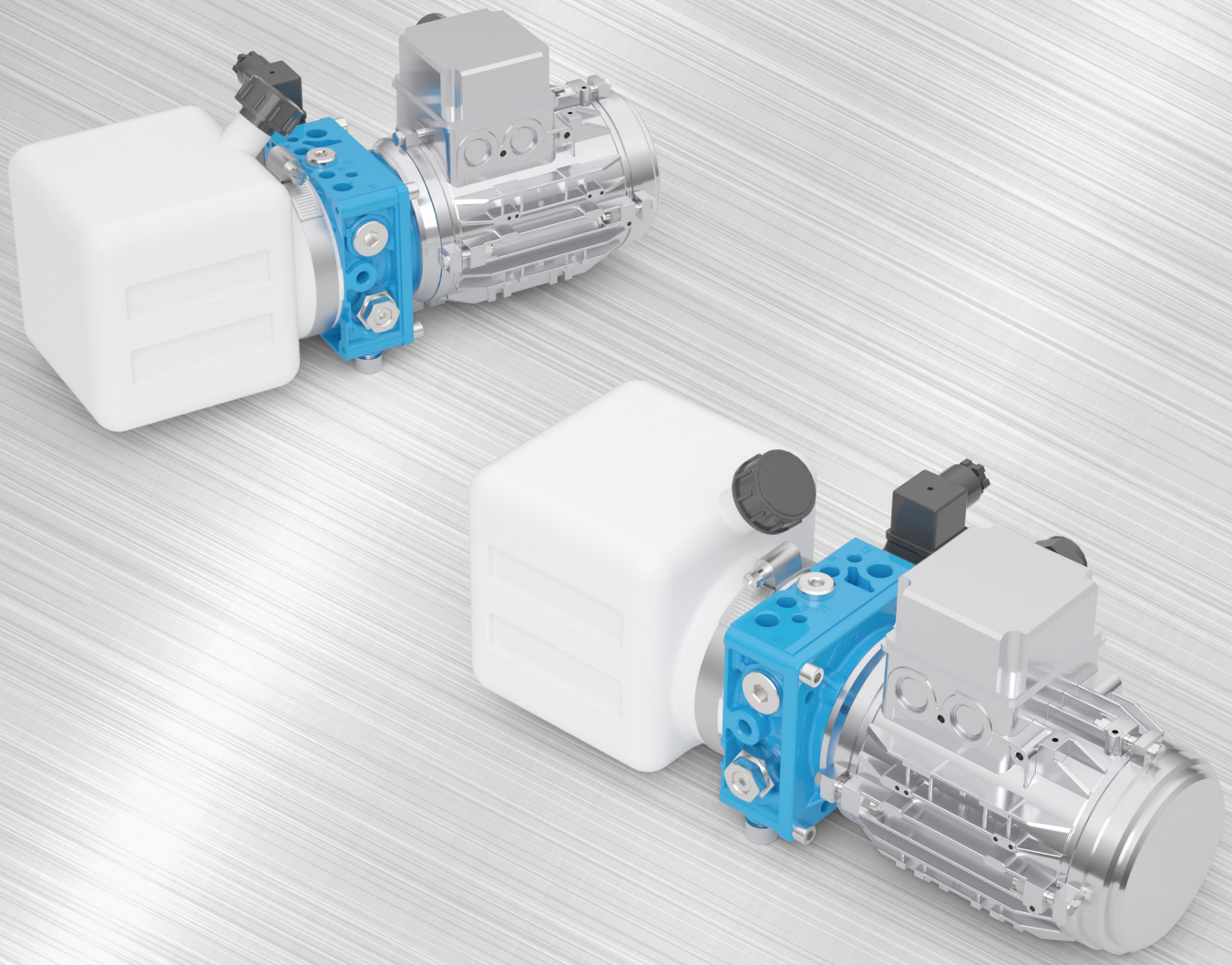
DANA BREVINI® Motion Systems

DC6A1A1_B90-000R0
06 2026

Product Catalog

Brevini® Power Pack
FR

New series of micro Power Pack



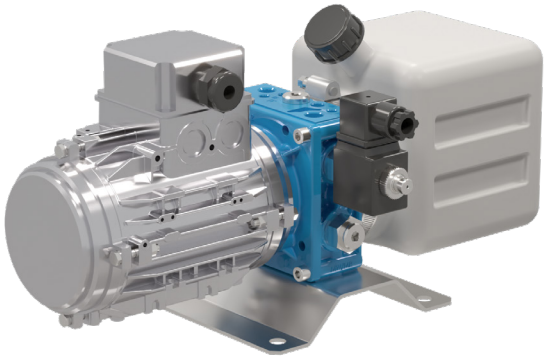
Design evolution

Power pack designed to replace previous series MR, introducing new cartridge valves SAE08 and relief valves with safe adjustment design.
Double fixing holes options, new return conveyor and block interface same as series FP

Index

Dana has introduced the introductive index, page symbols and bookmars, which allow you to arrive and print the relevant section faster.
Clicking the Dana logo at the bottom page, you'll come back to the index.

Introduction



The FR series (II version) power pack is an easy-to-assemble, compact, electro-hydraulic unit. With its versatility and modularity, it offers many combinations of hydraulic circuits to suit various requirements of plant design. This catalogue has been written to help the user choose the components for the power pack required for the specific application. However, the catalogue cannot foresee all the combinations that may be executed, so in some cases it may be necessary to consult our commercial engineering department.
For applications with very complex circuits, standard modular blocks for Cetop valves and other special blocks can be installed on the power pack, or blocks built to order can be included.

A few applications:

- Fork lifts
- Lifting platforms and beds
- Industrial automation (machine tools, food industry, textile industry)

You can chose from a wide variety of components with the following specifications:

- Gear pumps - Group 0.5 - from 0.25 to 1.25 cc.
- DC motors, 12/24 V, light-duty service, from 0.35 to 2.2 Kw
- Single and triple-phase motors with power ratings of up to 1.1 Kw - in a standard version or built to the customer's specifications (with minimum overall dimensions)
- Tanks in sheet steel with capacities of up to 8 litres
- Tanks in plastic with capacities of up to 2 litres

A fundamental part of the power pack is the endhead, which is made of die-cast aluminum alloy. The parts and dimensions of this component are shown below.

Operating limits

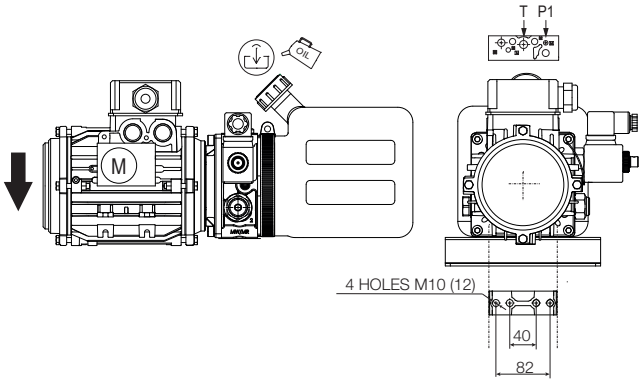
- Intermittent peak pressure: 290 bar (depending on pump type)
- Maximum flow rate: 6 l/min
- Maximum operating temperature:
  80°C (with sheet steel tank)
  70°C (with polyethylene tank)
  60°C (with polypropylene tank)
- Mineral-based hydraulic fluid: ISO 6743-4 (DIN 51524)
  Minimum viscosity: 12 mm^2/s
  Maximum viscosity: 80 mm^2/s
  Maximum viscosity at start-up: 500 mm^2/s
- Minimum ambient temperature -15°C
- Maximum ambient temperature 40°C (with peaks of 50°C)
- The validation of the endhead follows a life-test with 210 bar pulsed pressure repeated for 200.000 cycles

Operating pressure is controlled by the maximum pressure valve and the type of pump used (in terms of performance) may be determined by the maximum pressure valve. Therefore, it is essential not to change the maximum pressure valve. If neccessary, contact our technical service department.

Installation

1) The power pack must be mounted using the M10 holes on the endhead.
2) The power pack must not come into contact with sheet metal, protective guards or any parts that may vibrate and transmit noise.
3) The ports on the endhead have been identified by the letters P1-T-P2. The hydraulic connection must be made with fittings with cylindrical thread and with copper or rubber sealing gaskets (O-rings).
4) After the electrical connections have been made, check the direction of motor rotation by executing short pulses of 1 second each (max.): the motor must turn anti-clockwise, as shown in the figure.

The tank must be filled with new mineral-based, ISO 6743/4 fluid: it is important to filter the fluid while filling the tank.

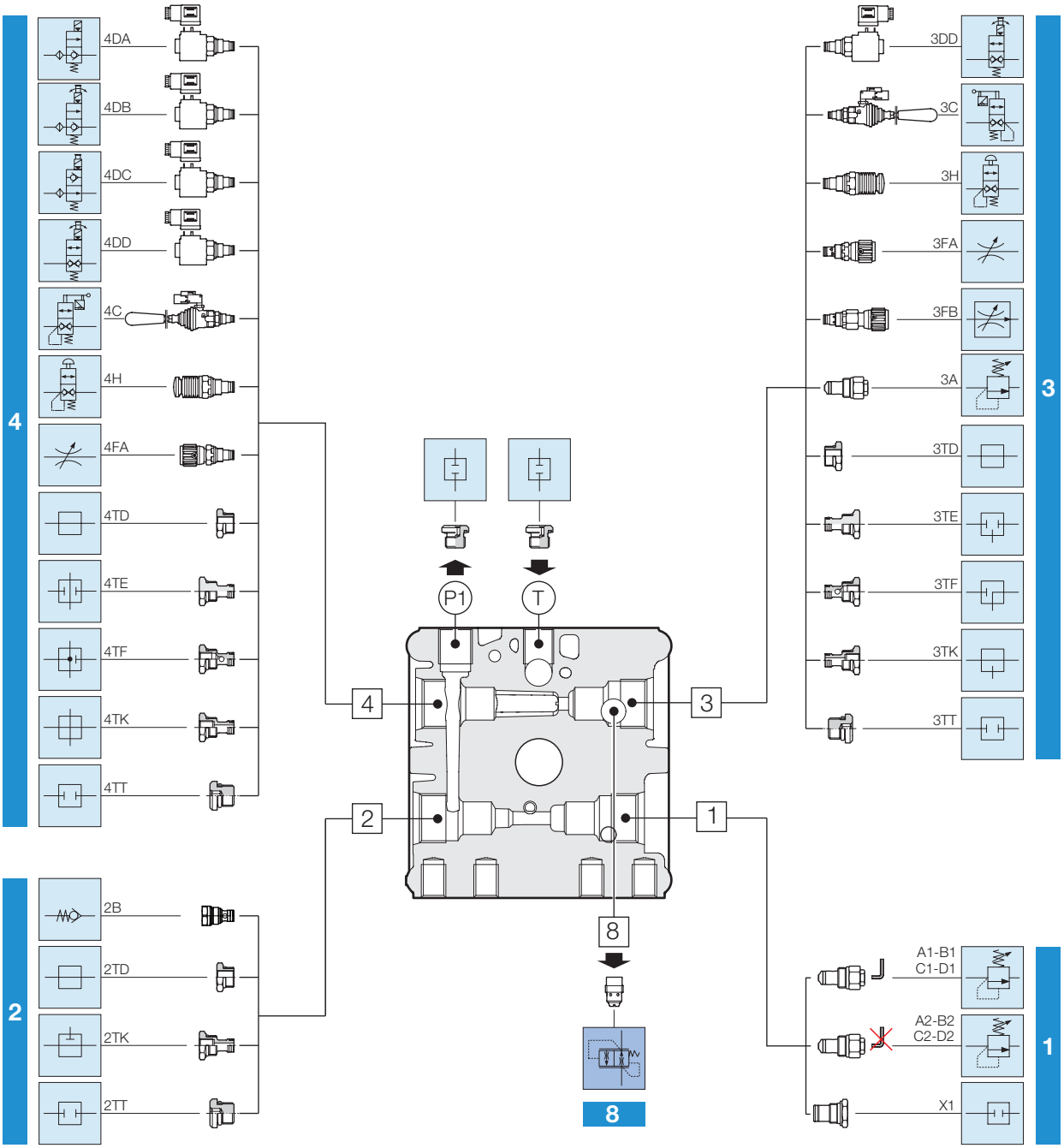


Symbols/abbreviations used in this catalog:

	Important data /information
	Mounting endhead side
	Ground floor
	Electrical connection boxes on AC motors
	Poles and/or starting relays on DC motors
	Fill plug with breather and level stick
	Fill plug with breather
	Standard plug (closed)
OIL	Standard oil fill plug
	Fill plug with breather
	Fill plug
	Fill plug with check valve
	Fill plug with back check
	Drain plug with magnet
	Plug (or level stick) with visual indicator
	Drain plug
HPU	Hydraulic Power Unit
*	Fields to be completed

Power pack endhead configuration

FRA

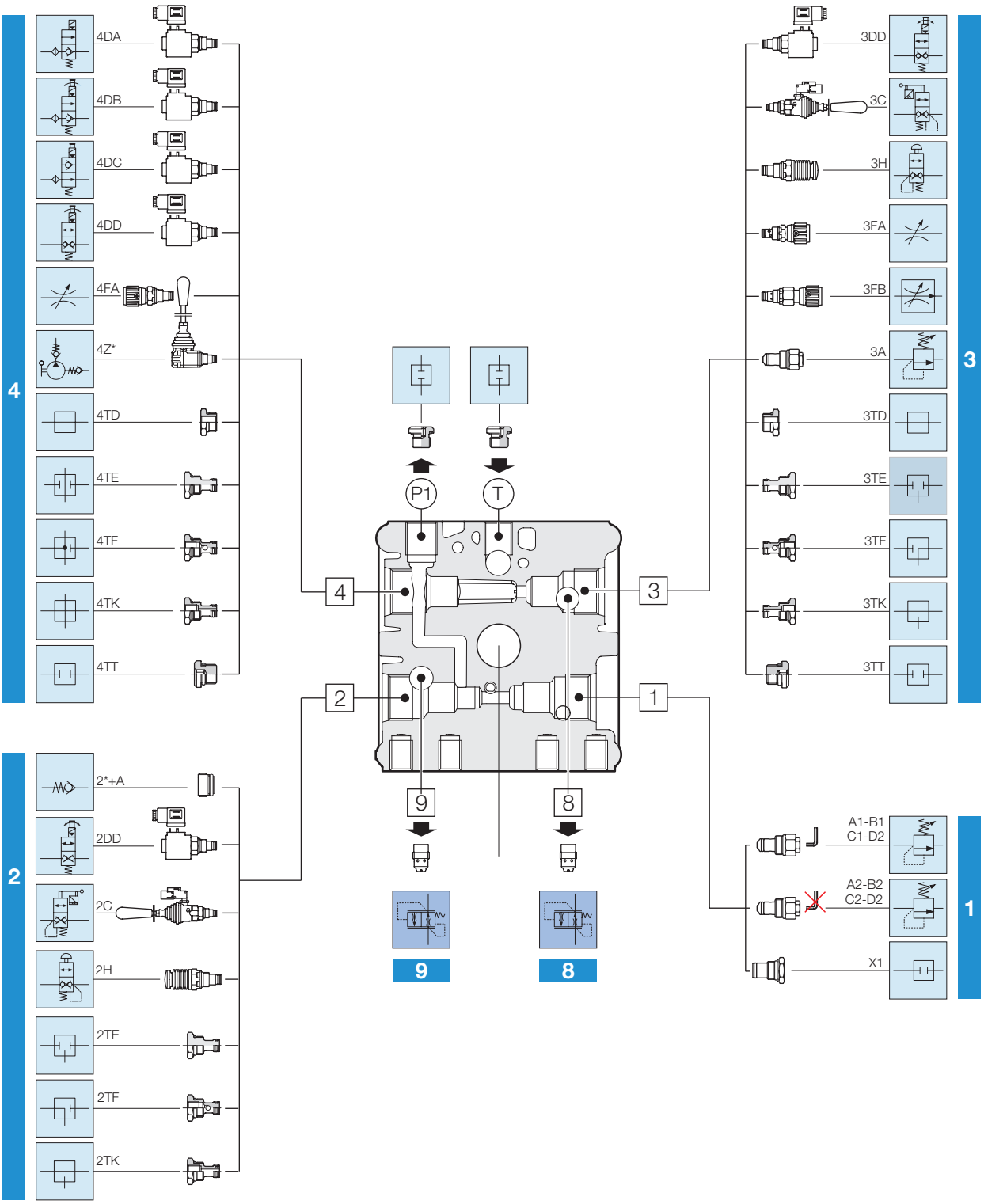


Flow control valves

Endhead configuration

Power pack endhead configuration

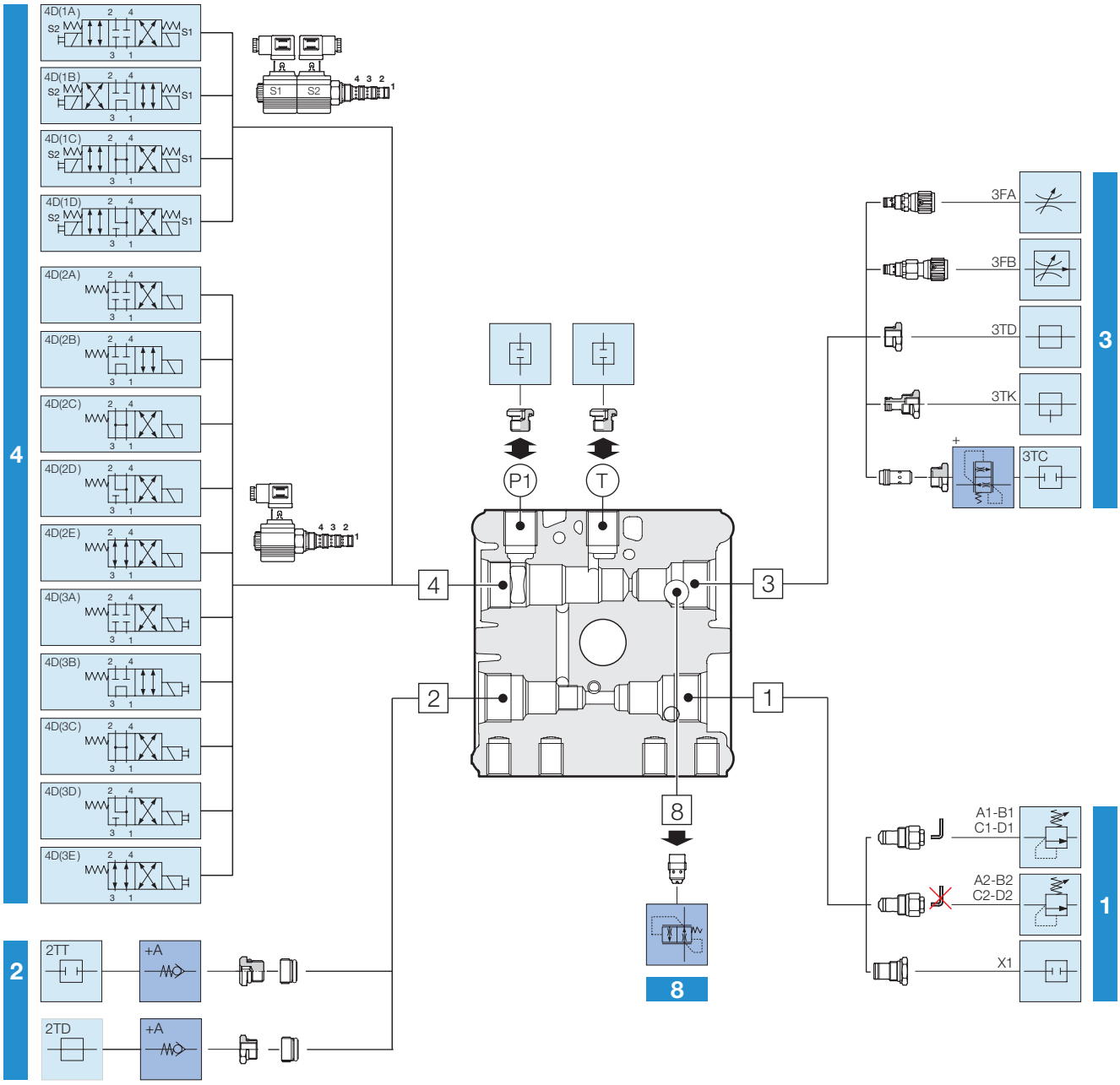
FRC



Flow control valves

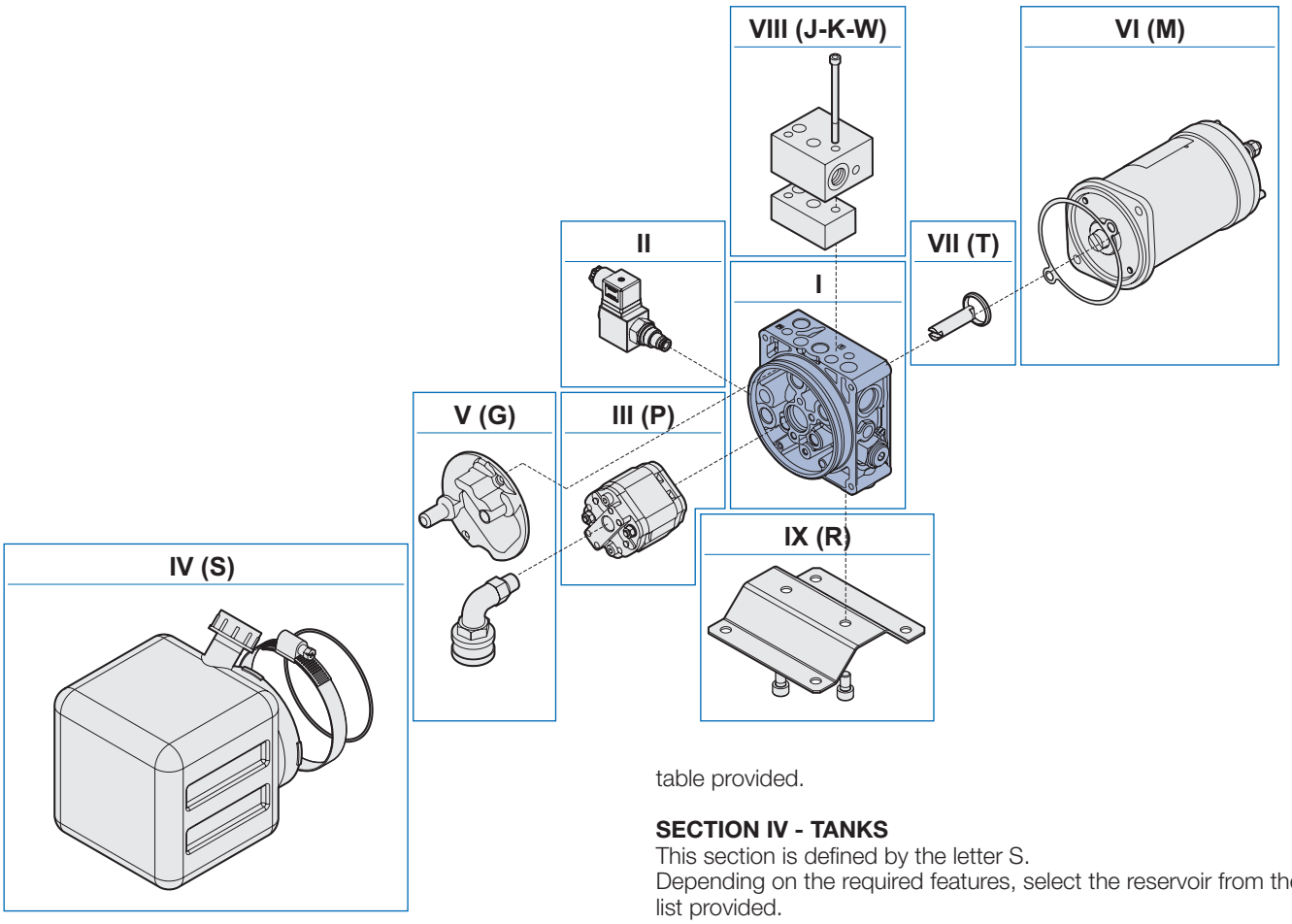
Power pack endhead configuration

FRE



Flow control valves

Power pack sections



With its great modularity, the FR series of power packs can create multiple configurations which satisfy requirements in a wide range of applications.
To make it easier to choose components, the power pack is subdivided into sections.

SECTION I - SERIE, FLANGE TYPE, VALVES ON CAVITY 1
FR Series Powerpacks are based on the Flange features.
The Flange is the core of the unit, on the flange are mounted all the valves, the pump, the motor and the reservoir.
The FR Flange is available in several Versions (with different tooling options).
The Flange Version must be chosen depending on the type of Hydraulic Circuit Layout required.
Together with the Flange Version, it is required to select the Valves to be mounted in the Various Cavities.
1 (Main Pressure Relief Valve).

