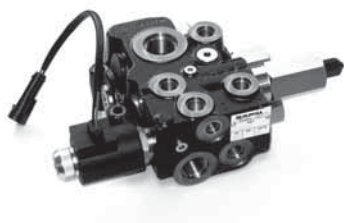
ATTENTION: The figures given in this table are only approximate. We reserve the right to make variations without prior notice.

**MASTER CYLINDERS**

Master cylinders with or without hydraulic booster, single or double circuit, single bore or step-bore piston.

**SAFIM S6 BRAKE VALVES**

Full power brake valve available in different configuration.

**MASTER PRIORITY VALVE®**

Master Priority Valve® feeds, with a single pump, steering, brakes and working equipment.

**WHEEL CYLINDERS**

Standard, spring actuated and multi-function brake cylinders.

**FARM TRACTORS HYDRAULIC BRAKING**

Hydraulic trailer brake valves for European and Italian homologation, quick-release couplings, service and parking brake cylinders for trailer.

**ACCESSORIES**

Accessories to complete the hydraulic brakes system.



SAFIM was awarded the following quality certificates: *ISO 9001 in the year 1999, VISION 2000 in the year 2002.*





CERTIFICATO

Nr 50 100 1898 - Rev. 02

Si attesta che / This is to certify that
IL SISTEMA QUALITÀ DI
THE QUALITY SYSTEM OF

SAFIM S.p.A.

VIA LIVINGSTONE 6
I-41010 MODENA (MO)

È CONFORME AI REQUISITI DELLA NORMA
HAS BEEN FOUND TO COMPLY WITH THE REQUIREMENTS OF

UNI EN ISO 9001:2000

Questo certificato è valido per il seguente campo di applicazione
This certificate is valid for the following product or service range

Progettazione e fabbricazione di componenti idraulici per il comando dei freni di macchine operatrici semoventi e trainate (EA 17)
Design and manufacture of hydraulic components to operate the brakes of self-propelled and towed operating vehicles (EA 17)

Data di emissione / Issue date 2009-06-23	Data di scadenza / Expiry date 2011-06-13
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Per l'Organismo di Certificazione
For the Certification Body
TÜV Italia S.r.l.

Member Body Approved by Italian Government (G) & UK
Department of Trade and Industry (DTI) (UK) (UK) (UK) (UK) (UK)



Claus Spillinger
Claus Spillinger
Management Representative

Rinnovo del certificato emesso per la prima volta in data 2002-07-01
"La validità del presente certificato è subordinata a sorveglianza periodica a 12 mesi e al riesame completo del sistema di gestione aziendale con periodicità triennale"
"The validity of the present certificate depends on the annual surveillance every 12 months and on the complete review of company's management system after three-years."

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SAFIM SAFIM was awarded the quality certificate *ISO 14001-2004 in the year 2006.*





CERTIFICATO

Nr 50 100 5496

Si attesta che / This is to certify that
IL SISTEMA DI GESTIONE AMBIENTALE DI
THE ENVIRONMENTAL MANAGEMENT SYSTEM OF

SAFIM S.p.A.

VIA LIVINGSTONE 6
I-41100 MODENA (MO)

È CONFORME AI REQUISITI DELLA NORMA
HAS BEEN FOUND TO CONFORM TO THE REQUIREMENTS OF

UNI EN ISO 14001:2004

Questo certificato è valido per il seguente campo di applicazione
This certificate is valid for the following product or service range

Progettazione e fabbricazione mediante lavorazioni meccaniche, assemblaggio e collaudo di componenti idraulici per il comando di freni di macchine operatrici semoventi e trainate (EA 18)
Design and manufacture of hydraulic devices for brakes control of self-propelled and towed operating vehicles, through machining, assembling and testing (EA 18)

Data di emissione / Issue date 2006-01-09	Data di scadenza / Expiry date 2009-01-03
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Per l'Organismo di Certificazione
For the Certification Body
TÜV Italia S.r.l.

Member Body Approved by Italian Government (G) & UK
Department of Trade and Industry (DTI) (UK) (UK) (UK) (UK) (UK)



Alessio Galasso
Alessio Galasso
Technical Representative

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