SECTION II - VALVES
Depending on the Type of Hydraulic Circuit Layout to be realized, it is required to Select the Valves for each of the available Cavities.
In order to correctly build up the Ordering Code, it is required to use the following procedure.
Peripheral Cavities (it is mandatory to mention all the Cavities in Numeral Order): starting from Cavity 2, mention all the Cavities and the Valves, Plugs or Fittings to be mounted in said Cavity.
Internal Cavities: normally connected to Tank (It is not mandatory to mention, but if required it should be done in Numeral Order): starting from Cavity 6, mention all the Internal Cavities where a Valve (usually a Return Line Valve) is mounted, Selecting the Valve Type to be mounted in said Cavity.
Outputs, see description in the Table.

SECTION III - PUMPS
It is mandatory to mention this section, defined by the letter P.
Depending on the required features, select the pump from the table provided.

SECTION IV - TANKS
This section is defined by the letter S.
Depending on the required features, select the reservoir from the list provided.
If no Reservoir is required, and also no Suction / Return Kit is required, please omit this section. If no Reservoir is required, but a Suction / Return Kit is required, please jump to Section V (defined by letter G).

SECTION V - TUBES KIT (suction and return, only for tanks on the catalog)
This section is defined by the letter G.
In order to define this Section, please select the Reservoir Type anyways.

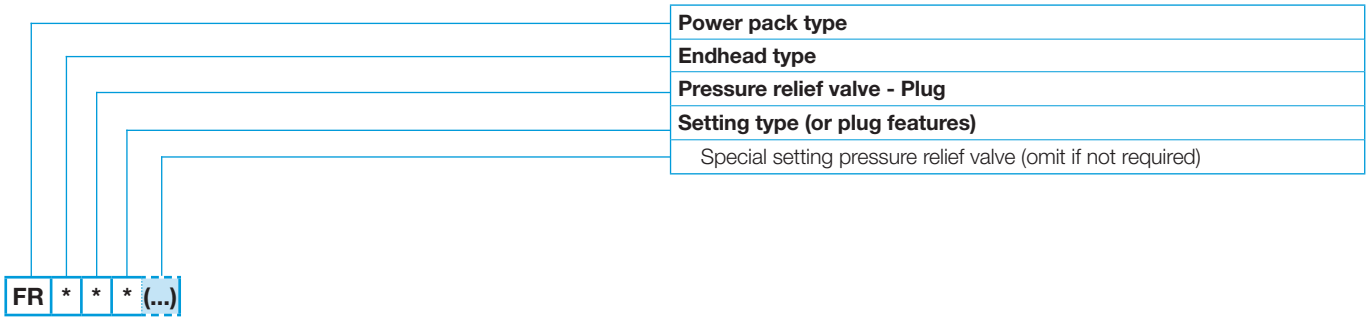
SECTION VI - MOTORS
This section is defined by the letter M.
Depending on the Type of Hydraulic Circuit Layout to be realized, it is required to Select the Motor Type. If no Motor is required, and no Transmission Kit is required, please omit this section. If no Motor is required, but a Transmission Kit is required, please jump to Section VII (defined by letter T).

SECTION VII - TRANSMISSION KIT (only for motors on the catalog)
This section is defined by the letter T.
Select the kit as per Table provided.

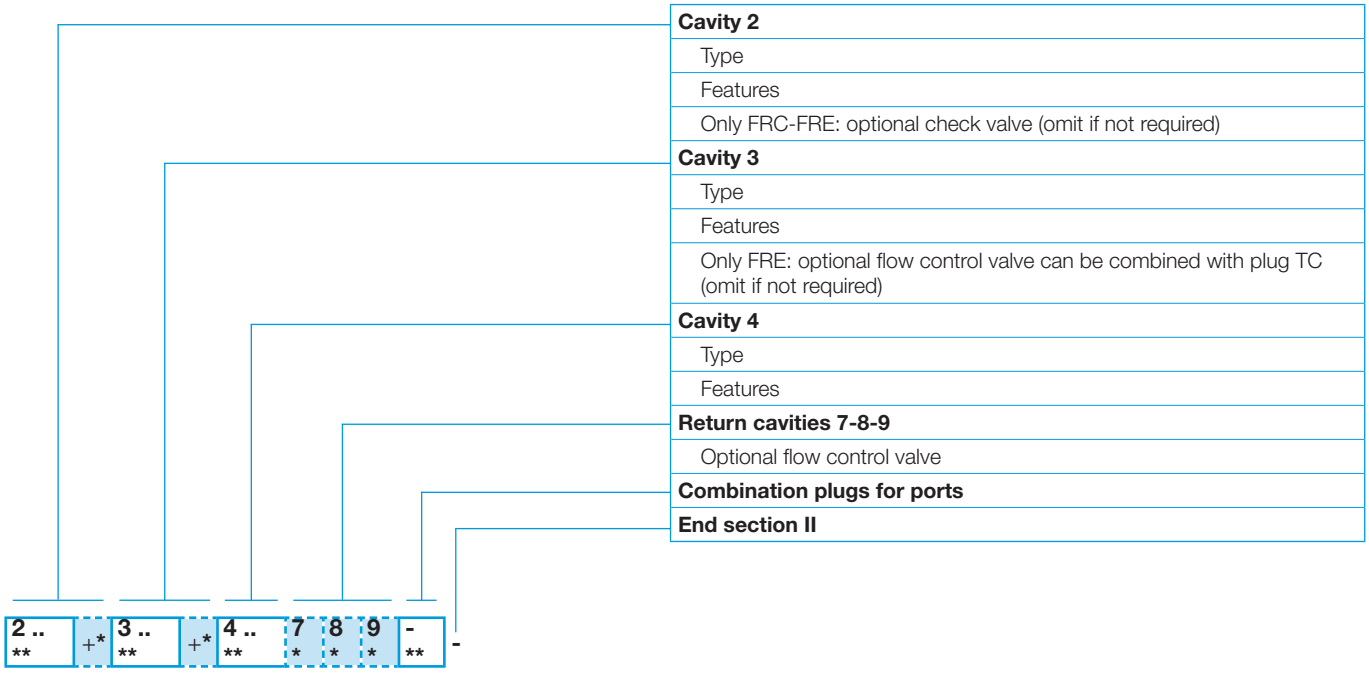
SECTION VIII - BLOCKS
This section it is not mandatory, depending on the Type of auxiliary Block required, definition Letter changes:
J, Blocks with CETOP type of interface for Solenoid Valves;
K, Bankable Valves Interface – Horizontal (Parallel to Unit Axis);
W, Bankable Valves Interface – Vertical (Perpendicular to Unit Axis).

SECTION IX - ACCESSORIES
His section it is not mandatory, is defined by the letter R
Check the available options in the list provided.
Accessories must be listed in Alphabetical Order.

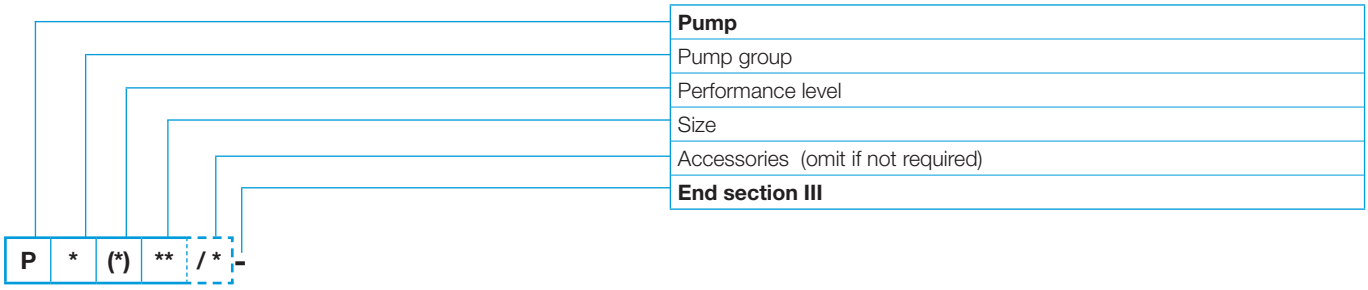
SECTION I - SERIE, ENDHEAD, VALVES ON CAVITY 1



SECTION II - VALVES

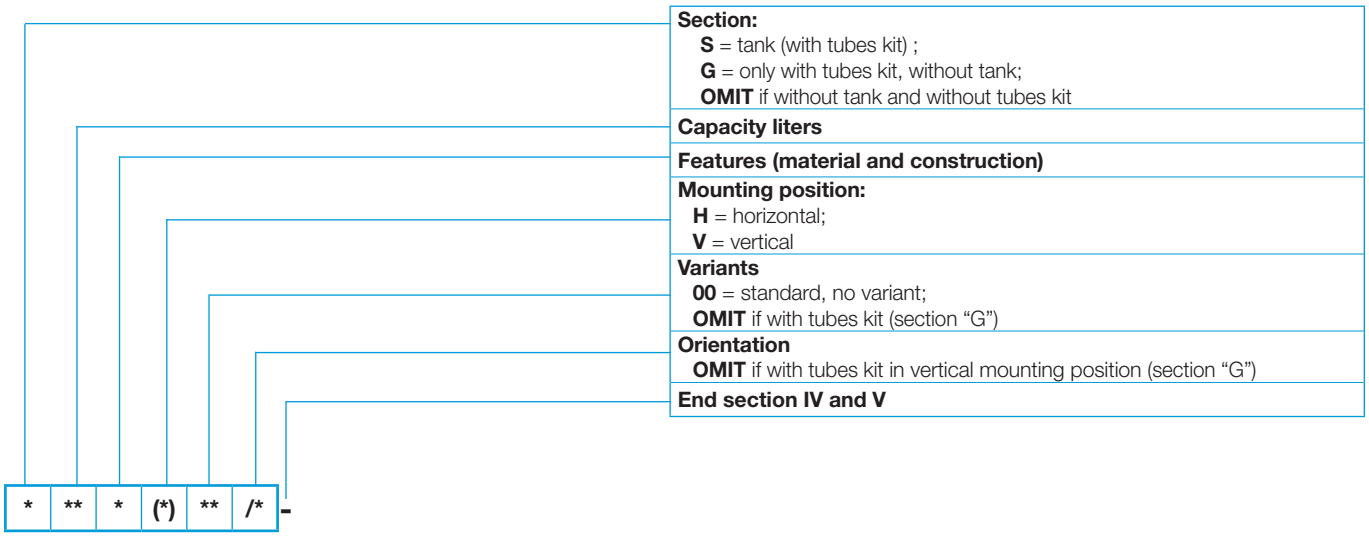


SECTION III - PUMPS

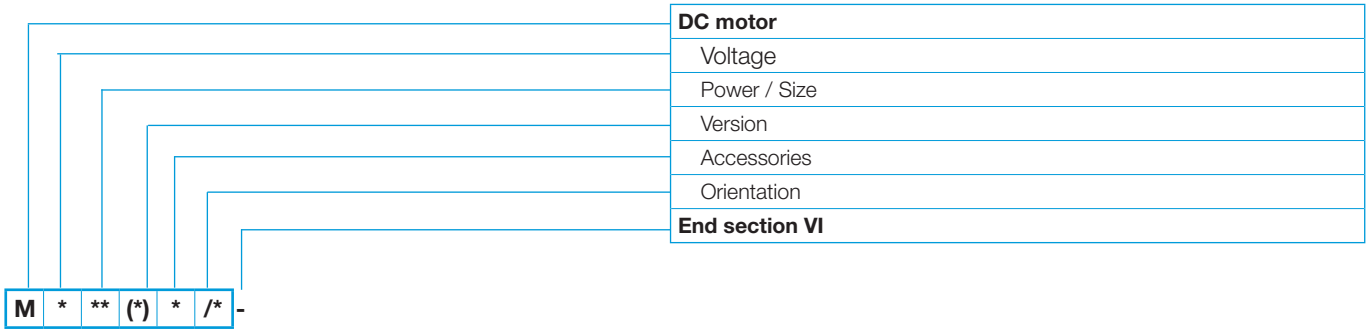


Selection code

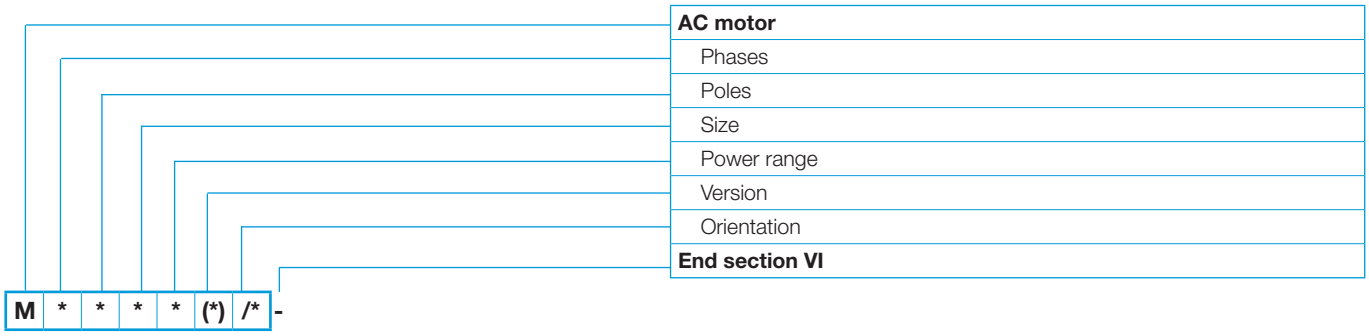
SECTION IV - TANKS / SECTION V - TUBES KIT



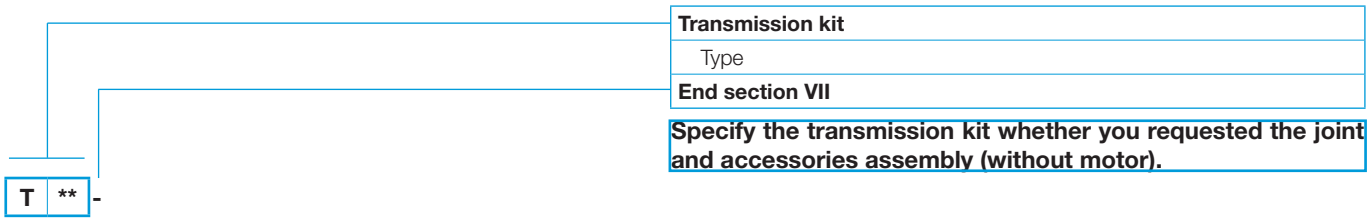
SECTION V - MOTORS



OR ..

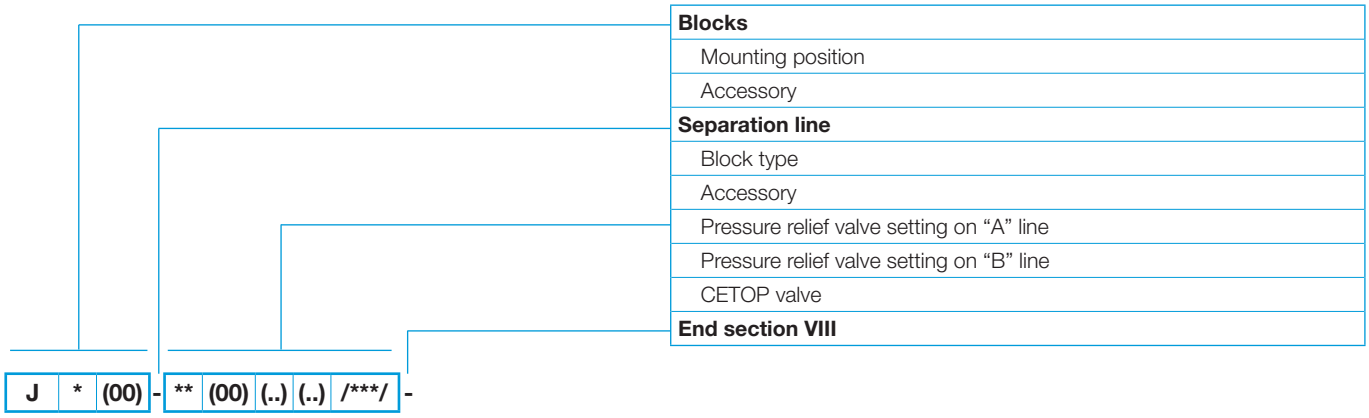


SECTION VI - TRANSMISSION KIT (only for motors on the catalog)

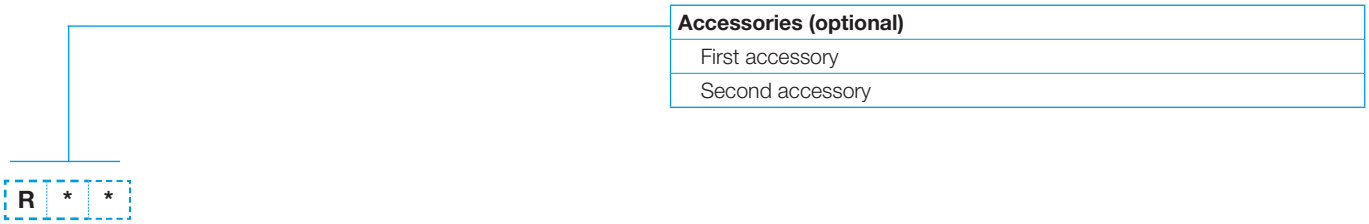


Specify the transmission kit whether you requested the joint and accessories assembly (without motor).

SECTION VII - BLOCKS



SECTION VIII - ACCESSORIES



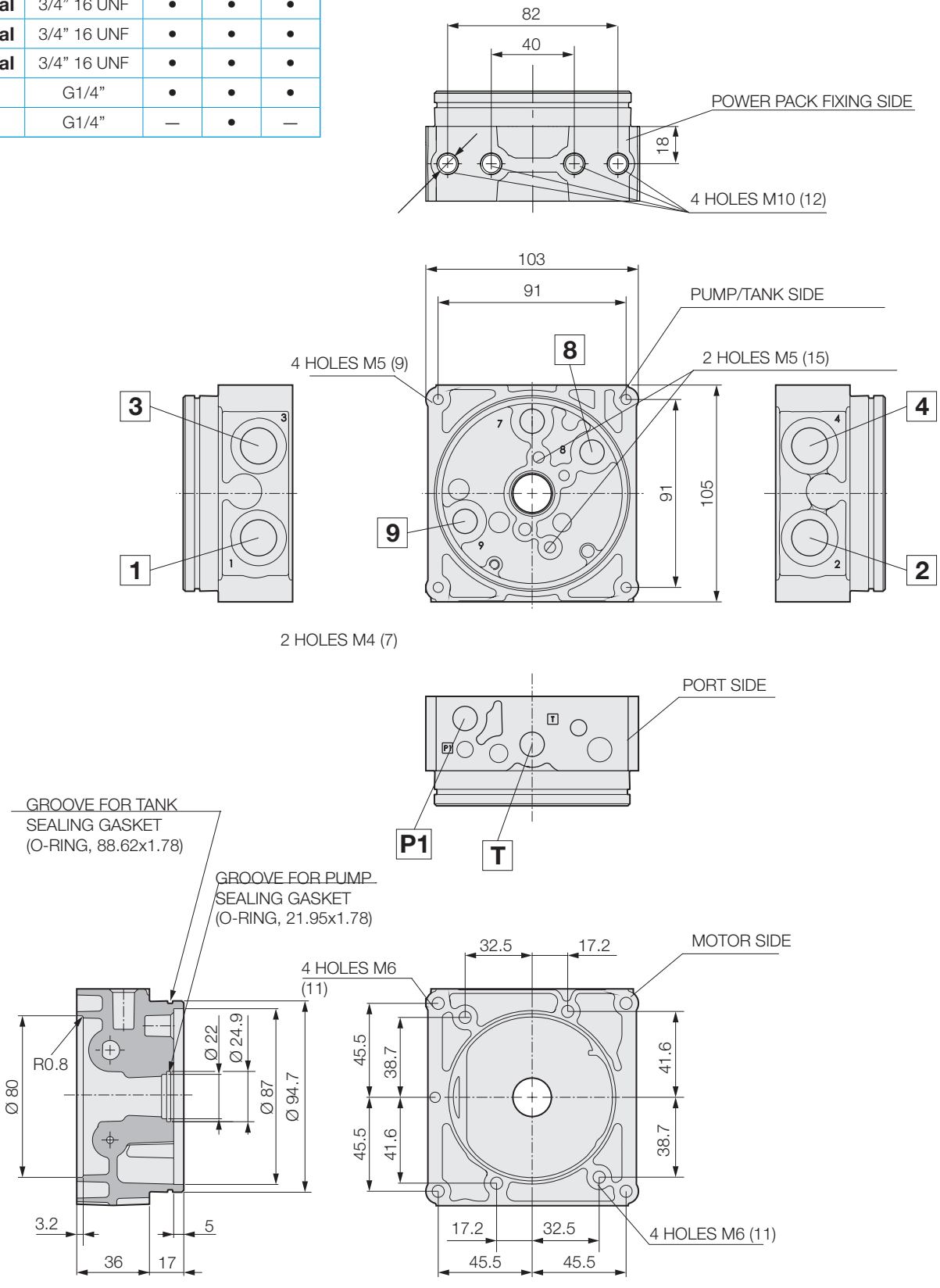
Endhead overall dimensions

Cavities on endhead:

Cavity		Thread	Endhead type		
			FRA	FRC	FRE
P1	Ports	G1/4”	•	•	•
T	Ports	G1/4”	•	•	•
1	Peripheral	3/4” 16 UNF	•	•	•
2	Peripheral	3/4” 16 UNF	•	•	•
3	Peripheral	3/4” 16 UNF	•	•	•
4	Peripheral	3/4” 16 UNF	•	•	•
8	Return	G1/4”	•	•	•
9	Return	G1/4”	—	•	—

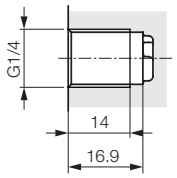
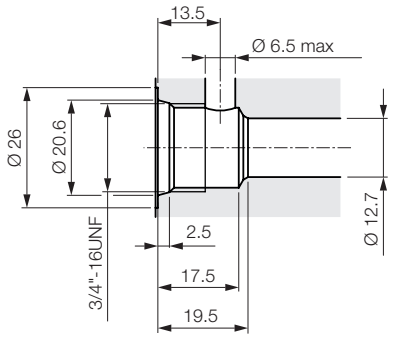
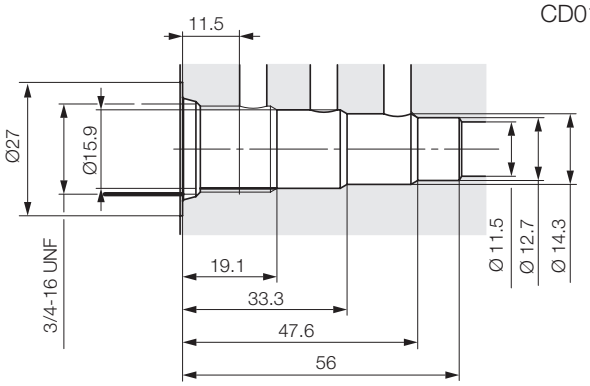
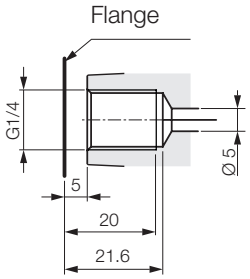
The number of cavities tooled identify the endhead type:

There are three types of cavities:
- **Peripheral cavities**, which can be accessed externally
- **Return cavities**, inside of the tank.
- **Ports**



The cavities (1-2-3-4) and the ports (P1-T) are marked on the die-cast endhead. The dimensions on the drawing are the same for all endhead.

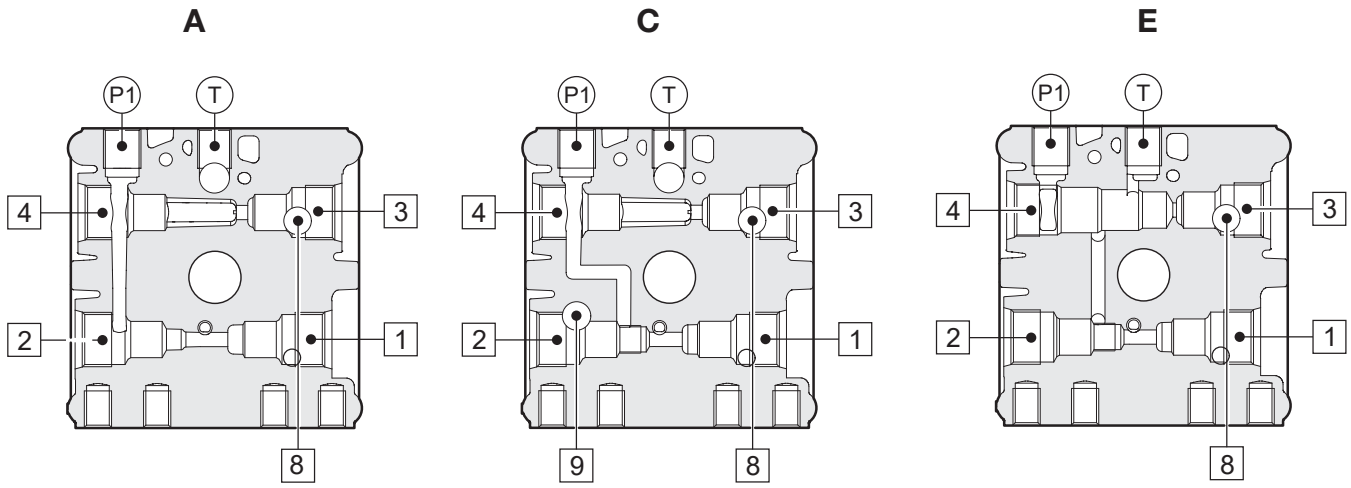
Cavities dimensions

Cavity		Thread	Drawing
P1 **T**	**Ports**	G1/4”	
1 **2** **3** **4**	**Peripheral** **(4 - Only for FRA - FRC)**	3/4 16 UNF	CD018014 
4	**Peripheral** **(4 - Only for FRE)**	3/4 16 UNF	CD018001 
7 **8** **9**	**Return**	G1/4”	

Sect. I - Endhead choice

Endhead type

FR	*

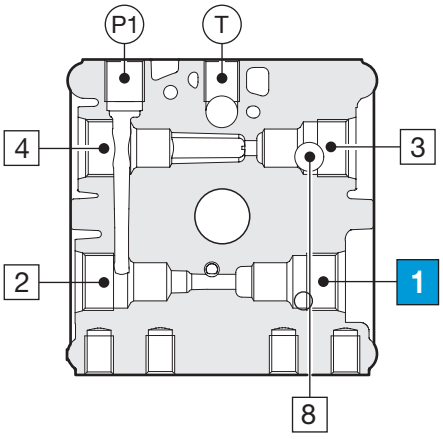


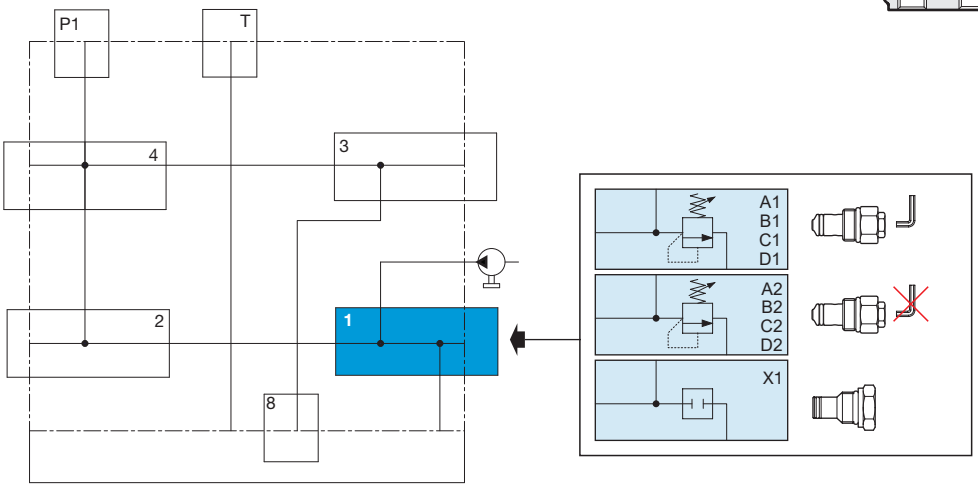
*** Endhead type**

*	Ports	Peripheral	Return
A	n. 2 (P1 - T)	n. 4 (1 - 2 - 3 - 4)	n. 1 (8)
C	n. 2 (P1 - T)	n. 4 (1 - 2 - 3 - 4)	n.2 (8 - 9)
E	n. 2 (P1 - T)	n. 4 (1 - 2 - 3 - 4)	n. 1 (8)

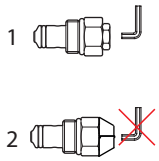
	Endhead codes G1/4”
FRA	M17100001
FRC	M17100002
FRE	M17100003

FRA* * * (...)	Pressure relief valve - Plug
	Setting type (or plug features)
	Special setting pressure relief valve (omit if not required)





1 * * (...) Pressure relief valve

*	*	Pressure (bar)	STD setting (bar)	(...) Special setting (bar)	Setting type	Code	Symbol	Drawing
A	1	15 ÷ 50	30	15 ÷ 30 (5 to 5)	Adjustable setting [1]	10461121		
	2				Not-adjustable setting	10461121 + 9043928 (Qty 2)		
B	1	40 ÷ 110	50	40 ÷ 110 (5 to 5)	Adjustable setting [1]	10461125		
	2				Not-adjustable setting	10461125 + 9043928 (Qty 2)		
C	1	80 ÷ 220	150	80 ÷ 220 (5 to 5)	Adjustable setting [1]	10461127		
	2				Not-adjustable setting	10461127 + 9043928 (Qty 2)		
D	1	150 ÷ 350	180	150 ÷ 290 (10 to 10)	Adjustable setting [1]	10461128		
	2				Not-adjustable setting	10461128 + 9043928 (Qty 2)		

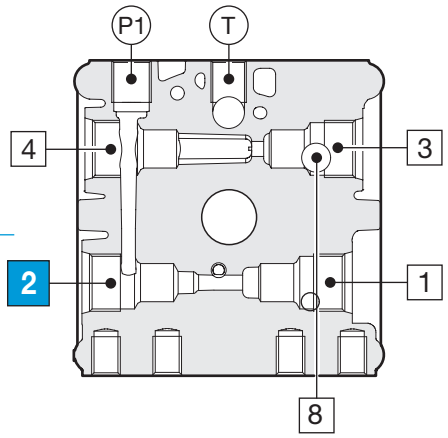
* * Plug

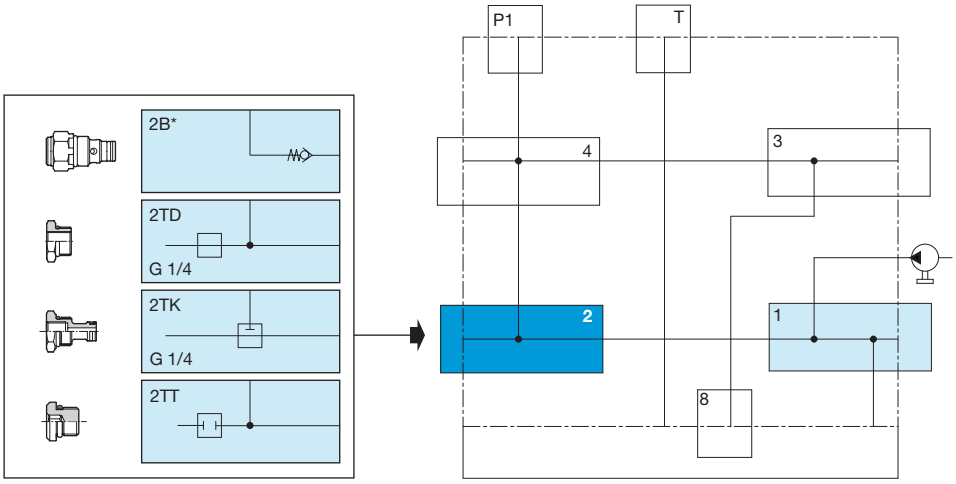
*	*	Description	Code	Symbol	Drawing
X	1	Plug	V70100005		

[1] Not-removable protection supplied separately, see accessories page 16

Sect. II - FRA Cavity 2

		Cavity	Type	Features
FRA*	** (...)	2	..	**





2 B * One-way check valve

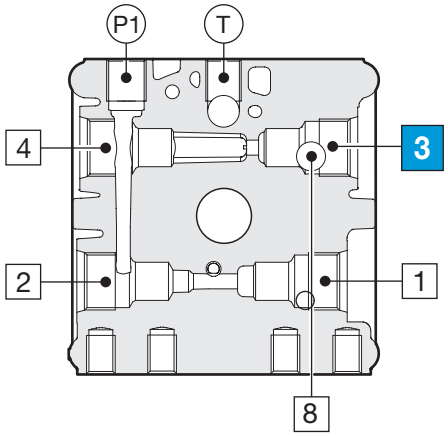
*	Description	Code	Symbol	Drawing
A	0.5 bar (cracking pressure)	CP0000016		

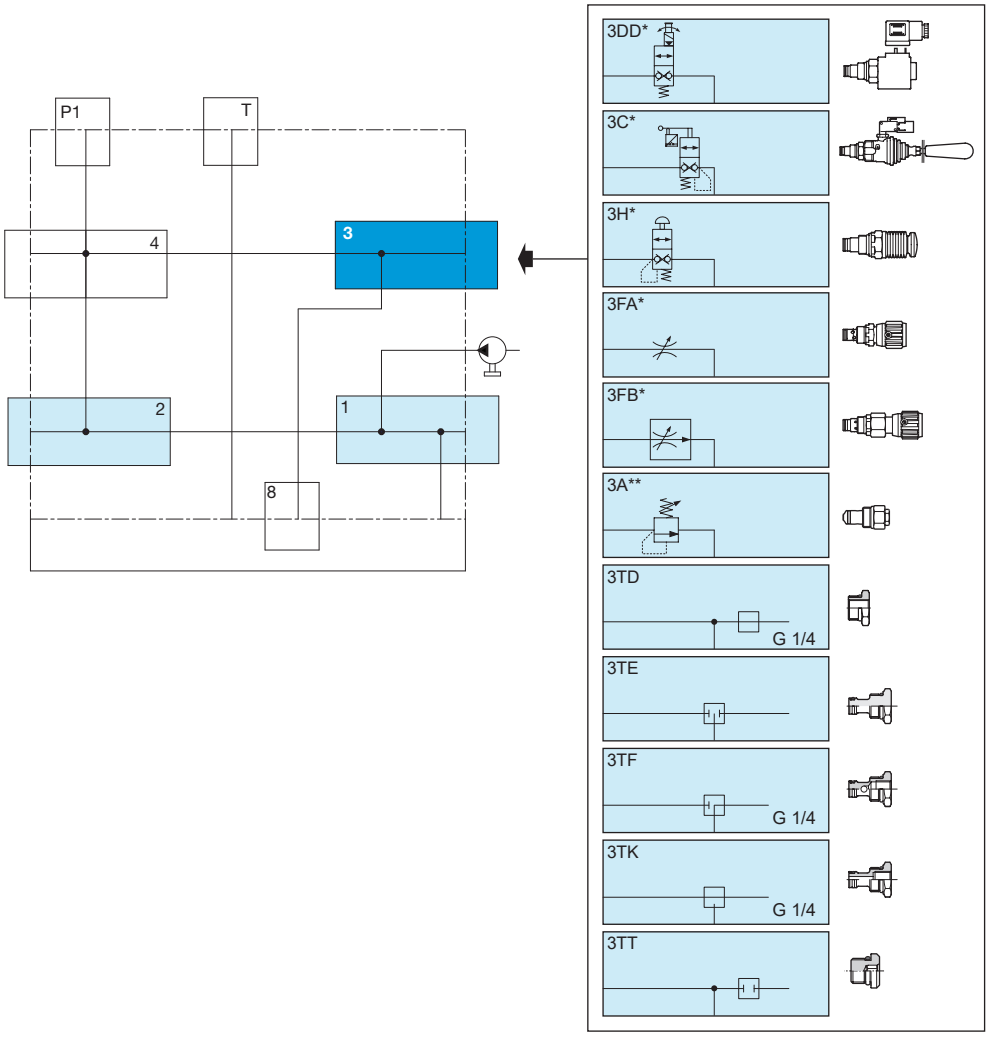
2 T * Plugs and fittings

*	Description	Code	Symbol	Drawing
D	Fitting 3/4 16 UNF - G1/4	20001700		
K	Fitting 3/4 16 UNF - DIN G1/4	20018000		
T	Plug 3/4 16 UNF	10563394		

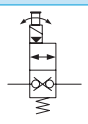
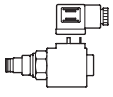
FRA*	** (...)	2 .. **	3	..	**

Cavity
Type
Features





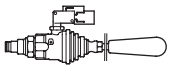
3 DD ** — Direct operated solenoid valve normally closed, with button emergency (1)

**	Description	Code (valve + connector)	Symbol	Drawing
AA	Voltage 12 Vdc	CRD0418NCAEL002 + V86050002		
AB	Voltage 24 Vdc	CRD0418NCAEM002 + V86050002		

(1) Valves supplied with connector. Without connector see accessories page 62

Sect. II - FRA Cavity 3

3 C * Lever operated valve

*	Description	Code	Symbol	Drawing
A	Without microswitch	CMF04L0001		
B	With microswitch	CMF04M0001		

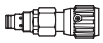
3 H * Button operated valves

*	Description	Code	Symbol	Drawing
A	Push-button control	CPE04P000.1		

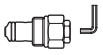
3 FA * Bidirectional flow control valves not compensated

*	Description	Code	Symbol	Drawing
A	Screw adjustment	CSB04C0000		
B	Plastic knob adjustment	CSB04V0000		

3 FB * Unidirectional flow control valves compensated

*	Description	Code	Symbol	Drawing
A	Screw adjustment	CSC04C0000		
B	Plastic knob adjustment	CSC04V0000		

3 A ** (...) Pressure relief valves

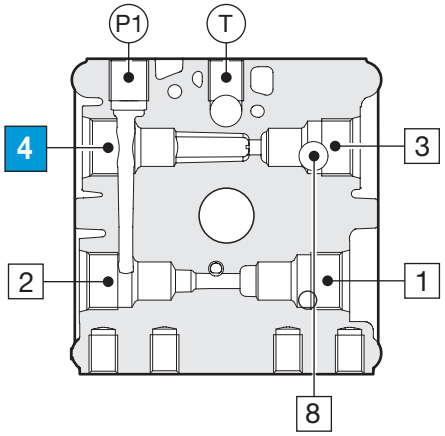
**	Description	STD setting (bar)	Setting (bar)	Code	Symbol	Drawing
AA	Adjustable setting	30	Min 15 - Max 30	10461121		
AB		50	Min 40 - Max 110	10461125		
AC		150	Min 80 - Max 220	10461127		
AD		180	Min 150 - Max 290	10461128		

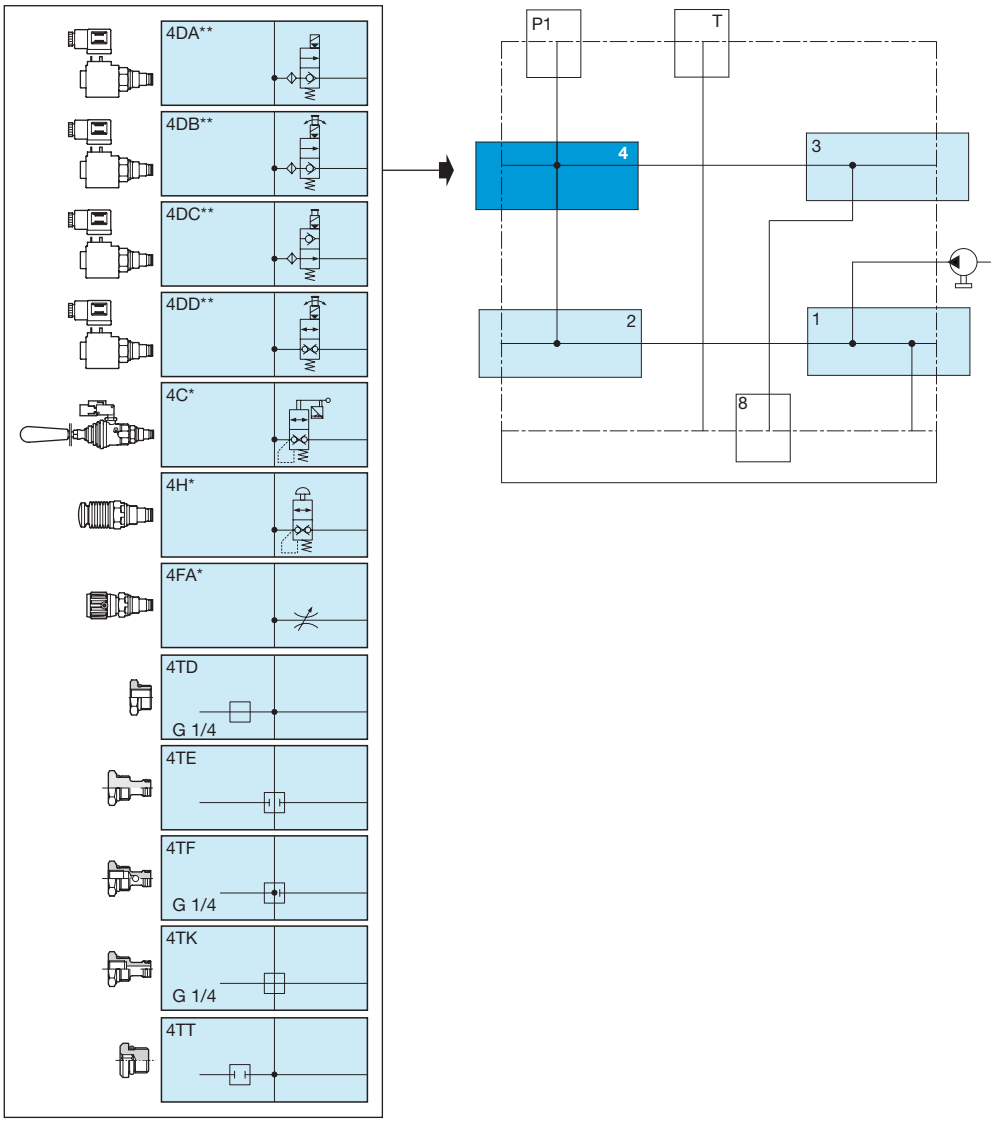
3 T * Plugs and fittings

*	Description	Code	Symbol	Drawing
D	Fitting 3/4 16 UNF - G1/4	20001700		
E	Long plug 3/4 16 UNF	20003800		
F	Fitting 3/4 16 UNF - G1/4	20009400		
K	Fitting 3/4 16 UNF DIN - G1/4	20018000		
T	Plug 3/4 16 UNF	10563394		

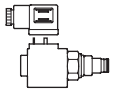
FRA*	** (...)	2 .. **	3 .. ***	4	..	**

Cavity
Type
Features



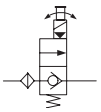
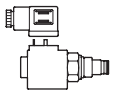


4 DA ** Piloted solenoid valves normally closed, without emergency (1)

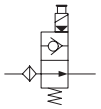
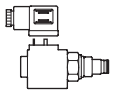
**	Description	Code (valve + connector)	Symbol	Drawing
AA	Voltage 12 Vdc	CRP0418NCASL004 + V86050002		
AB	Voltage 24 Vdc	CRP0418NCASM004 + V86050002		
AC	Voltage 24 Vac 50 Hz	CRP0418NCASA004 + V86050002		
AD	Voltage 115 Vac 50 Hz	CRP0418NCASJ004 + V86050002		
AE	Voltage 230 Vac 50 Hz	CRP0418NCASI004 + V86050002		

II FRA

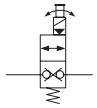
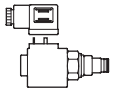
4 DB ** Piloted solenoid valves normally open, with rotary emergency (1)

**	Description	Code (valve + connector)	Symbol	Drawing
AA	Voltage 12 Vdc	CRP0418NCAEL004 + V86050002		
AB	Voltage 24 Vdc	CRP0418NCAEM004 + V86050002		
AC	Voltage 24 Vac 50 Hz	CRP0418NCAEA004 + V86050002		
AD	Voltage 115 Vac 50 Hz	CRP0418NCAEJ004 + V86050002		
AE	Voltage 230 Vac 50 Hz	CRP0418NCAEI004 + V86050002		

4 DC ** Piloted solenoid valves normally open, with button emergency (1)

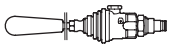
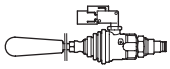
**	Description	Code (valve + connector)	Symbol	Drawing
AA	Voltage 12 Vdc	CRP0418NAAEL003 + V86050002		
AB	Voltage 24 Vdc	CRP0418NAAEM003 + V86050002		
AC	Voltage 24 Vac 50/60 Hz (RAC with rectifier)	CRP0418NAAE2003 + V86200002		
AD	Voltage 115 Vac 50 - 120 Vac 60 Hz (RAC with rectifier)	CRP0418NAAEZ003 + V86200002		
AE	Voltage 230 Vac 50 - 240 Vac 60 Hz (RAC with rectifier)	CRP0418NAAEX003 + V86200002		
AF	Voltage 48 Vdc	CRP0418NAAEN003 + V86050002		

4 DD ** Direct operated solenoid valve normally closed, with button emergency (1)

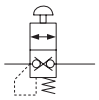
**	Description	Code (valve + connector)	Symbol	Drawing
AA	Voltage 12 Vdc	CRD0418NCAEL002 + V86050002		
AB	Voltage 24 Vdc	CRD0418NCAEM002 + V86050002		

(1) Valves supplied with connector. Without connector see accessories page 62

4 C * Lever operated valve

*	Description	Code	Symbol	Drawing
A	Without microswitch	CMF04L0001		
B	With microswitch	CMF04M0001		

4 H * Button operated valves

**	Description	Code	Symbol	Drawing
A	Push-button control	CPE04P000.1		

4 FA * Bidirectional flow control valves not compensated

*	Description	Code	Symbol	Drawing
A	Screw adjustment	CSB04C0000		
B	Plastic knob adjustment	CSB04V0000		

4 T * Plugs and fittings

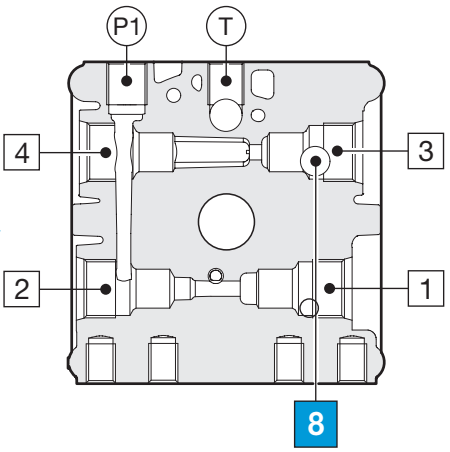
*	Description	Code	Symbol	Drawing
D	Fitting 3/4 16 UNF - G1/4	20001700		
E	Long plug 3/4 16 UNF	20003800		
F	Fitting 3/4 16 UNF - G1/4	20009400		
K	Fitting 3/4 16 UNF DIN - G1/4	20018000		
T	Plug 3/4 16 UNF	10563394		

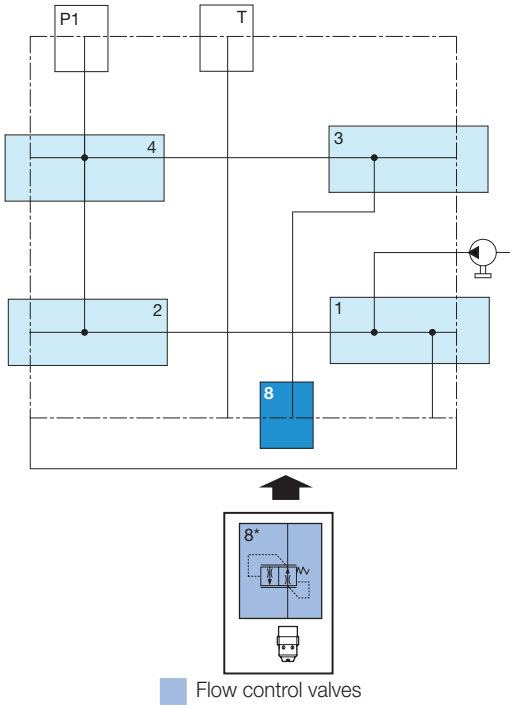
Sect. II - FRA Cavity 8

Flow control valves, omit if not required

Return cavities

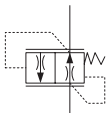
FRA*	** (...)	2 .. **	3 .. ***	4 .. **	8	*	-





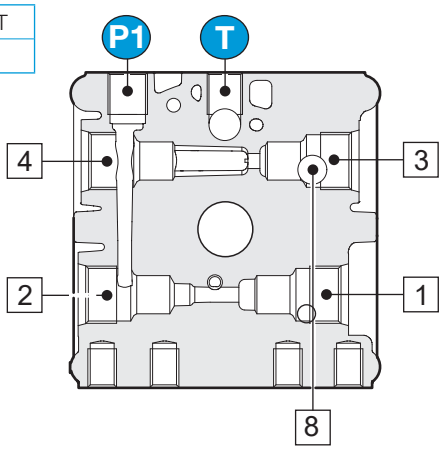
Flow control valves

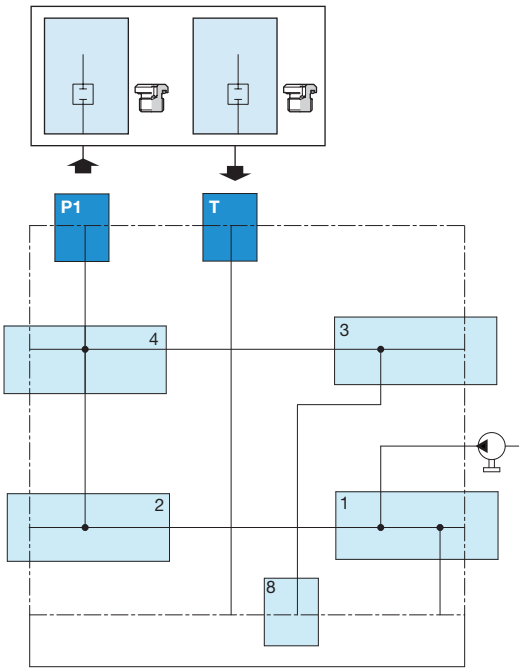
8 * Flow control valves for return cavities"8"

*	Nominal flow at 120 bar	Code	Symbol	Drawing
A	1.4 l/min	VSC040100		
B	2.3 l/min	VSC040200		
C	2.8 l/min	VSC040300		
E	4.3 l/min	VSC040400		
G	5.2 l/min	VSC040600		
J	6.5 l/min	VSC040800		
L	8.0 l/min	VSC041100		

FRA*	** (...)	2 .. **	3 .. ***	4 .. **	8*	-**	-

Combinations plugs on ports P1 - T
End section II





-** Combinations plugs on ports P1-T

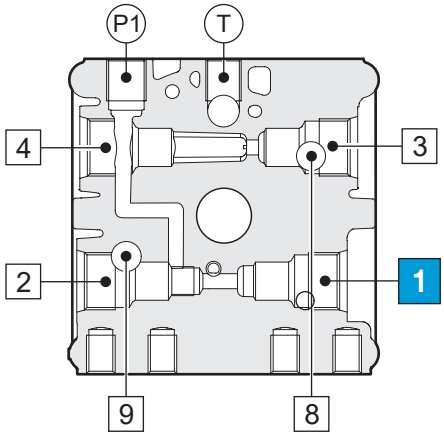
-**	P1	T
-00	↑	↑
-02	⊗	↑
-03	↑	⊗
-06	⊗	⊗

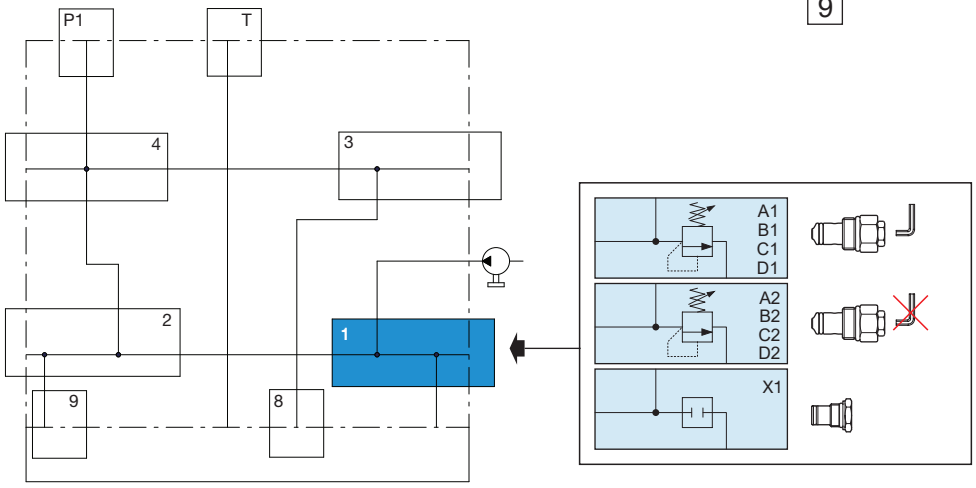
Combination -00 to use with the standard blocks (page 58)

Symbols Description

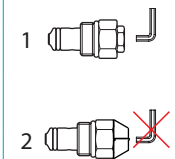
Type	Description	Thread	Code	Symbol	Drawing
⊗	Port closed with plug	G 1/4"	20024000		
↑	Port open		–	–	–

FRC*	Pressure relief valve - Plug
*	Setting type (or plug features)
*	Special setting pressure relief valve (omit if not required)
(...)	





1 * * (...) Pressure relief valve

*	*	Pressure (bar)	STD setting (bar)	(...) Special setting (bar)	Setting type	Code	Symbol	Drawing
A	1	15 ÷ 50	30	15 ÷ 30 (5 to 5)	Adjustable setting (1)	10461121		
	2				Not-adjustable setting	10461121 + 9043928 (Qty 2)		
B	1	40 ÷ 110	50	40 ÷ 110 (5 to 5)	Adjustable setting (1)	10461125		
	2				Not-adjustable setting	10461125 + 9043928 (Qty 2)		
C	1	80 ÷ 220	150	80 ÷ 220 (5 to 5)	Adjustable setting (1)	10461127		
	2				Not-adjustable setting	10461127 + 9043928 (Qty 2)		
D	1	150 ÷ 350	180	150 ÷ 290 (10 to 10)	Adjustable setting (1)	10461128		
	2				Not-adjustable setting	10461128 + 9043928 (Qty 2)		

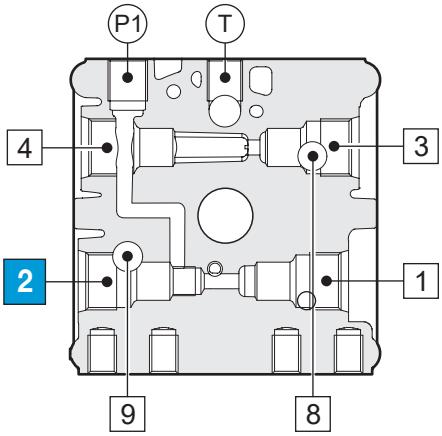
* * Plug

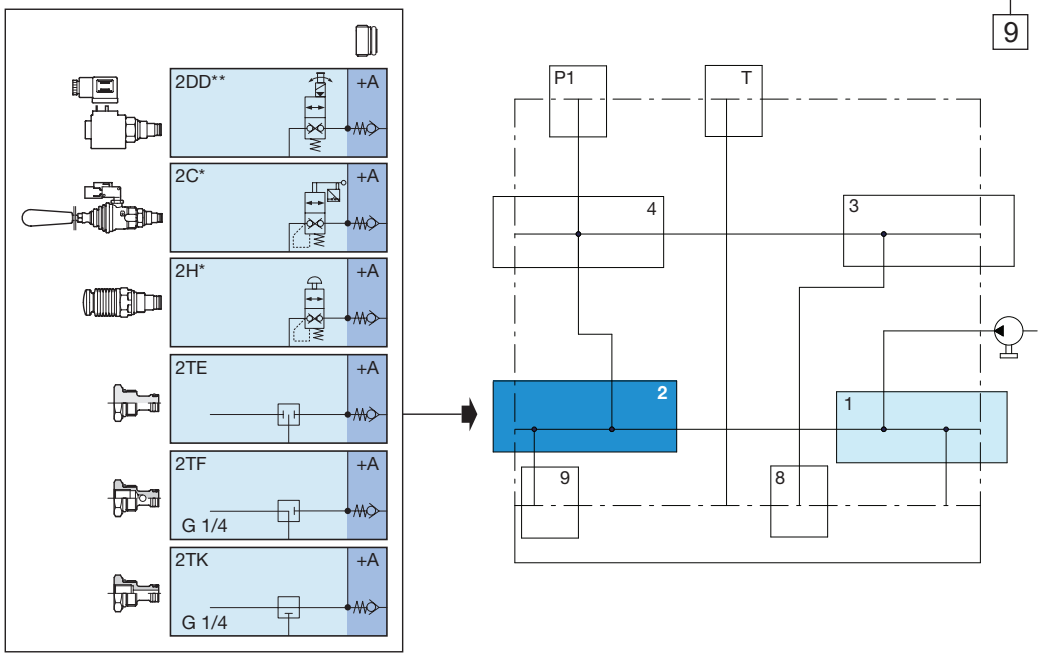
*	*	Description	Code	Symbol	Drawing
X	1	Plug	V70100005		

1 = Not-removable protection supplied separately, see accessories page 62

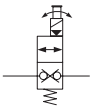
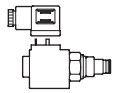
Cavity	
Type	
Features	
Check valve (omit if not required)	

FRC* | ** (...) | 2 | .. | ** | +*

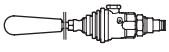
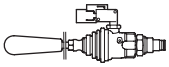




2 DD ** +* Direct operated solenoid valve normally closed, with button emergency (1)

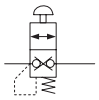
**	Description	Code (valve + connector)	Symbol	Drawing
AA	Voltage 12 Vdc	CRD0418NCAEL002 + V86050002		
AB	Voltage 24 Vdc	CRD0418NCAEM002 + V86050002		

2 C * +* Lever operated valve

*	Description	Code	Symbol	Drawing
A	Without microswitch	CMF04L0001		
B	With microswitch	CMF04M0001		

1 = Valves supplied with connector. Without connector see accessories page 62

2 H * Button operated valves

**	Description	Code	Symbol	Drawing
A	Push-button control	CPE04P000.1		

2 T * Plugs and fittings

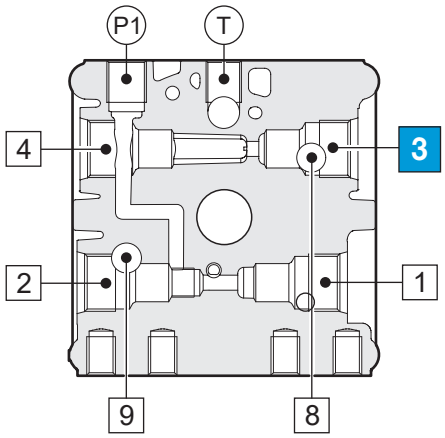
*	Description	Code	Symbol	Drawing
E	Long plug 3/4 16 UNF	20003800		
F	Fitting 3/4 16 UNF - G1/4	20009400		
K	Fitting 3/4 16 UNF DIN - G1/4	20018000		

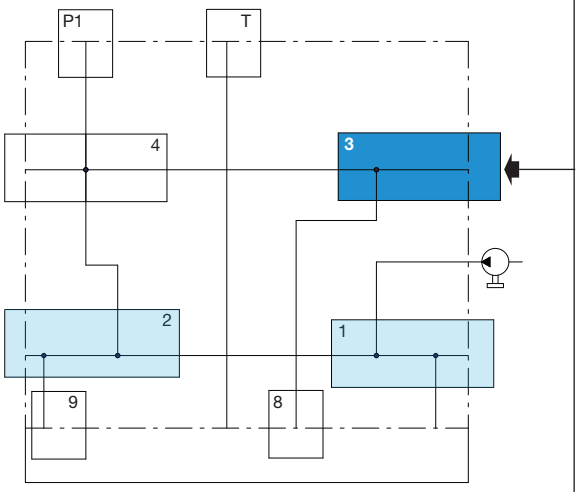
2 .. ** +* Check valve

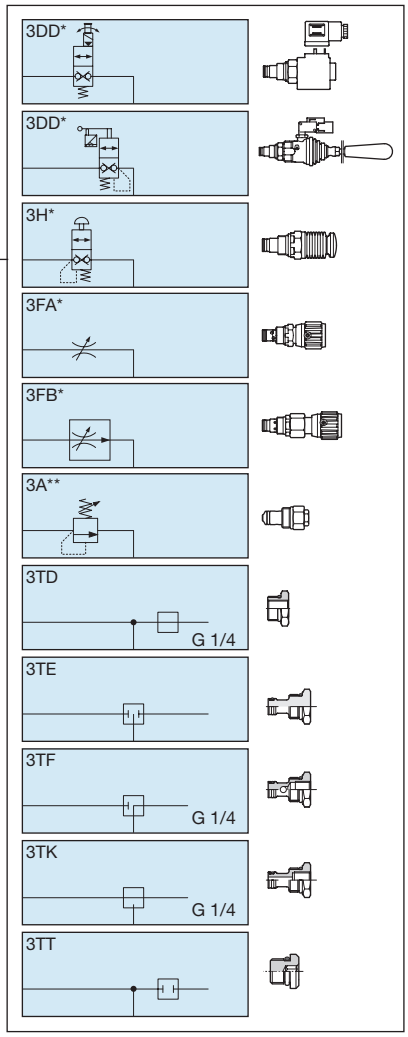
*	Max flow	Code	Symbol	Drawing
+A	10 l/min	9038896		

FRC*	** (...)	2 .. **	+*	3	..	**

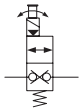
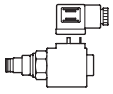
Cavity
Type
Features





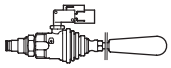


3 DD ** Piloted solenoid valves normally closed, with emergency (1)

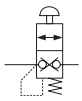
**	Description	Code (valve + connector)	Symbol	Drawing
AA	Voltage 12 Vdc	CRD0418NCAEL002 + V86050002		
AB	Voltage 24 Vdc	CRD0418NCAEM002 + V86050002		

1 = Valves supplied with connector. Without connector see accessories page 62

3 C * Lever operated valve

*	Description	Code	Symbol	Drawing
A	Without microswitch	CMF04L0001		
B	With microswitch	CMF04M0001		

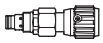
3 H * Button operated valves

*	Description	Code	Symbol	Drawing
A	Push-button control	CPE04P000.1		

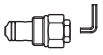
3 FA * Bidirectional flow control valves not compensated

*	Description	Code	Symbol	Drawing
A	Screw adjustment	CSB04C0000		
B	Plastic knob adjustment	CSB04V0000		

3 FB * Unidirectional flow control valves compensated

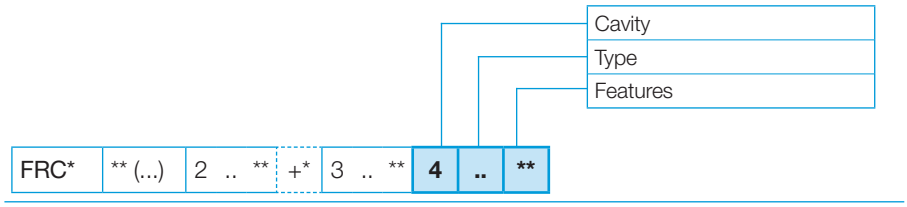
*	Description	Code	Symbol	Drawing
A	Screw adjustment	CSC04C0000		
B	Plastic knob adjustment	CSC04V0000		

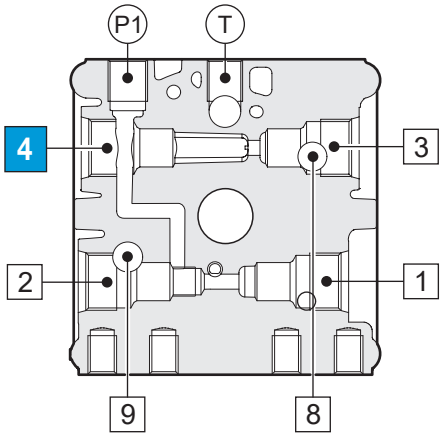
3 A ** (...) Pressure relief valves

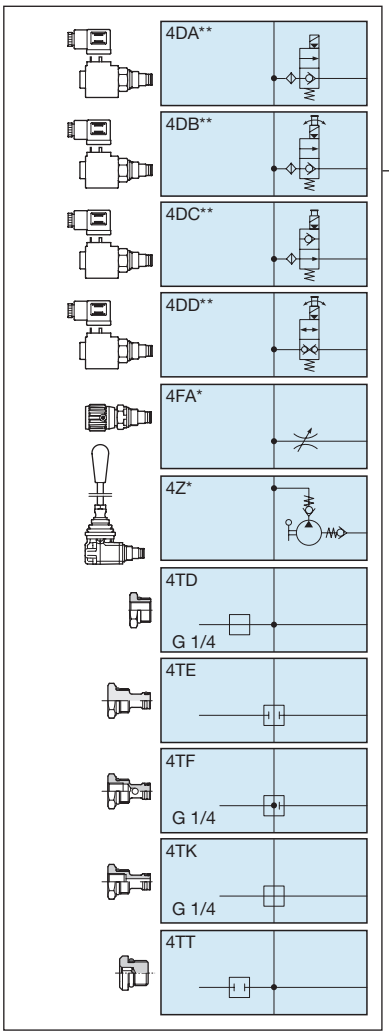
**	Description	STD setting (bar)	Setting (bar)	Code	Symbol	Drawing
AA	Adjustable setting	30	Min 15 - Max 30	10461121		
AB		50	Min 40 - Max 110	10461125		
AC		150	Min 80 - Max 220	10461127		
AD		180	Min 150 - Max 290	10461128		

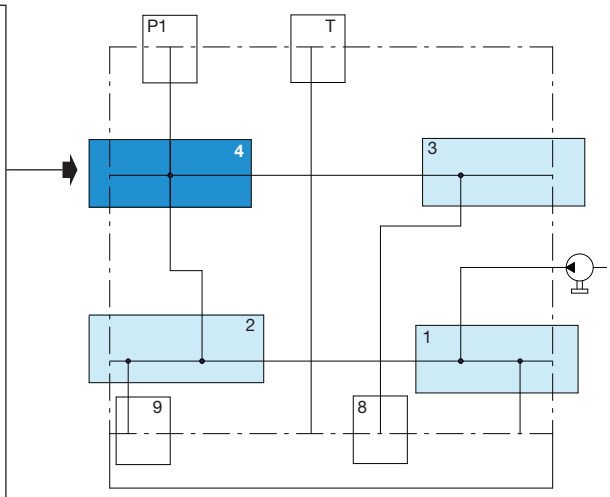
3 T * Plugs and fittings

*	Description	Code	Symbol	Drawing
D	Fitting 3/4 16 UNF - G1/4	20001700		
E	Long plug 3/4 16 UNF	20003800		
F	Fitting 3/4 16 UNF - G1/4	20009400		
K	Fitting 3/4 16 UNF DIN - G1/4	20018000		
T	Plug 3/4 16 UNF	10563394		


Cavity
Type
Features
FRC*
** (...)
2 .. **
+*
3 .. **
4
..
**

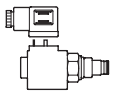

P1
T
4
3
2
1
9
8


4DA**
4DB**
4DC**
4DD**
4FA*
4Z*
4TD
G 1/4
4TE
4TF
G 1/4
4TK
G 1/4
4TT

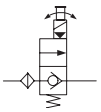
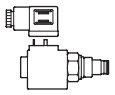

P1
T
4
3
2
1
9
8

II FRC

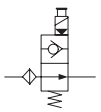
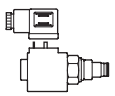
4 DA ** Piloted solenoid valves normally closed, without emergency (1)

**	Description	Code (valve + connector)	Symbol	Drawing
AA	Voltage 12 Vdc	CRP0418NCASL004 + V86050002		
AB	Voltage 24 Vdc	CRP0418NCASM004 + V86050002		
AC	Voltage 24 Vac 50 Hz	CRP0418NCASA004 + V86050002		
AD	Voltage 115 Vac 50 Hz	CRP0418NCASJ004 + V86050002		
AE	Voltage 230 Vac 50 Hz	CRP0418NCASI004 + V86050002		

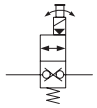
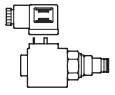
4 DB ** Piloted solenoid valves normally open, with rotary emergency (1)

**	Description	Code (valve + connector)	Symbol	Drawing
AA	Voltage 12 Vdc	CRP0418NCAEL004 + V86050002		
AB	Voltage 24 Vdc	CRP0418NCAEM004 + V86050002		
AC	Voltage 24 Vac 50 Hz	CRP0418NCAEA004 + V86050002		
AD	Voltage 115 Vac 50 Hz	CRP0418NCAEJ004 + V86050002		
AE	Voltage 230 Vac 50 Hz	CRP0418NCAEI004 + V86050002		

4 DC ** Piloted solenoid valves normally open, with button emergency (1)

**	Description	Code (valve + connector)	Symbol	Drawing
AA	Voltage 12 Vdc	CRP0418NAAEL003 + V86050002		
AB	Voltage 24 Vdc	CRP0418NAAEM003 + V86050002		
AC	Voltage 24 Vac 50/60 Hz (RAC with rectifier)	CRP0418NAAE2003 + V86200002		
AD	Voltage 115 Vac 50 - 120 Vac 60 Hz (RAC with rectifier)	CRP0418NAAEZ003 + V86200002		
AE	Voltage 230 Vac 50 - 240 Vac 60 Hz (RAC with rectifier)	CRP0418NAAEX003 + V86200002		
AF	Voltage 48 Vdc	CRP0418NAAEN003 + V86050002		

4 DD ** Direct operated solenoid valve normally closed, with button emergency (1)

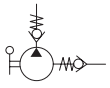
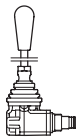
**	Description	Code (valve + connector)	Symbol	Drawing
AA	Voltage 12 Vdc	CRD0418NCAEL002 + V86050002		
AB	Voltage 24 Vdc	CRD0418NCAEM002 + V86050002		

1 = Valves supplied with connector. Without connector see accessories page 62

4 FA * Bidirectional flow control valves not compensated

*	Description	Code	Symbol	Drawing
A	Screw adjustment	CSB04C0000		
B	Plastic knob adjustment	CSB04V0000		

4 Z * Hand pumps

*	Description	Code	Symbol	Drawing
A	Displacement 1 cc	CPM0410001		
B	Displacement 2 cc	CPM0420001		

4 T * Plugs and fittings

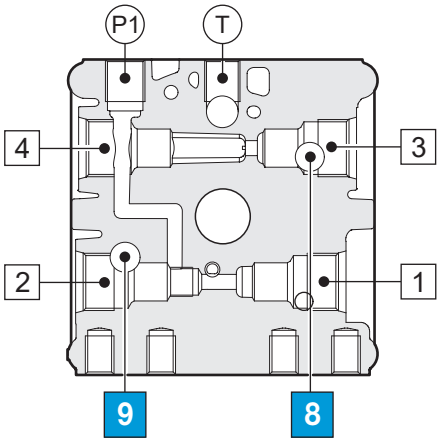
*	Description	Code	Symbol	Drawing
D	Fitting 3/4 16 UNF - G1/4	20001700		
E	Long plug 3/4 16 UNF	20003800		
F	Fitting 3/4 16 UNF - G1/4	20009400		
K	Fitting 3/4 16 UNF DIN - G1/4	20018000		
T	Plug 3/4 16 UNF	10563394		

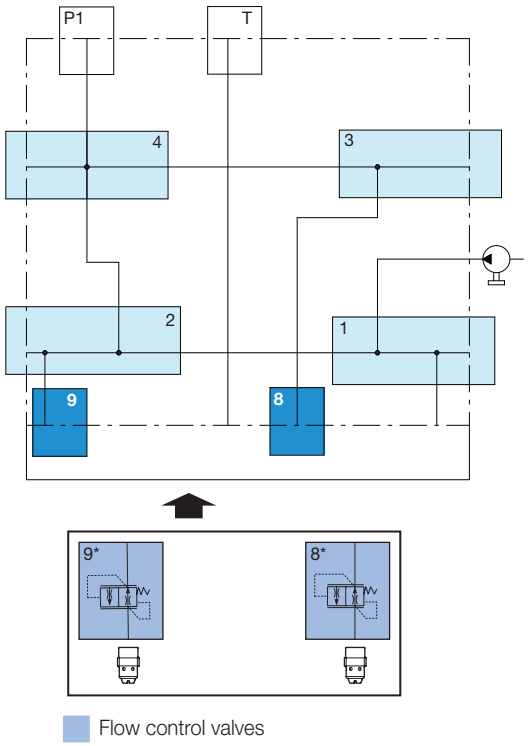
Sect. II - FRC Cavity 8-9

Flow control valves, omit if not required

Return cavities

FRC*	** (...)	2 .. **	+*	3 .. ***	4 .. **	8*	9*	-

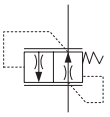


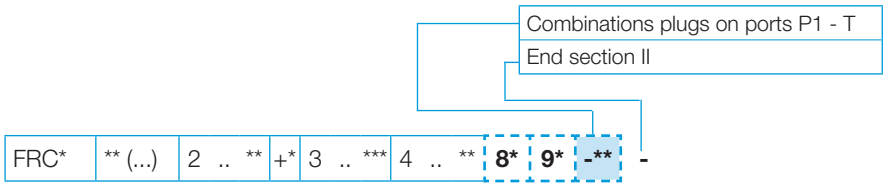


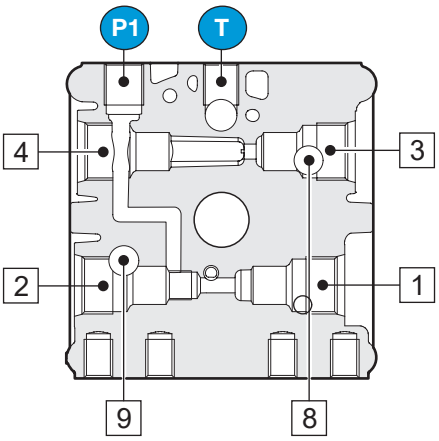
Flow control valves

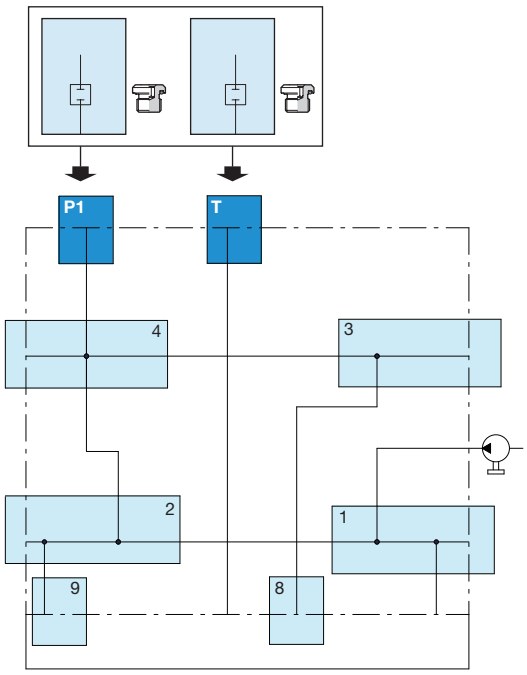
8 * 9

Flow control valves for return cavities"8-9"

*	Nominal flow at 120 bar	Code	Symbol	Drawing
A	1.4 l/min	VSC040100		
B	2.3 l/min	VSC040200		
C	2.8 l/min	VSC040300		
E	4.3 l/min	VSC040400		
G	5.2 l/min	VSC040600		
J	6.5 l/min	VSC040800		
L	8.0 l/min	VSC041100		







II FRC

-** Combinations plugs on ports P1-T

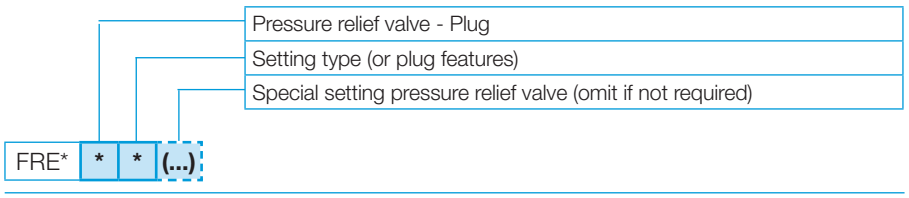
-**	P1	T
-00	↑	↑
-02	⊗	↑
-03	↑	⊗
-06	⊗	⊗

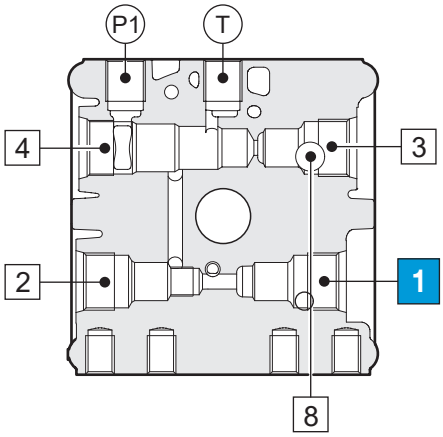
Combination -00 to use with the standard blocks (page 16)

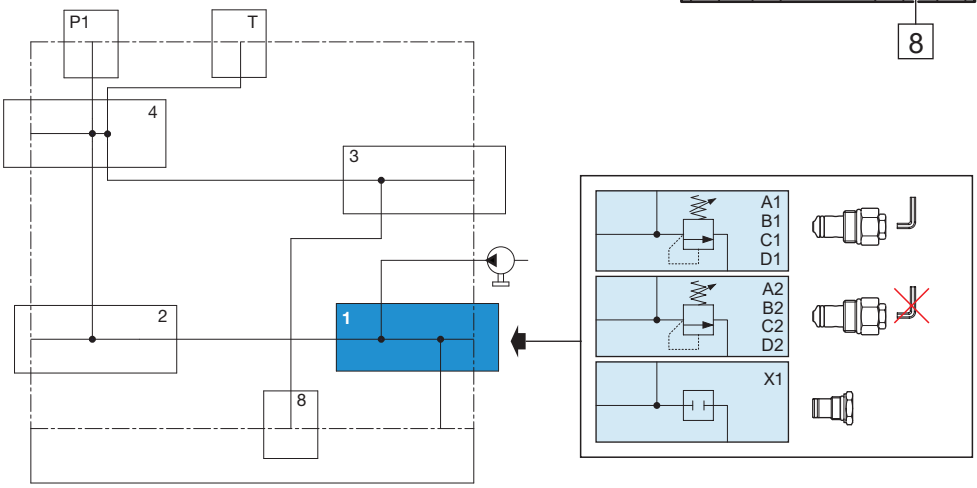
Symbols Description

Type	Description	Thread	Code	Symbol	Drawing
⊗	Port closed with plug	G 1/4"	20024000		
↑	Port open		–	–	–

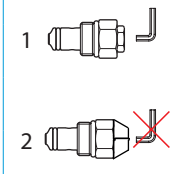
Sect. II - FRE Cavity 1







1 * * (...) Pressure relief valve

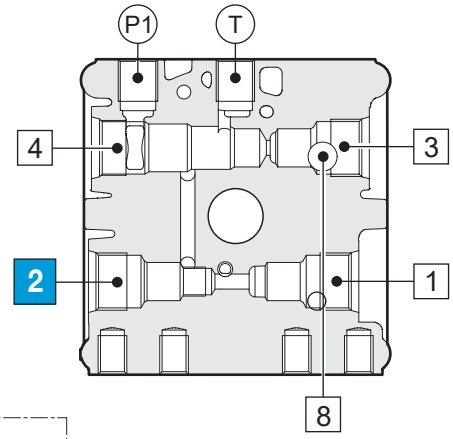
*	*	Pressure (bar)	STD setting (bar)	(...) Special setting (bar)	Setting type	Code	Symbol	Drawing
A	1	15 ÷ 50	30	15 ÷ 30 (5 to 5)	Adjustable setting (1)	10461121		
	2				Not-adjustable setting	10461121 + 9043928 (Qty 2)		
B	1	40 ÷ 110	50	40 ÷ 110 (5 to 5)	Adjustable setting (1)	10461125		
	2				Not-adjustable setting	10461125 + 9043928 (Qty 2)		
C	1	80 ÷ 220	150	80 ÷ 220 (5 to 5)	Adjustable setting (1)	10461127		
	2				Not-adjustable setting	10461127 + 9043928 (Qty 2)		
D	1	150 ÷ 350	180	150 ÷ 290 (10 to 10)	Adjustable setting (1)	10461128		
	2				Not-adjustable setting	10461128 + 9043928 (Qty 2)		

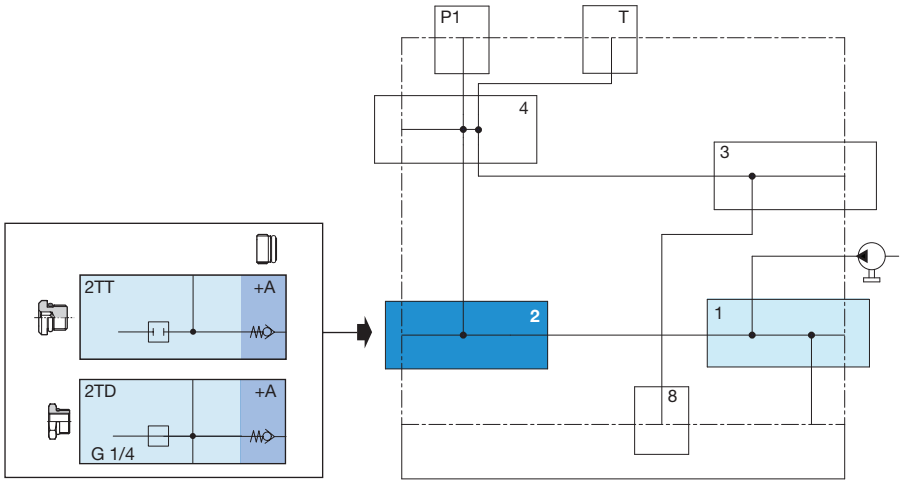
* * Plug

*	*	Description	Code	Symbol	Drawing
X	1	Plug	V70100005		

1 = Not-removable protection supplied separately, see accessories page 62

		Cavity			
		Type			
		Features			
		Check valve (omit if not required)			
FRE*	** (...)	2	..	**	+*





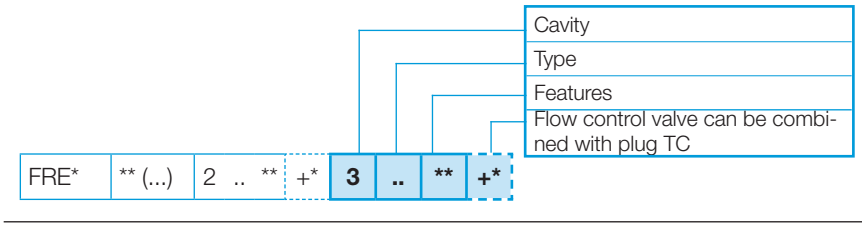
II FRE

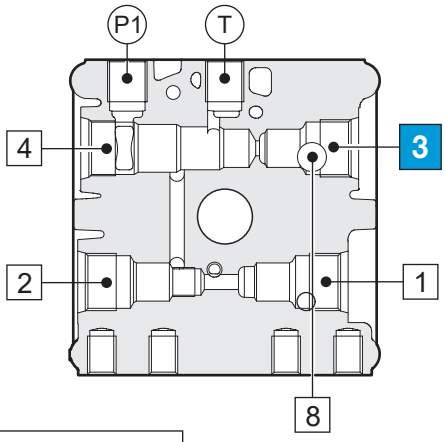
2 T * Plug

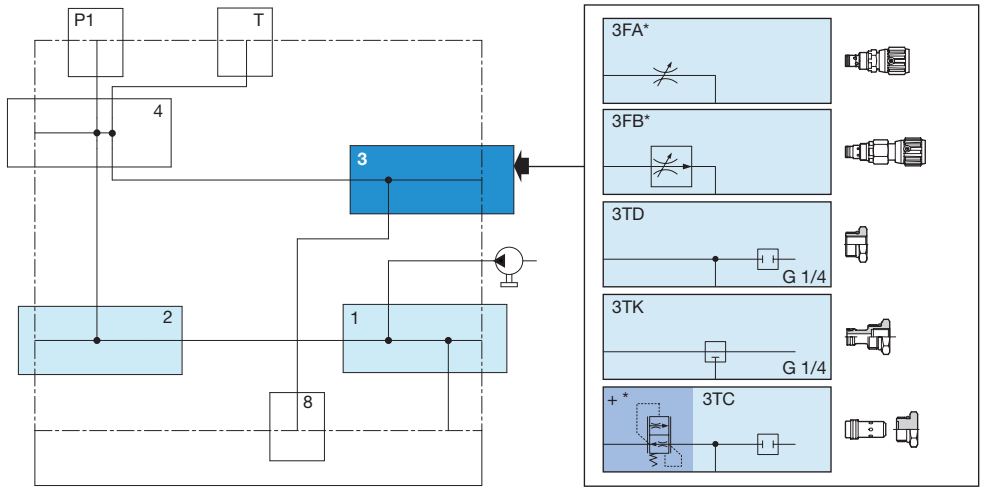
*	Description	Code	Symbol	Drawing
T	Plug 3/4 16 UNF	10563394		
D	Fitting 3/4 16 UNF - G1/4	20001700		

2 .. ** +* Check valve

*	Max flow	Code	Symbol	Drawing
+A	10 l/min	9038896		







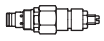
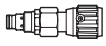
Optional flow control valve.

II FRE

3 FA * Bidirectional flow control valves not compensated

*	Description	Code (valve + connector)	Symbol	Drawing
A	Screw adjustment	CSB04C0000		
B	Plastic knob adjustment	CSB04V0000		

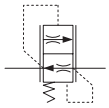
3 FB * Unidirectional flow control valves compensated

*	Description	Code (valve + connector)	Symbol	Drawing
A	Screw adjustment	CSC04C0000		
B	Plastic knob adjustment	CSC04V0000		

3 T * +* Plugs and fittings

**	Description	Code	Symbol	Drawing
D	Fitting 3/4 16 UNF - G1/4	20001700		
K	Fitting 3/4 16 UNF DIN - G1/4	20018000		
C	Plug 3/4 16 UNF [1]	R78150099		

3 T C +* Flow control valves [1]

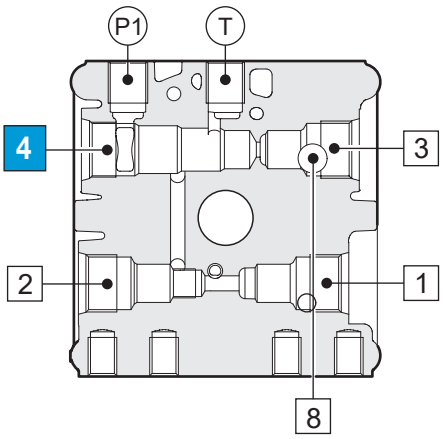
*	Flow	Code	Symbol	Drawing
+B	1.4 l/min	VSC040101		
+C	2.3 l/min	VSC040201		
+E	2.8 l/min	VSC040301		
+G	4.3 l/min	VSC040401		
+J	5.2 l/min	VSC040601		
+L	6.5 l/min	VSC040801		
+N	8.0 l/min	VSC041101		

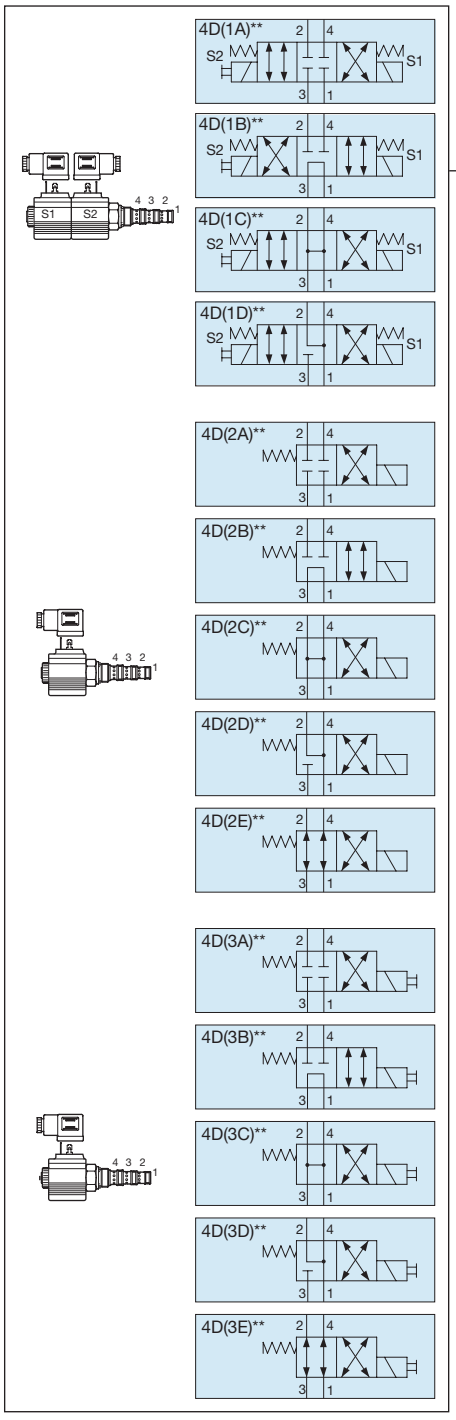
[1] The flow control valves can be installed with the plug TC.

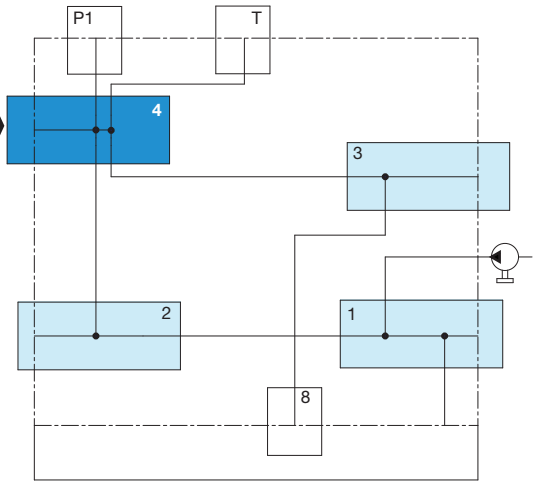
Sect. II - FRE Cavity 4

FRE*	** (...)	2 .. **	+*	3 .. **	+*	4	D(**)	**

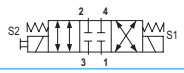
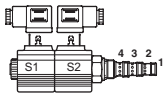
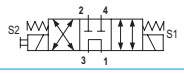
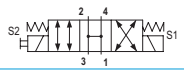
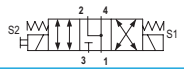
Cavity
Type
Features



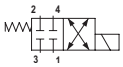
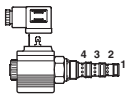
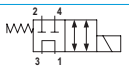
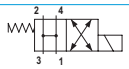
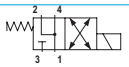
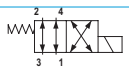




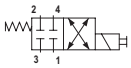
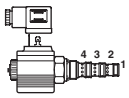
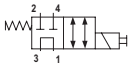
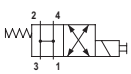
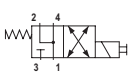
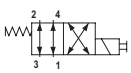
4 D(**) ** Solenoid valves 4 way 3 positions with emergency (1)

(**) **	Description	Code (valve + connectors)	Symbol	Drawing
(1A)AA	Voltage 12 Vdc (closed centre “C” spool)	C4V0422C3FEL001 + V86050002 (x2)		
(1A)AB	Voltage 24 Vdc (closed centre “C” spool)	C4V0422C3FEM001 + V86050002 (x2)		
(1B)AA	Voltage 12 Vdc (open centre “A” spool)	C4V0422A3FEL001 + V86050002 (x2)		
(1B)AB	Voltage 24 Vdc (open centre “A” spool)	C4V0422A3FEM001 + V86050002 (x2)		
(1C)AA	Voltage 12 Vdc (centre “H” spool)	C4V0422H3FEL001 + V86050002 (x2)		
(1C)AB	Voltage 24 Vdc (centre “H” spool)	C4V0422H3FEM001 + V86050002 (x2)		
(1D)AA	Voltage 12 Vdc (centre “Y” spool)	C4V0422Y3FEL001 + V86050002 (x2)		
(1D)AB	Voltage 24 Vdc (centre “Y” spool)	C4V0422Y3FEM001 + V86050002 (x2)		

4 D(**) ** Solenoid valves 4 way 2 positions without emergency (1)

(**) **	Description	Code (valve + connectors)	Symbol	Drawing
(2A)AA	Voltage 12 Vdc (closed centre “C” spool)	C4V0422C2FSL001 + V86050002		
(2A)AB	Voltage 24 Vdc (closed centre “C” spool)	C4V0422C2FSM001 + V86050002		
(2B)AA	Voltage 12 Vdc (open centre “A” spool)	C4V0422A2FSL001 + V86050002		
(2B)AB	Voltage 24 Vdc (open centre “A” spool)	C4V0422A2FSM001 + V86050002		
(2C)AA	Voltage 12 Vdc (centre “H” spool)	C4V0422H2FSL001 + V86050002		
(2C)AB	Voltage 24 Vdc (centre “H” spool)	C4V0422H2FSM001 + V86050002		
(2D)AA	Voltage 12 Vdc (centre “Y” spool)	C4V0422Y2FSL001 + V86050002		
(2D)AB	Voltage 24 Vdc (centre “Y” spool)	C4V0422Y2FSM001 + V86050002		
(2E)AA	Voltage 12 Vdc (direct “D” spool)	C4V0422D2FSL001 + V86050002		
(2E)AB	Voltage 24 Vdc (direct “D” spool)	C4V0422D2FSM001 + V86050002		

4 D(**) ** Solenoid valves 4 way 2 positions with emergency (1)

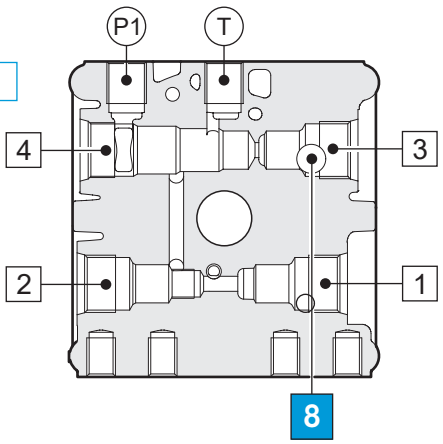
(**) **	Description	Code (valve + connectors)	Symbol	Drawing
(3A)AA	Voltage 12 Vdc (closed centre “C” spool)	C4V0422C2FEL001 + V86050002		
(3A)AB	Voltage 24 Vdc (closed centre “C” spool)	C4V0422C2FEM001 + V86050002		
(3B)AA	Voltage 12 Vdc (open centre “A” spool)	C4V0422A2FEL001 + V86050002		
(3B)AB	Voltage 24 Vdc (open centre “A” spool)	C4V0422A2FEM001 + V86050002		
(3C)AA	Voltage 12 Vdc (centre “H” spool)	C4V0422H2FEL001 + V86050002		
(3C)AB	Voltage 24 Vdc (centre “H” spool)	C4V0422H2FEM001 + V86050002		
(3D)AA	Voltage 12 Vdc (centre “Y” spool)	C4V0422Y2FEL001 + V86050002		
(3D)AB	Voltage 24 Vdc (centre “Y” spool)	C4V0422Y2FEM001 + V86050002		
(3E)AA	Voltage 12 Vdc (direct “D” spool)	C4V0422D2FEL001 + V86050002		
(3E)AB	Voltage 24 Vdc (direct “D” spool)	C4V0422D2FEM001 + V86050002		

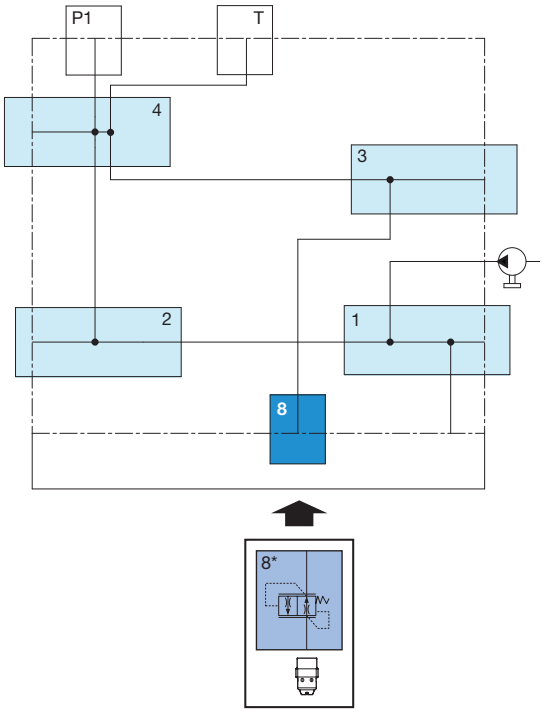
1 = Valves supplied with connector. Without connector see accessories page 16

Flow control valve, omit if not required

Return cavitiy

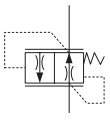
FRE*	** (...)	2 .. **	+*	3 .. ***	+*	4 D(**).. **	8*





Flow control valve

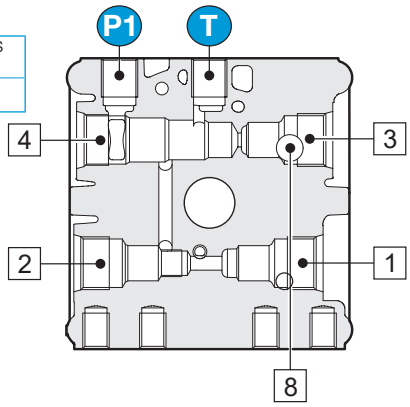
8 * Flow control valve for return cavity"8"

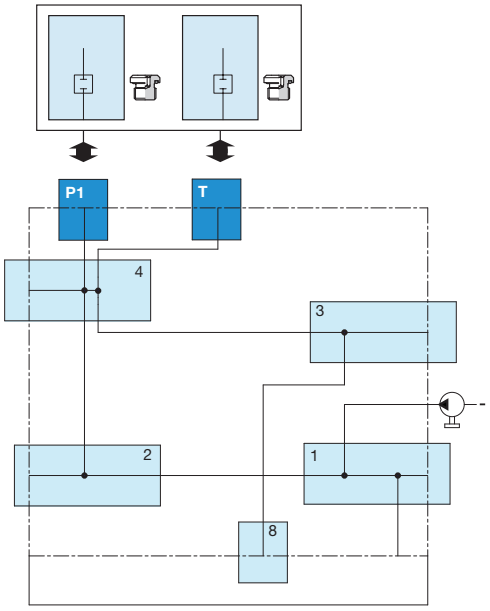
*	Nominal flow at 120 bar	Code	Symbol	Drawing
A	1.4 l/min	VSC040100		
B	2.3 l/min	VSC040200		
C	2.8 l/min	VSC040300		
E	4.3 l/min	VSC040400		
G	5.2 l/min	VSC040600		
J	6.5 l/min	VSC040800		
L	8.0 l/min	VSC041100		

FRE*	** (...)	2 .. **	+*	3 .. ***	+*	4 D(**).. **	8*	-**

Combinations plugs on ports P1 - T

End section II





-** Combinations plugs on ports P1-T

-**	P1	T
-00	↑↓	↑↓
-02	⊗	↑↓
-03	↑↓	⊗

Symbols Description

Type	Description	Thread	Code	Symbol	Drawing
⊗	Port closed with plug	G 1/4"	20024000		
↑↓	Port open		–	–	–

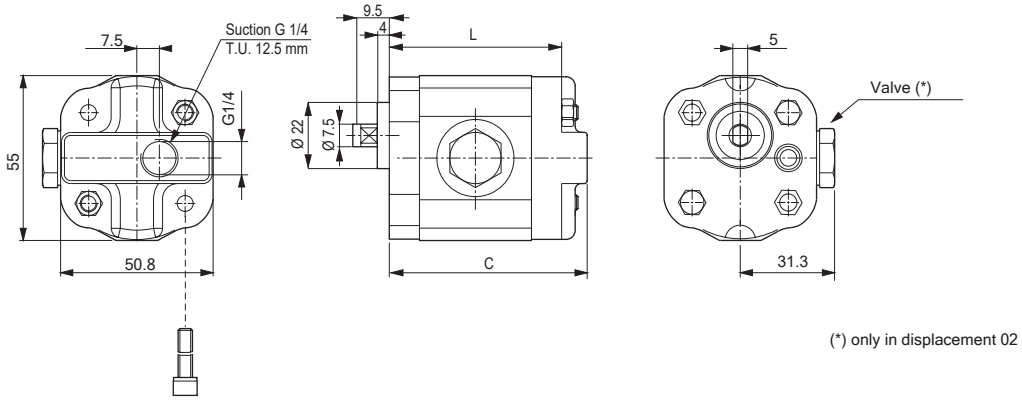
Combination -00 to use with the standard blocks (page 58)

	Pump
	Pump group
	Performance level
	Size
	End section III

FR.....	P	*	(*)	**	-

P	0	(1)	**	-

Pumps group 05



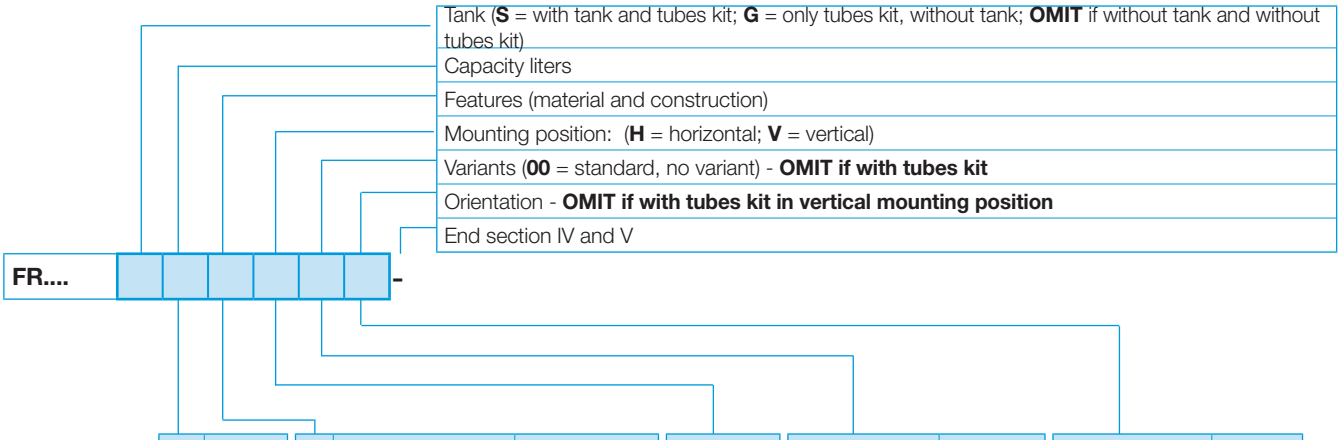
(*) only in displacement 02

Tightening torque 6.5 ÷ 7.5 Nm

Code	Nominal displacement (cc/rev)	C (mm)	L (mm)	Pump Kit code	Max working pressure (bar)	Peak pressure (bar)	Max speed (rpm)
02	0,30	54	45,5	17050019.035	230	270	7000
04	0,50	55,7	47,2	17050021.035	230	270	7000
05	0,62	56,7	48,2	17050022.035	230	270	6500
07	0,84	58,5	50	17050023.035	230	270	6500
09	1,00	59,8	51,3	17050024.035	230	270	6000
12	1,25	61,9	53,4	17050025.035	230	270	6000

P2 = Intermittent operating pressure
P3 = Intermittent peak pressure (20 sec. max)

III

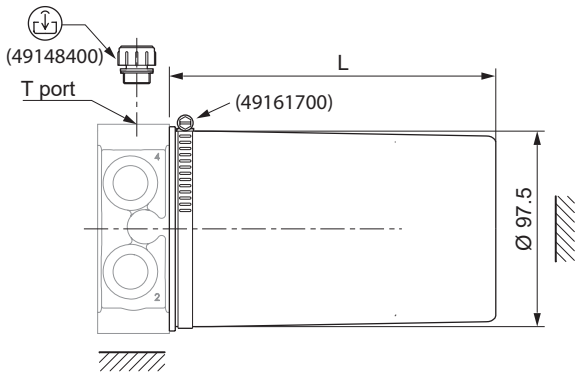


**	Liters	*	Dimensions (mm)	Material	(*) Mounting	** Variants	Page	* Orientation	Page
A5	0.5	**K**	Ø 97.5- L 112.5	Nylon	**(V)**	**00**	42	**/1**	
A7	0.7	**P**	Ø 98.3- L 143	Polyethylene	**(H)** **(V)**	**00**	42	**/1**(std) **/2** **/3** **/4**	
01	1.0	**K**	Ø 97.5- L 172	Nylon	**(H)** **(V)**	**00**	42	**/1**	
01	1.0	**Q**	⍁ 130 - L 155	Polyethylene	**(H)** **(V)**	**00**	42		
02	2.0	**Q**	⍁ 130 - L 223	Polyethylene	**(H)** **(V)**	**00**	42		
01	1.0	**H**	Ø 100 - L 165	Nylon reinforced	**(H)** **(V)**	**00**	43		
01	1.0	**A**	Ø 123 - L 141	Sheet steel	**(H)** **(V)**	**00**	44		46
02	2.0	**A**	Ø 123 - L 200	Sheet steel	**(H)** **(V)**	**00**	44	**/1**(std) **/2** **/3** **/4**	
02	3.0	**A**	Ø 123 - L 330	Sheet steel	**(H)** **(V)**	**00**	44		
05	5.0	**B**	Ø 175 - L 246	Sheet steel	**(H)** **(V)**	**00**	45		
06	6.0	**B**	Ø 175 - L 308	Sheet steel	**(H)** **(V)**	**00**	45		
08	8.0	**B**	Ø 175 - L 370	Sheet steel	**(H)** **(V)**	**00**	45		

* | ** | * | (*) | ** | * - Nylon tank - Visual oil level - Horizontal/Vertical mounting

Capacity	Features	Mounting	Variant (1)	L (mm)	Capacity (liters) Nominal	Full	Usable	Tank (with clamp)
A5	K	(V)	00	112.5	0.5	0.5	0.4	90310177
01	K	(H) (V)	00	172	1	1	0.8	90310104

Operating temperature -10°C ÷ +60°C
Plug on T port: supplied as accessory see page 62

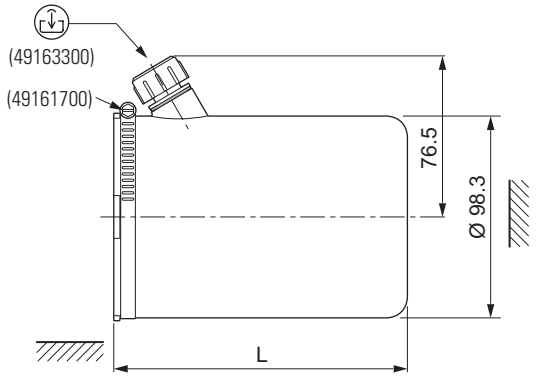


(..) spare parts

* | ** | * | (*) | ** | * - Polyethylene tank - Visual oil level - Horizontal/Vertical mounting

Capacity	Features	Mounting	Variant (1)	L (mm)	Capacity (liters) Nominal	Full	Usable	Tank (with clamp and plug)
A7	P	(H) (V)	00	143	0.7	0.7	0.6	90310496

Operating temperature -10°C ÷ +60°C

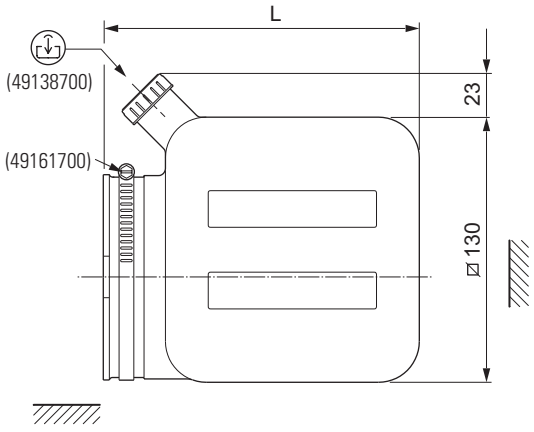


(..) spare parts

* | ** | * | (*) | ** | * - Polyethylene tank - Visual oil level - Horizontal mounting

Capacity	Features	Mounting	Variant (1)	L (mm)	Capacity (liters) Nominal	Full	Usable	Tank (with clamp and plug)
01	Q	(H) (V)	00	155	1	1	0.9	90310278
02	Q	(H) (V)	00	223	2	2	1.8	90310279

Operating temperature -10°C ÷ +60°C -



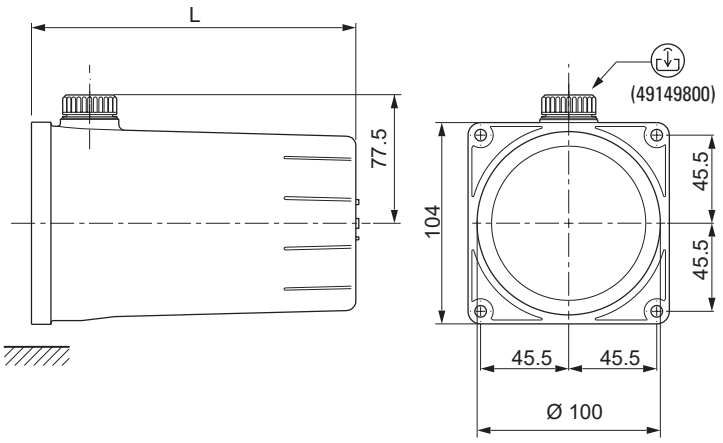
(..) spare parts

(1) Variant - OMIT if without tank but with tubes kit

* | ** | * | (H) | ** | * - Nylon tank reinforced with fiberglass - Visual oil level - Horizontal mounting

Capacity	Features	Mounting	Variant (1)	L (mm)	Capacity (liters) Nominal	Full	Usable	Tank (with screw, breather plug)
01	H	(H)	00	165	1	0.8	0.7	90310497

Operating temperature -10°C ÷ +60°C -

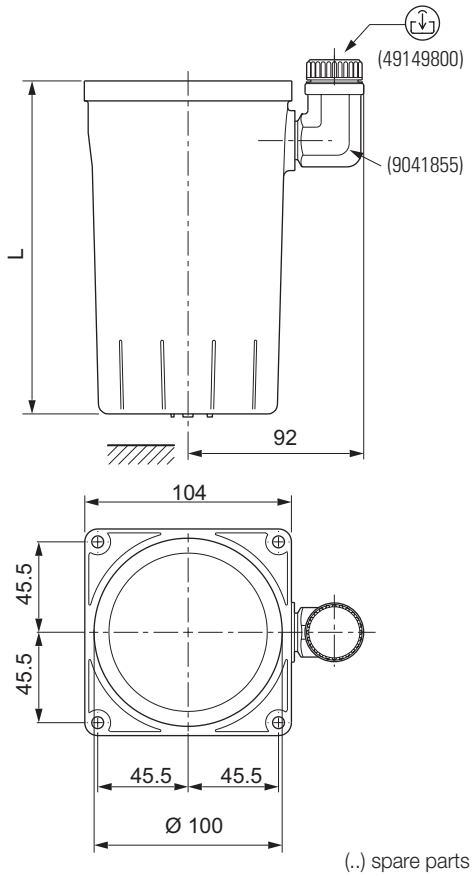


(..) spare parts

* | ** | * | (V) | ** | * - Nylon tank reinforced with fiberglass - Visual oil level - Vertical mounting

Capacity	Features	Mounting	Variant (1)	L (mm)	Capacity (liters) Nominal	Full	Usable	Tank (with screw, breather plug)
01	H	(V)	00	165	1	0.8	0.7	90310498

Operating temperature -10°C ÷ +60°C -



(..) spare parts

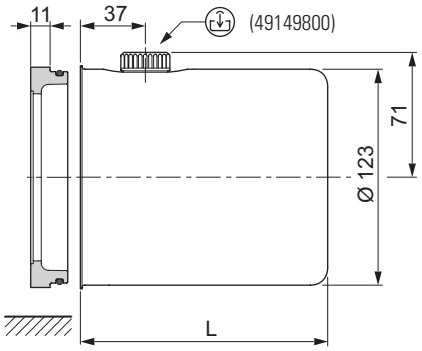
(1) Variant - OMIT if without tank but with tubes kit

Sect. IV - Tanks and Tubes kit

* | ** | * | (H) | ** | * - Steel tank - Horizontal mounting

Capacity	Features	Mounting	Variant (1)	L (mm)	Capacity (liters) Nominal	Full	Usable	Tank (with plug)	Tank fixing kit (flange, screws and O-Ring)
01	A	(H)	00	141	1	1	0.7	90310000	17010091
02	A	(H)	00	200	2	1.6	1.5	90310001	
03	A	(H)	00	330	3	3	2.8	90310002	

(1) Variant - OMIT if without tank but with tubes kit



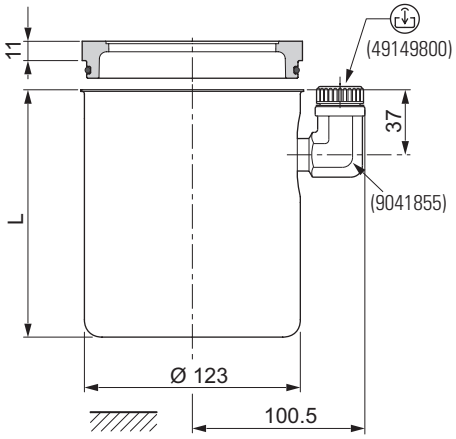
(..) spare parts

IV

* | ** | * | (V) | ** | * - Steel tank - Vertical mounting

Capacity	Features	Mounting	Variant (1)	L (mm)	Capacity (liters) Nominal	Full	Usable	Tank (with plug)	Tank fixing kit (flange, screws and O-Ring)
01	A	(V)	00	141	1	0.9	0.7	90310009	17010091
01	A	(V)	00	200	2	1.6	1.5	90310010	
03	A	(V)	00	330	3	2.9	2.8	90310011	

(1) Variant - OMIT if without tank but with tubes kit

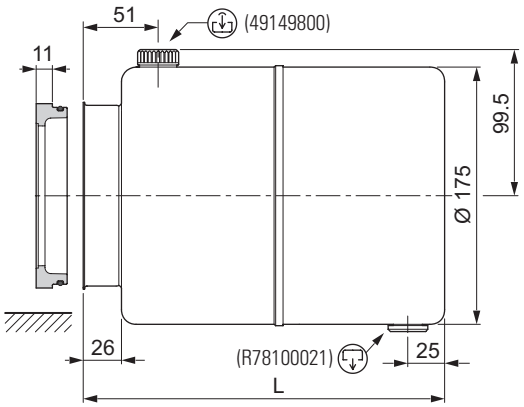


(..) spare parts

* | ** | * | (H) | ** | * - Steel tank - Horizontal mounting

Capacity	Features	Mounting	Variant (1)	L (mm)	Capacity (liters) Nominal	Full	Usable	Tank (with plugs)	Tank fixing kit (flange, screws and O-Ring)
05	B	(H)	00	246	5	4.7	4.5	90310003	17010092
06	B	(H)	00	308	6	6	5.9	90310004	
08	B	(H)	00	370	8	8	7.3	90310005	

(1) Variant - OMIT if without tank but with tubes kit



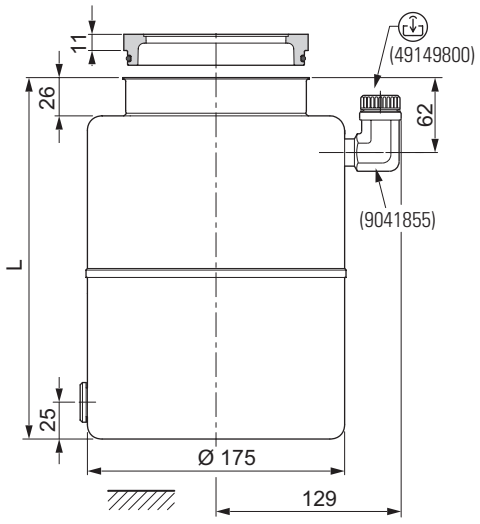
(..) spare parts

IV

* | ** | * | (V) | ** | * - Steel tank - Vertical mounting

Capacity	Features	Mounting	Variant (1)	L (mm)	Capacity (liters) Nominal	Full	Usable	Tank (with plugs)	Tank fixing kit (flange, screws and O-Ring)
05	B	(V)	00	246	5	4.3	4.1	90310012	17010092
06	B	(V)	00	308	6	5.8	5.5	90310013	
08	B	(V)	00	370	8	7.5	7.2	90310015	

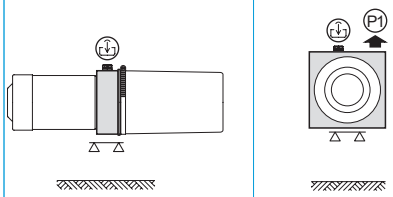
(1) Variant - OMIT if without tank but with tubes kit

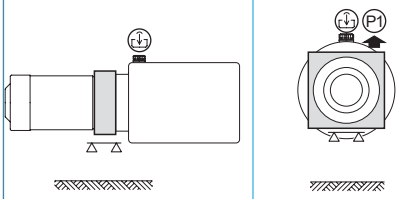


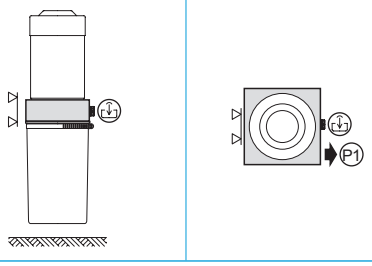
Sect. IV - Tanks and Tubes kit

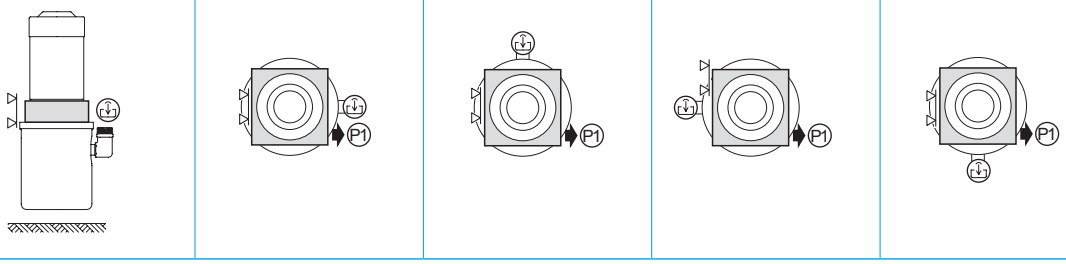
*	**	*	(*)	**	/*

- Tanks orientation according to the mounting position

For tanks			(*)	Mounting position	/* Orientation /1 (standard)			
S	01	K	(H)	Horizontal				

For tanks			(*)	Mounting position	/* Orientation /1 (standard)	/2	/3	/4
S	**	A B H K P Q	(H)	Horizontal				

For tanks			(*)	Mounting position	/* Orientation /1 (standard)			
S	A5 01	K	(V)	Vertical				

For tanks			(*)	Mounting position	/* Orientation /1 (standard)	/2	/3	/4
S	**	A B H K P Q	(H)	Vertical				

Motor
Voltage
Power / Size
Version
Accessories
Orientation
End section V

All motors are equipped with a transmission kit (coupling and components for the assembly)

FR	M	*	**	(*)	*	/*	-

*	Voltage
2	12 VDC
4	24 VDC

**	Power	Size
GA	350 W	Ø 80
GC	700 W	Ø 80
AA	1500 W	Ø 115
EN	1600 W	Ø 115
GB	400 W	Ø 80
GD	800 W	Ø 80
AB	2000 W	Ø 115
ES	2200 W	Ø 115

(*)	Version	Page
(1)	Std	48
(1)	Std	48
(1)	Std	49
(1)	Std	49
(1)	Std	48
(1)	Std	48
(1)	Std	49
(1)	Std	49

* Accessories
0 - B
0 - B
0 - B - C
0 - B - C - E
0 - B
0 - B
0 - B - C
0 - B - C - E

/* Orientation		Page
/1 /2 /3 /4	Std	51

*	Accessories description	Page
0	Without accessories	–
B	Starting switch	50
C	Thermal protection	50
E	Starting switch + thermal protection	50

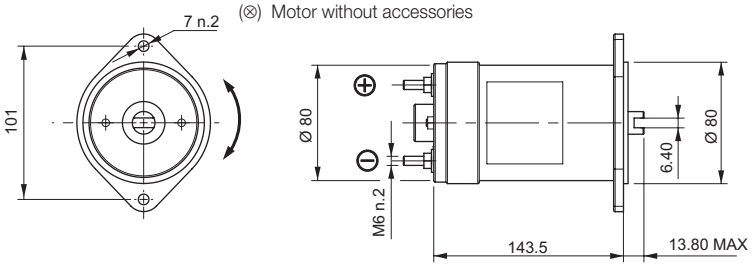
V DC

For more details, features and performances DC motors, see catalog Dana code DOC00053.

Motors: 12 VDC 350 W / 24 VDC 400 W (permanent magnets)

					Voltage	W	A	rpm	Nm	S2 min	S3%	IP	IC	Ø mm	Code (⊗)
M	2	GA	(1)	* /*	12 VDC	350	40	3300	1.0	10	35	54	F	80	25021400
M	4	GB	(1)	* /*	24 VDC	400	30	3100	1.2	5	20	54	F	80	25021500

IP protection level becomes effective after installationon on power pack.
(⊗) Motor without accessories



M * ** (*) * /* - Accessories (page 62)

*	Description
0	Without accessories
B	Starting switch 150A fixing with clamp

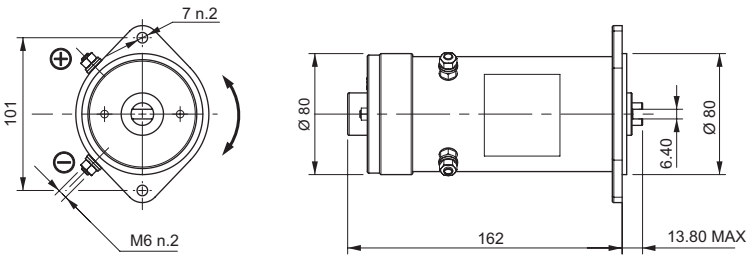
Code trasmission kit: page 56

V DC

Motors: 12 VDC 700 W / 24 VDC 800 W (permanent magnets)

					Voltage	W	A	rpm	Nm	S2 min	S3%	IP	IC	Ø mm	Code (⊗)
M	2	GC	(1)	* /*	12 VDC	700	90	3300	2.0	2.5	10	54	F	80	25021600
M	4	GD	(1)	* /*	24 VDC	800	70	3000	2.5	2	5	54	F	80	25021700

IP protection level becomes effective after installationon on power pack.
(⊗) Motor without accessories



M * ** (*) * /* - Accessories (page 62)

*	Description
0	Without accessories
B	Starting switch 150A

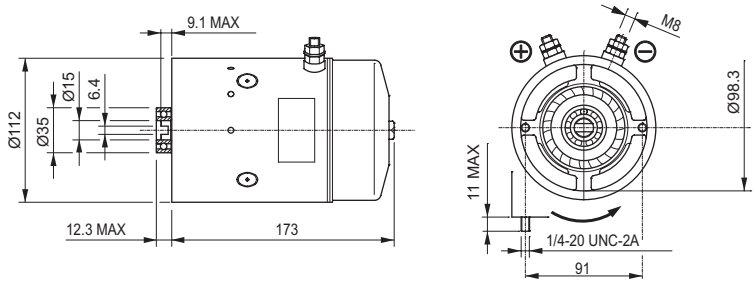
Code trasmission kit: page 56

For more details, features and performances DC motors, see catalog Dana code DOC00053.

Motors: 12 VDC 1500 W / 24 VDC 2000 W (wound field compound)

				Voltage	W	A	rpm	Nm	S2 min	S3%	IP	IC	Ø mm	Code (⊗)
M	2	AA	(1) * /*	12 VDC	1500	225	2500	5.5	1	5	54	F	115	25022200
M	4	AB	(1) * /*	24 VDC	2000	150	2250	8	2	5	54	F	115	25022300

IP protection level becomes effective after installationon on power pack.
(⊗) Motor without accessories



M * ** (*) * /* - Accessories (page 62)

*	Description
0	Without accessories
B	Starting switch 150A

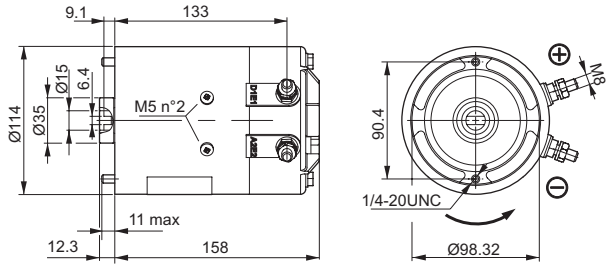
Acquires IP 10 protection level with “ventilation” accessory.

Code trasmission kit: page 56

Motors: 12 VDC 1600 W / 24 VDC 2200 W (wound field compound)

				Voltage	W	A	rpm	Nm	S2 min	S3%	IP	IC	Ø mm	Code (⊗)
M	2	EN	(1) * /*	12 VDC	1600	230	2600	5	2	10	54	F	115	25021100
M	4	ES	(1) * /*	24 VDC	2200	140	2700	8	1.2	5	54	F	115	25021200

IP protection level becomes effective after installationon on power pack.
(⊗) Motor without accessories



M * ** (*) * /* - Accessories (page 62)

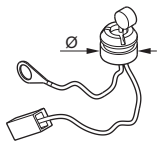
*	Description
0	Without accessories
B	Starting switch 150A
C	Thermal protection
E	Starting switch + thermal protection

Code trasmission kit: page 56

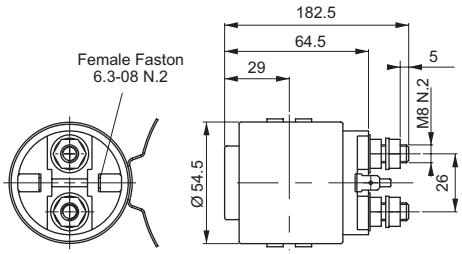
For more details, features and performances DC motors, see catalog Dana code DOC00053.

M | * | ** | (*) | **C** | /* | - **Accessory: Thermal protection**

Thermal protection		
Code	**Ø mm**	**For motors**
90340009	16	M2EN - M4ES



M | * | ** | (*) | **B** | /* | - **Accessory: Starting switch**



150A starting switch		
Code (•)	**VDC**	**For motors**
10525044	12	M2GA - M2GC
10455492	12	M2AA
KIT07012.024	12	M2EN
10525048	24	M4GB - M4GD
10455498	24	M4AB
KIT07012.019	24	M4ES

(•) Complete kit with all assembly components.

V DC

For more details, features and performances DC motors, see catalog Dana code DOC00053.

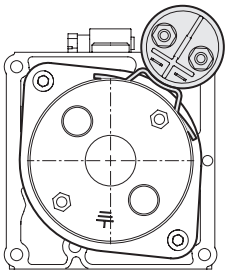
M	*	**	(*)	*	/*	-

Starting switch orientation

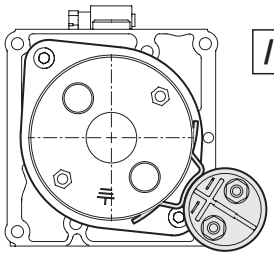
Starting switch and poles position.

Do not use “orientation 1” with blocks.

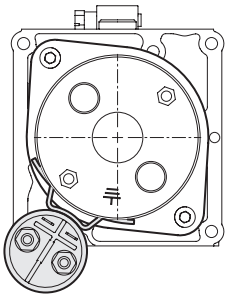
/1
standard



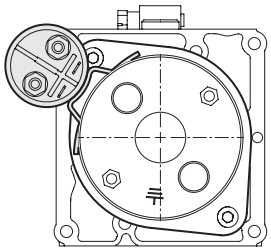
/2



/3



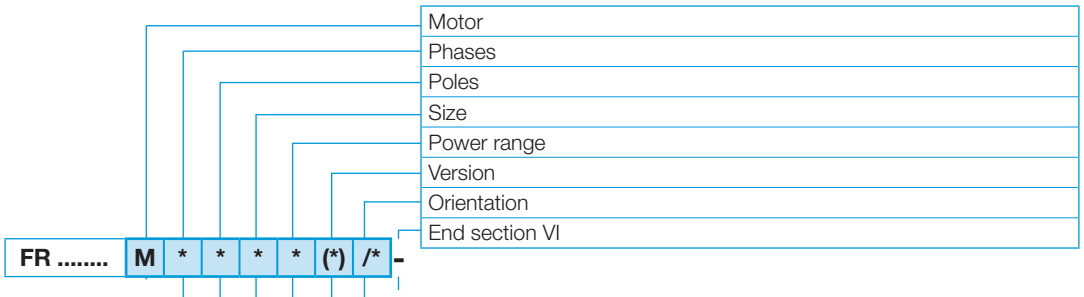
/4



V
DC

For more details, features and performances DC motors, see catalog Dana code DOC00053.

Sect. V - AC Motors



*	Phases
M	Single phase
T	Three phase

* Poles
2
4
2
4

*	Size
L	71
L	71
M	80
M	80
L	71
L	71
M	80
M	80
L	71
L	71
M	80
M	80
L	71
L	71
M	80
M	80

*	Power range		Page
	Power	Voltage	
A	0.37 kW	230 Vac 50 Hz	53
B	0.55 kW	230 Vac 50 Hz	53
A	0.75 kW	230 Vac 50 Hz	53
B	1.10 kW	230 Vac 50 Hz	53
A	0.25 kW	230 Vac 50 Hz	53
B	0.37 kW	230 Vac 50 Hz	53
A	0.55 kW	230 Vac 50 Hz	53
B	0.75 kW	230 Vac 50 Hz	53
A	0.37 kW	230/400 Vac 50 Hz	54
B	0.55 kW	230/400 Vac 50 Hz	54
A	0.75 kW	230/400 Vac 50 Hz	54
B	1.10 kW	230/400 Vac 50 Hz	54
A	0.25 kW	230/400 Vac 50 Hz	54
B	0.37 kW	230/400 Vac 50 Hz	54
A	0.55 kW	230/400 Vac 50 Hz	54
B	0.75 kW	230/400 Vac 50 Hz	54

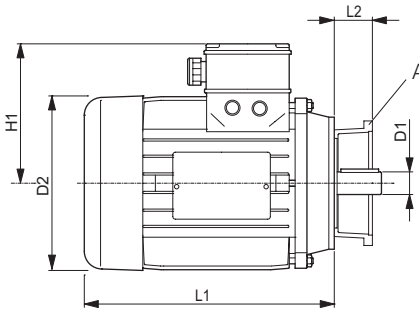
(*) Version	
(1)	Std

/* Orientation		Page
/1 /2 /3 /4	Std	55

V
AC

Motors supplied with all assembly components (transmission kit, coupling, etc).

M	*	*	*	*	(*)

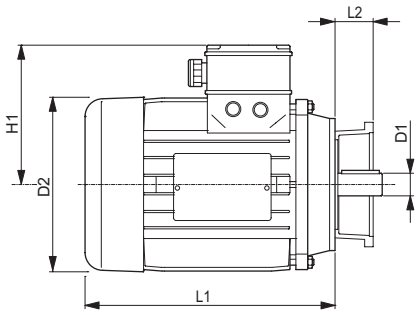


Single-phase motors 2-4 Poles - 230 Vac 50Hz - Version B14

		Phases	Poles	Size	D1 (•)	D2 (•)	H1 (•)	L1 (•)	Power range				Cable gland metric thred	Adapter			Single Motor	Transmission kit (for pump)
									Po-wer kW	Voltage	IP	IC	S3		Code	Screw UNI 5931	L2	
M	**M 2 L A (1)**	2	2	71	14	138	109.5	220	0.37	230 Vac 50 Hz.	55	F	75%	M20x1,5	9041144	M5x16	19.5	9045596	KIT02008.092
M	**M 2 L B (1)**	2	2	71	14	138	109.5	220	0.55	230 Vac 50 Hz.	55	F	75%	M20x1,5	9041144	M5x16	19.5	9045597	
M	**M 2 M A (1)**	2	2	80	19	156	123	238.5	0.75	230 Vac 50 Hz.	55	F	75%	M20x1,5	9041145	M6x20	19.5	9045598	KIT02008.091
M	**M 2 M B (1)**	2	2	80	19	156	123	238.5	1.1	230 Vac 50 Hz.	55	F	75%	M20x1,5	9041145	M6x20	19.5	9045599	
M	**M 4 L A (1)**	2	4	71	14	138	109.5	220	0.25	230 Vac 50 Hz.	55	F	75%	M20x1,5	9041144	M5x16	19.5	9045589	KIT02008.092
M	**M 4 L B (1)**	2	4	71	14	138	109.5	220	0.37	230 Vac 50 Hz.	55	F	75%	M20x1,5	9041144	M5x16	19.5	9045590	
M	**M 4 M A (1)**	2	4	80	19	156	124.5	238.5	0.55	230 Vac 50 Hz.	55	F	75%	M20x1,5	9041145	M6x20	19.5	9045591	KIT02008.091
M	**M 4 M B (1)**	2	4	80	19	156	125.5	238.5	0.75	230 Vac 50 Hz.	55	F	75%	M20x1,5	9041145	M6x20	19.5	9045592	

(•)= Approximate dimensions

M	*	*	*	*	(*)

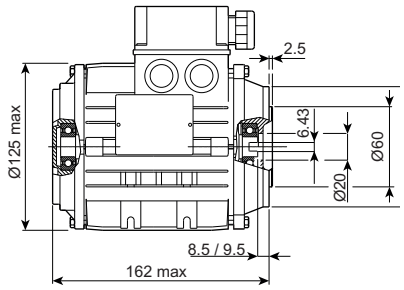


Three-phase motors 2-4 Poles - 230/400 Vac 50Hz - Version B14

		Phases	Poles	Size	D1 (•)	D2 (•)	H1 (•)	L1 (•)	Power range					Cable gland metric thred	Adapter			Single Motor	Transmission kit (for pump)
									Po-wer kW	Voltage	IP	IC	S3		Code	Screw UNI 5931	L2		
M	T 2 L A (1)	3	2	71	14	138	110	218	0.37	230/400 Vac 50 Hz.	55	F	75%	M20x1,5	9041144	M6x20	19.5	9045559	KIT02008.092
M	T 2 L B (1)	3	2	71	14	138	110	218	0.55	230/400 Vac 50 Hz.	55	F	75%	M20x1,5	9041144	M6x20	19.5	9045560	
M	T 2 M A (1)	3	2	80	19	156	125	239	0.75	230/400 Vac 50 Hz.	55	F	75%	M20x1,5	9041145	M6x20	30.4	9045527	KIT02008.091
M	T 2 M B (1)	3	2	80	19	156	125	239	1.1	230/400 Vac 50 Hz.	55	F	75%	M20x1,5	9041145	M6x20	30.4	9045561	
M	T 4 L A (1)	3	4	71	14	138	110	218	0.25	230/400 Vac 50 Hz.	55	F	75%	M20x1,5	9041144	M6x20	19.5	9045576	KIT02008.092
M	T 4 L B (1)	3	4	71	14	138	110	218	0.37	230/400 Vac 50 Hz.	55	F	75%	M20x1,5	9041144	M6x20	19.5	9045577	
M	T 4 M A (1)	3	4	80	19	156	125	239	0.55	230/400 Vac 50 Hz.	55	F	75%	M20x1,5	9041145	M6x20	30.4	9045578	KIT02008.091
M	T 4 M B (1)	3	4	80	19	156	125	239	0.75	230/400 Vac 50 Hz.	55	F	75%	M20x1,5	9041145	M6x20	30.4	9045579	

V AC

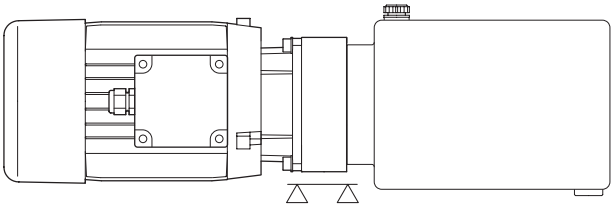
For size 63 motors, contact our technical service department.

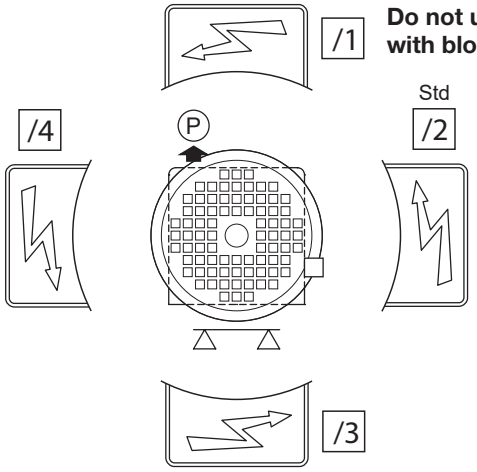


M	*	*	*	*	(*)	/*

- **Motor orientation**

Connector box position on power pack.





Do not use “orientation 1” with blocks.

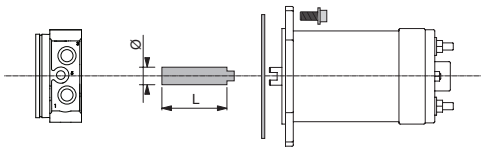
Sect. VI - Transmission kit DC motors

Transmission kit (only for motors on the catalog)
Type
End section VII

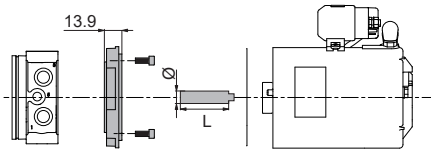
Specify the transmission kit whether you requested the joint and accessories assembly (without motor).

FR..... **T** ****** **-**

**	Transmission kit				For DC motors
	Code	Pump	L	Ø	
01	KIT08019.045	Gr. 0.5	30	14	**GA** (350 W - Ø 80 - Page 48) **GC** (700 W - Ø 80 - Page 48) **GB** (400 W - Ø 80 - Page 48) **GD** (800 W - Ø 80 - Page 48)



**	Transmission kit				For DC motors
	Code	Pump	L	Ø	
02	KA0000066	Gr. 0.5	49.1	14	**AA** (1500 W - Ø 114 - Page 48) **EN** (1600 W - Ø 114 - Page 48) **AB** (2000 W - Ø 114 - Page 48) **ES** (2200 W - Ø 114 - Page 48) **GN** (1600 W - Ø 114 - Page 48) **GP** (2200 W - Ø 114 - Page 48)

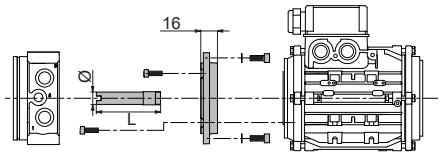


Transmission kit (only for motors on the catalog)
Type
End section VII

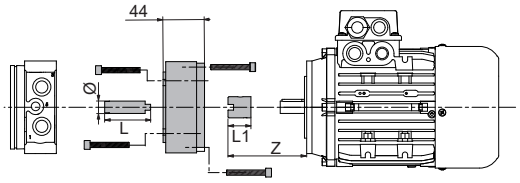
Specify the transmission kit whether you requested the joint and accessories assembly (without motor).

FR ..... **T** ****** -

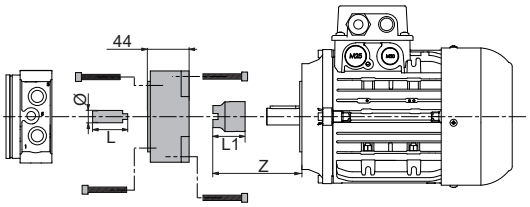
**	Transmission kit				For AC motors		Page
	Code	Pump	L	Ø	Ref.	Size	
1R	KIT02008.090	Gr. 0.5	73.7	14.9	R	63 (B14)	53



**	Transmission kit						For AC motors		Page
	Code	Pump	L	Ø	L1	Z	Ref.	Size	
1L	KIT02008.092	Gr. 0.5	52.6	14	26.5	40	L	71 (B14)	53



**	Transmission kit						For AC motors		Page
	Code	Pump	L	Ø	L1	Z	Ref.	Size	
1M	KIT02008.091	Gr. 0.5	40.8	14	38	52.5	M	80 (B14)	53



"Z" : dimension of the coupling side motor

VI

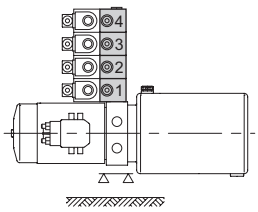
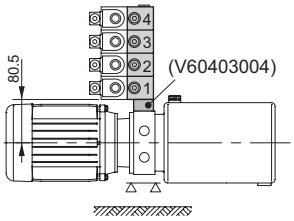
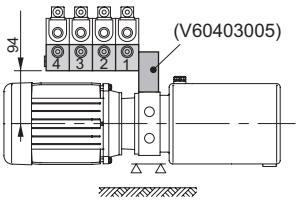
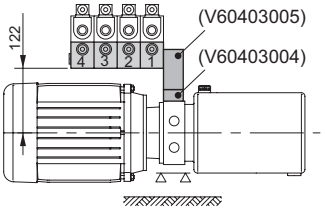
FR ...	J * (00) -

J	Standard blocks
*	Mounting position
(00)	Accessory
-	Separation line

In the order confirmation the code of the "Blocks and CETOP valves" will be converted into a type Jxxxx (xxxx = sequential number).

The blocks mounting kit (interface 90°, heighten) is included on the selection code (see "Mounting kits "table page 61).

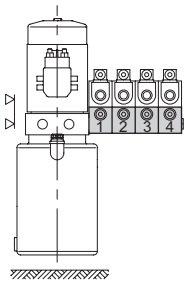
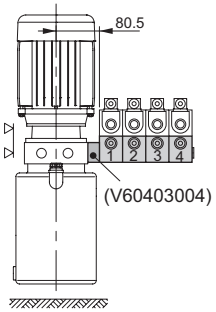
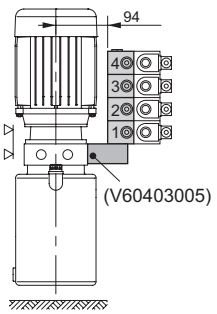
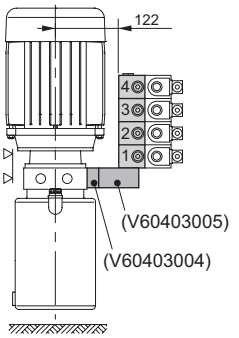
Blocks mounting on horizontal power pack

J 0	J A	J B	J C
			
Blocks orthogonal to the axis Except AC motors ref. size R-L-M	**Blocks orthogonal to the axis with heighten** For AC motors ref. size R-L-M	**Blocks parallel to the axis with interface 90°** Except AC motors ref. size M	**Blocks parallel to the axis with heighten and interface 90°** For AC motors ref. size M

The blocks can not be mounted with motors oriented in position "1" (DC motors, see page 51. AC motors, see page 55).

VII

Blocks mounting on vertical power pack

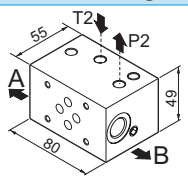
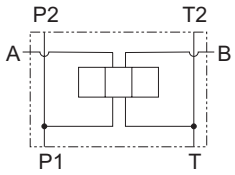
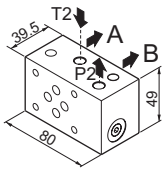
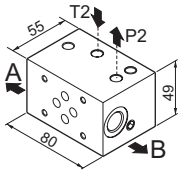
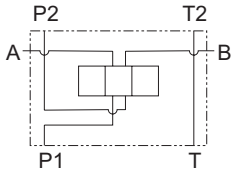
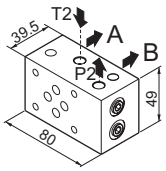
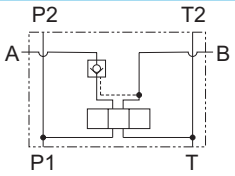
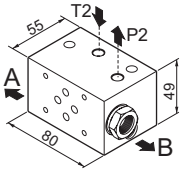
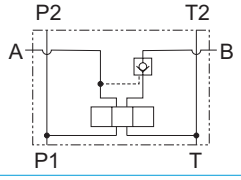
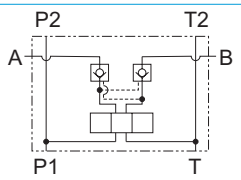
J 0	J A	J B	J C
			
Blocks orthogonal to the axis Except AC motors ref. size R-L-M	**Blocks orthogonal to the axis with heighten** For AC motors ref. size R-L-M	**Blocks parallel to the axis with interface 90°** Except AC motors ref. size M	**Blocks parallel to the axis with heighten and interface 90°** For AC motors ref. size M

The blocks can not be mounted with motors oriented in position "1" (DC motors, see page 51. AC motors, see page 55).

FR ..J*(00)	Block type
**	Accessory
(00)	Pressure relief valve setting on “A” line
(..)	Pressure relief valve setting on “B”line
(..)	CETOP valve
/***/	End section VIII

Repeat for each block (max.5)

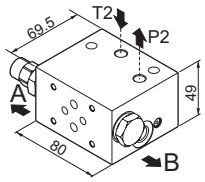
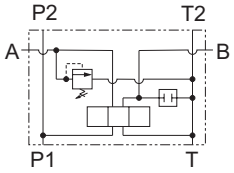
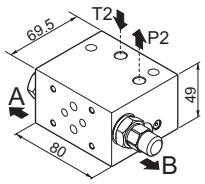
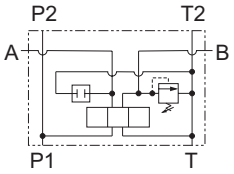
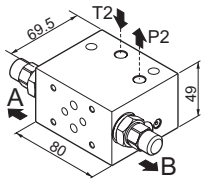
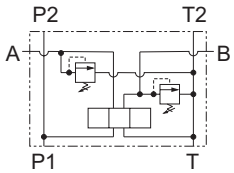
****** (00) **(..)** **(..)** /***/ - **Block type**

**	(00)	(..)	(..)	Description	Code	Drawing	Scheme
A2	(00)	**(0)**	**(0)**	Middle parallel - Lateral ports G3/8”	V60403010		
A3	(00)	**(0)**	**(0)**	Middle parallel - Rear ports G3/8”	V60403001		
B2	(00)	**(0)**	**(0)**	Middle series - Lateral ports G3/8”	V60403011		
B3	(00)	**(0)**	**(0)**	Middle series - Rear ports G3/8”	V60403003		
E1	(00)	**(0)**	**(0)**	With pilot check valve on ”A” port . Rear ports G1/4”	V60413002		
E2	(00)	**(0)**	**(0)**	With pilot check valve on ”B” port. Rear ports G1/4”	V60413003		
E3	(00)	**(0)**	**(0)**	With pilot check valve on ”A” and “B” ports. Rear ports G1/4”	V60413001		

P1 - T1: thread, closing with plug G1/8” (17010079)

VII

**	(00)	(..)	(..)	/***/	-	**Block type**

	(00)	(..)	(..)	Description	Code	Drawing	Scheme
F1	(00)	**(D)**	**(0)**	With pressure relief valve on “A” port Setting 15 ÷ 50 bar - Lateral ports G1/4”	1318828		
		(E)	**(0)**	With pressure relief valve on “A” port Setting 50 ÷ 110 bar - Lateral ports G1/4”	1318829		
		(F)	**(0)**	With pressure relief valve on “A” port Setting 110 ÷ 220 bar - Lateral ports G1/4”	1318830		
		(G)	**(0)**	With pressure relief valve on “A” port Setting 220 ÷ 290 bar - Lateral ports G1/4”	1318831		
F2	(00)	**(0)**	**(D)**	With pressure relief valve on “B” port Setting 15 ÷ 50 bar - Lateral ports G1/4”	1318832		
		(0)	**(E)**	With pressure relief valve on “B” port Setting 50 ÷ 110 bar - Lateral ports G1/4”	1318833		
		(0)	**(F)**	With pressure relief valve on “B” port Setting 110 ÷ 220 bar - Lateral ports G1/4”	1318834		
		(0)	**(G)**	With pressure relief valve on “B” port Setting 220 ÷ 290 bar - Lateral ports G1/4”	1318835		
F3	(00)	**(D)**	**(D)**	With pressure relief valve on “A” and “B” Setting 15 ÷ 50 bar - Lateral ports G1/4”	1318836		
		(E)	**(E)**	With pressure relief valve on “A” and “B” Setting 50 ÷ 110 bar - Lateral ports G1/4”	1318837		
		(F)	**(F)**	With pressure relief valve on “A” and “B” Setting 110 ÷ 220 bar - Lateral ports G1/4”	1318838		
		(G)	**(G)**	With pressure relief valve on “A” and “B” Setting 220 ÷ 290 bar - Lateral ports G1/4”	1318839		

P1 - T1: thread, closing with plug G1/8” (17010079)

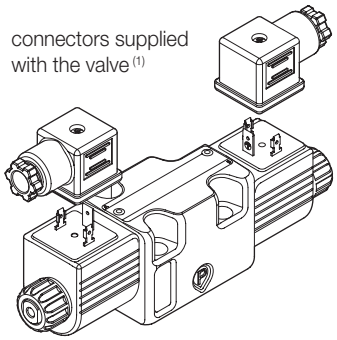
Mounting kits

Mounting kit: blocks	For No. blocks	Code
Mounting position **0-2-3**	1	V60513007
	2	V60513008
	3	V60513009
	4	V60513010
Mounting position **1** (with heighten)	1	V60513011
	2	V60513012
	3	V60513013
	4	V60513014

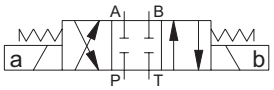
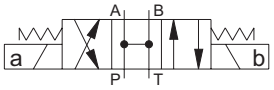
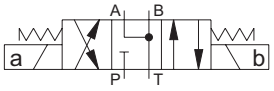
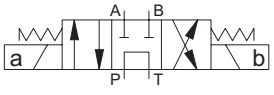
Mounting kit: interface 90°	Code
Mounting position **2**	V60513051

Mounting kit: interface 90° with heighten	Code
Mounting position **3**	V60513049

The blocks mounting kit (interface 90°, heighten) is included on the selection code (see mounting position, page 58).



**	(00)	(..)	(..)	/***/	- CETOP 3 valves

/***/	Voltage	Code	Spool (2)			Screw kit for valve mounting
			Type	Mounting	Scheme	
/000/	Without valve					
/001/	24 VDC (M)	ADC3E01CM001	01	C		V60513015
/002/	12 VDC (L)	ADC3E01CL001				
/003/	24 VDC (M)	B0018894 (ADC3E02CM001)	02	C		
/004/	12 VDC (L)	ADC3E02CL001				
/005/	24 VDC (M)	ADC3E03CM001	03	C		
/006/	12 VDC (L)	ADC3E03CL001				
/007/	24 VDC (M)	B0018893 (ADC3E04CM001)	04	C		
/008/	12 VDC (L)	ADC3E04CL001				

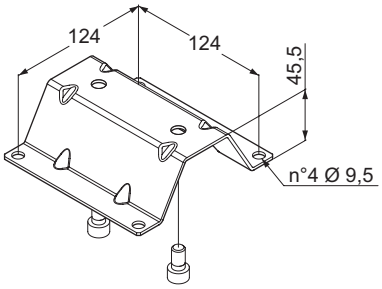
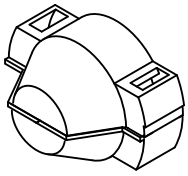
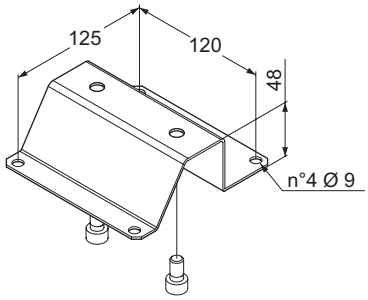
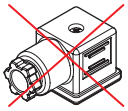
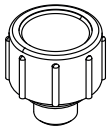
1 = Valves supplied with connector. Without connector see accessories page 62
2 = More details, features and performances, see catalog Dana “Valves and Electronics” code DOC00078

VII

Sect. VIII - Accessories

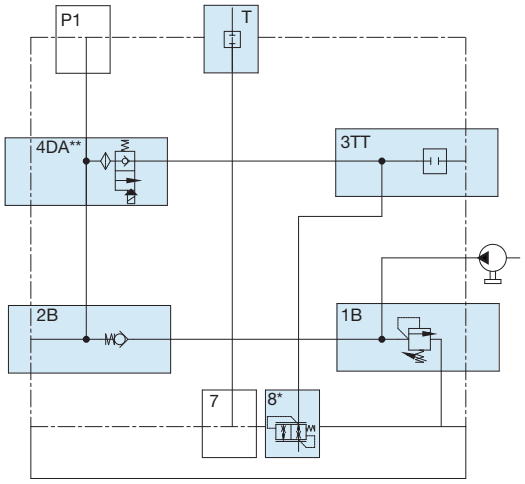
Accessories (optional)
First accessory
Second accessory

FR ..... **R** * *

*	Description	Drawing	Code	Note
A	Standard foot, (galvanized sheet steel) thickness 2.5 mm (unassembled)		Kit (foot and screws): 17010075	
B	Not-removable red plastic plug for pressure relief valve (unassembled)		Plug: 9043928 (Qty 2)	
D	High foot, (galvanized sheet steel) thickness 2 mm (unassembled)		Kit (foot and screws): 17010053	
F	Without valves connectors			
H	Fill plug with breather G1/4"		Plug: 49148400	

Example with FRA endhead

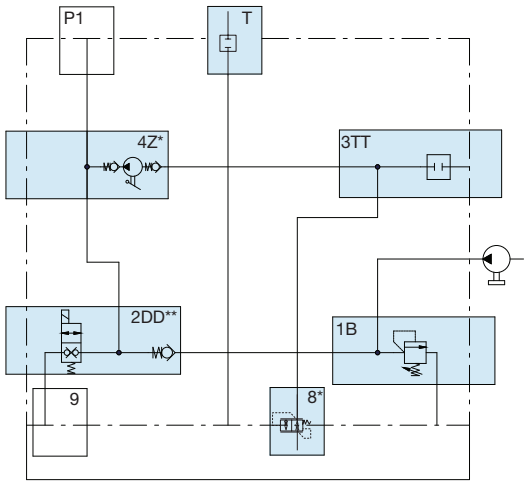
FRA - 1B1 - 2BA - 3TT - 4DAAA - 8E - 03



Cavity	Code	Description	Page
1	**1B1**	Pressure relief valve with check valve (40 ÷ 110 bar) with screw and detachable closing, standard setting 50 bar	13
2	**2BA**	One-way check valve 0.5 bar (cracking pressure)	14
3	**3TT**	Plug 3/4 16 UNF	15
4	**4DAAA**	Piloted solenoid valves normally closed, without emergency. Voltage 12 Vdc	17
8	**8E**	Flow control valves for return cavities "8" /(4.3l/min)	20
P1-T	**-03**	Combinations plugs on ports (P1= open; T= closed with plug)	21

Example with FRC endhead

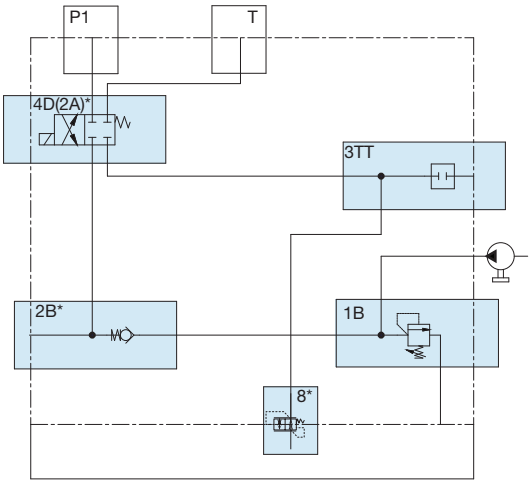
FRC - 1B1 - 2DDAA+A - 3TT - 4ZA - 8E - 03



Cavity	Code	Description	Page
1	**1B1**	Pressure relief valve with check valve (40 ÷ 110 bar) with screw and detachable closing, standard setting 50 bar	22
2	**2DDAA+A**	Piloted solenoid valves normally closed, without emergency. Voltage 12 Vdc	23
3	**3TT**	Plug 3/4 16 UNF	25
4	**4ZA**	Piloted solenoid valves normally closed, without emergency. Voltage 12 Vdc	27
8	**8E**	Flow control valves for return cavities "8" /(4.3l/min)	30
P1-T	**03**	Combinations plugs on ports (P1= open; T= closed with plug)	31

Example

Example with FRE endhead



FRE - 1B1 - 2BA - 3TT - 4D(2B)AA - 8E - 00

Cavity	Code	Description	Page
1	**1B1**	Pressure relief valve with check valve (40 ÷ 110 bar) with screw and detachable closing, standard setting 50 bar	32
2	**2BA**	One-way check valve 0.5 bar (cracking pressure)	33
3	**3TT**	Plug 3/4 16 UNF	34
4	**4D(2B)AA**	Solenoid valves 4 way 2 positions without emergency. Voltage 12 Vdc (open center "A" spool)	36
8	**8E**	Flow control valves for return cavities "8" /(4.3l/min)	38
P1-T	**00**	Combinations plugs on ports (P1= open; T= open)	39

DANA
BREVINI®
Motion Systems

GENERAL INSTRUCTIONS

This manual applies to HPU hydraulic power units.
The User is solely responsible for the use of this manual and completely assumes the relative risk. Dana Motion Systems Italia S.r.l. will not be responsible for special, indirect, accidental or consequential damage deriving from the use of this manual or the product, or from inexperience with the use of this manual or of the product. DANA will not be responsible - even to third parties - for poor or improper installation, maintenance, or repair of the product, or for the use of non-original replacement parts. This manual may not be reproduced, in whole or in part, in any form or by any means, for any use which is not the User's personal use, without the express written consent of DANA. DANA thanks you for choosing one of its products. In order to use the product correctly, DANA asks you to carefully follow the instructions and suggestions contained in this manual. This manual is intended for Users with trained personnel (who specialize in the hydraulics, electrical and mechanical sectors). This manual is no substitute for the professionalism and skill of the User's personnel. The User must make sure that its personnel have been provided with this manual and understand the instructions contained in it. Since DANA is committed to ongoing research and development, it reserves the right to modify the technical characteristics of its products, at any time and without prior notice, as deemed necessary. To ensure the availability of certain components, DANA draws upon a network of select, qualified suppliers; as a result, these components may vary in size and appearance. This manual is subject to change and addition but must not be considered to be out of date. Since HPU are complex products with configurations that vary a great deal, the diagrams contained in this manual are intended only to make it easier to understand the text and often do not show the product exactly as it is.

⚠ **The HPU and its components may be assembled, installed, started and maintained by trained technical personnel, only.**

⚠ The User is responsible for choosing the product and its accessories. Thus, it is important for the User to investigate the problems associated with its specific application by performing suitable analyses and tests. **The User is also responsible for installing the safety systems and affixing the warnings that are required by current regulations.**

PRESCRIBED USE OF THIS POWER UNIT

This HPU is designed to be the main control unit in hydraulic automation systems. Given the wide range of applications of HPU, and since the final destination of the unit is not always known to the manufacturer, this manual will provide information only on popular applications such as forklifts, lifting platforms and beds, lifts for cars, cranes on small trucks, snowplows, and automated systems in the industrial sector.

LIMITS OF USE

The manufacturer does not always know the final destination of the product. When the User chooses a HPU, it must therefore determine which product is suitable by running a test with a sample prototype. Our offices are available to help the User choose the correct HPU for its needs.

⚠ **The HPU must not be used in the following applications:**

- environments where there is a danger of explosion or fire
- aeronautical/space vehicles and systems
- braking, locking and retention systems in general
- equipment and systems used in military, nuclear, medical or hospital applications

In any case, DANA reserves the right - upon request - to evaluate the applications listed above and to authorize an application, if appropriate.

⚠ **The HPU must not be used to perform safety functions. The following are possible problem areas:**

- Strong stresses and vibration may cause fluid to be ejected from the breather and fill cap.
- Highly dusty environments may cause the breather and fill cap to become plugged.
- Strong discharge pressure into the tank may generate foam and alter the characteristics of the hydraulic fluid.
- Exposing the HPU to sunlight may cause damage to the exposed plastic parts (especially the tanks).
- The DC motors must be wired using suitably large cables.
- Single-phase AC motors must be chosen to handle the minimum voltage available from the power mains.
- The electrically actuated valves that are normally used in these applications are not perfectly sealed, and this characteristic must be considered by the User when designing its machinery or equipment.
- Each HPU is given a final leak test under pressure, and its internal ducts are flushed to ensure cleanliness. As a result, the system where the HPU is installed should be perfectly clean, and the hydraulic fluid used must be clean and filtered

SAFETY SPECIFICATIONS

Your HPU has been designed and built to the current state of the art and complies with all applicable laws and regulations. The User is responsible for connecting the HPU to its machineries or equipment. The unit and the system where it is installed must be assembled, placed into service and maintained by properly trained personnel. A number of dangerous conditions that may occur during operation will now be described. Sometimes, a potentially dangerous situation may seem to be normal, but must not be underestimated. Likewise, the possibility of overconfidence and performing tasks by habit, which may take the place of paying proper attention to safety, must also not be underestimated.

⚠ Unexpected spurts and leaks of hydraulic fluid hot enough to cause burns may occur during startup, normal operation, maintenance, adjustment, bleeding of the system, and operation and actuation of the valves and the control systems.

⚠ Hydraulic fluid may be hazardous to health, since contact with the skin and eyes can cause serious damages. Carefully follow the instructions on personal protection and safety that are specified by the manufacturer of the fluid, as specified on the technical/toxicological information sheet.

⚠ Hydraulic fluid may be a pollutant. As a result, it is good practice to avoid losing fluid by using basins to collect it. Also, use oil-absorbent products to protect the skin from accidental leaks and spurts of fluid.

⚠ Never tamper with any valve, connection, accessory or component on the HPU. Simply loosening a valve may cause loads to fall freely or structures to give way.

⚠ All installation, assembly, maintenance, disassembly and replacement operations on the HPU and its components must be performed in full compliance with safety regulations. During these operations, the hydraulic circuit must never be pressurized (zero pressure), and no load must be exerted on the tool or machinery the HPU is connected to (zero load).

⚠ All electrical connections and disconnections must be performed by trained, specialized personnel.

⚠ Before performing any type of operation or service on the HPU, electrically disconnect the power line (whether AC or DC) from the motors and from any other electrical device on the HPU.

⚠ Before servicing non-electrical devices or motorization systems (whether pneumatic, hydraulic, mechanical, etc.), such devices and systems must first be disconnected from the relative feed lines and must be set up so that they cannot produce energy and thus cause movements, even accidentally.

⚠ On HPU with a ventilated DC motor, some areas of the HPU may not be protected from moving parts (the fan). In this case, the User is responsible for providing suitable guards. Unprotected areas are labeled with a suitable warning.

Some parts of the HPU - and the hydraulic fluid itself - may reach high temperatures and burn the skin. Be sure to follow all safety instructions.

⚠ The User must install the HPU in a position on the machinery and equipment that makes repair and maintenance procedures easy to perform.

When performing any such operation, it is good practice to:

- Use proper safety equipment (goggles, gloves, shoes, etc.);
- Work in conditions of utmost cleanliness and use tools, equipment and benches that are clean and in good operating condition;
- Work in conditions of maximum safety;
- Use oil-absorbent products.

IDENTIFYING THE UNIT

HPU are provided with identification labels.
Some fields may be optional. HPU are identified by a part number and an ordering code on the documents provided with the units (invoice). All requests for explanations or replacement parts must be accompanied by the identification codes described above.

COMPLIANCE WITH DIRECTIVES

Machinery Directive 2006/42/EC

This HPU is designed to be incorporated into another machinery and may be placed into service only when that machinery has been certified as complying with Machinery Directive 2006/42/EC.

EMC Directive 2014/30/UE

AC Motor – Three-phase or single-phase: not applicable.
DC motor - Field wound: compliant.
DC Motor - Permanent-magnet type: not compliant. The User must install an interference filter on the power line.

LV Directive 2014/35/UE

AC Motor - Three-phase or single-phase: compliant.
DC motor - Excluded from the Directive (up to 75 V).

OPERATIONAL LIMITS

Flow rate: The flow rate is determined by the pump and motor chosen. This HPU is designed to handle an optimal minimum flow rate of 5 L/min and a maximum flow rate of 20 L/min.
Minimum pressure: This HPU is built to control a minimum pressure of 10 bar. The same minimum pressure is also required for proper operation of possible flow regulators that control the outgoing flow.
Maximum pressure: The maximum pressure is determined by the pump, the motor and the relief valve (hereafter referred to as the RV). Nevertheless, all the components in the HPU have been chosen to suit the RV that is installed.
Under the most severe conditions and with specific components, the pressure limits are as follows:
250 bar: intermittent operating pressure
290 bar: intermittent peak pressure for a max. of 20 s
320 bar: overshooting pressure

⚠ **The RV must not be replaced without prior authorization from DANA**

Temperature: This HPU is designed to operate with fluid at a temperature of -10 to 70° C. See the chapter, "Choosing the Hydraulic Fluid" for more information on temperature limits.
Since rapid temperature changes may deteriorate the properties and service life of the fluid, it is essential to protect the fluid from this type of situation.

STORAGE

HPU must be handled with care and attention. Certain protruding parts may be subject to breakage, such as the breather and fill cap on the tank. Another weak point is the tank made of plastic. Pay special attention to the flange, its valves and its components since they are particularly vulnerable to impact. If the HPU is equipped with valve assemblies, they must be protected from impacts and dents. Also, avoid bending the assemblies excessively, as this could cause irreversible damage. For HPU with tanks of small dimensions, since the motor is the heaviest component on an HPU, it is essential that the HPU be stored horizontally (and never vertically, with the tank underneath and the motor on top).
An HPU must be placed in an environment that is protected from dust and direct sunlight (UV rays), and at an ambient temperature of -10 to +30 °C (up to 40°C max. for brief periods).

CHOOSING THE HYDRAULIC FLUID

Any mineral-based hydraulic fluid can be used. When choosing a fluid, the operational parameters of the system and the ambient temperature must be taken into consideration to obtain best performance. Use HM-HR-HV mineral-based hydraulic fluid meeting ISO 6743/4 (DIN 51524) specifications, with an ISO 3448-compliant viscosity class, and with the following conditions of use:

- minimum viscosity: **12 cSt** - maximum viscosity: **80 cSt**
- maximum viscosity at startup: **500 cSt**
- operating viscosity: **20 to 50 cSt**
- oil optimum operating temperature: **30° to 60 °C**
- minimum ambient temperature: **-15 °C**
- maximum ambient temperature: **40 °C (with peaks of 50 °C)**

ⓘ The use of other fluids may damage the system and prevent it from operating properly. In any case, DANA reserves the right - upon request - to evaluate the use of other fluids and to authorize such use if appropriate.

ⓘ Since each HPU is given a final test for proper operation, several cc of fluid with the above characteristics may remain in the unit.

ⓘ It is important not to mix hydraulic fluids from different manufacturers or fluids of different types. Such mixing may cause sludge and sediment to form that could prevent the HPU from operating properly.

ⓘ The values reported above are standard conditions of use that do not take into account the various types of tanks that may be installed and the resulting limitations. If plastic tanks are used, it is a good idea to consider that they offer poorer temperature performance.

Optimal temperature for using tanks made of sheet metal and polyethylene (PE): **-10 °C (ambient) to 70 °C (operating)**

Temperature limits for using tanks made of **sheet metal:**
-15 °C (ambient) to 80 °C (operating)

Temperature limits for using tanks made of **polypropylene (PP):**
-10 °C (ambient) to 60 °C (operating)

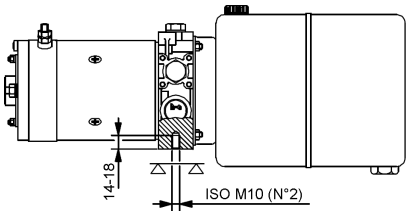
The above parameters, which are the result of experience and laboratory tests, take into account the mounting systems and fasteners that are essential to machineries or equipment with average levels of vibration (transpallets in a workshop environment).

INSTALLATION

ⓘ During installation, be sure that important assembling operations are carried out with the greatest degree of cleanliness in a clean, dust-free area.

⚠ The HPU must be installed in an ergonomic position that provides easy access for inspection and maintenance. It is just as important to install it in an area which is protected from accidental impact and kept away from accidental physical contact, since the high temperature of the unit during operation may cause burns.

ⓘ The HPU must be securely fastened to the machinery at its sturdiest points (such as the load-bearing frame, longitudinal members, etc), away from all sources of noise and vibration, and away from parts of machinery that may vibrate or transmit and/or amplify noise and vibration.
HPU with a plastic tank must be installed in areas with limited temperature swings and away from direct exposure to sunlight.



The HPU must be installed using the two ISO M10 holes in its aluminum body. The HPU described above may be installed with a special foot that is available upon request. On fixed machineries (horizontal or vertical position), the weight limits recommended for fastening with the two M10 holes are:

- with B14 AC motor, size 112
- with 10 L tank
- with 12 L tank and the additional support of the feet on the tank.

On moving machineries (the vertical position is preferable, mount the unit close to the center of gravity), the weight limits recommended for fastening with two M10 holes are:

- with all DC motors
- with 6 L tanks in sheet steel
- with 5 L tanks in PP
- with 4 L tanks in PE

Tanks with a higher capacity can be installed on HPU for special applications. For example, the tank can be anchored to the frame of a moving vehicle.

General rules for correct installation

Examine the hydraulic diagram and the electrical diagram (if available). Our technical/business office is at your disposal for further information/explanations.

Avoid removing the plastic protection plugs until you connect the hoses.

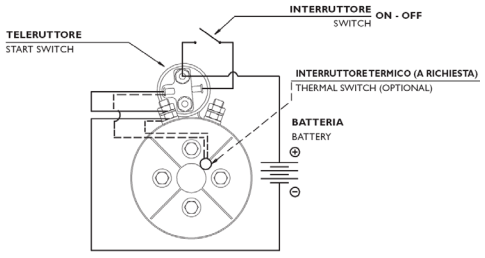
Some electrically actuated valves have a screw-type manual safety device. This safety must be deactivated before operating the system.

For HPU equipped with CETOP modular assemblies for connecting proportional solenoid valves, use DIN EN ISO 1179-2 cylindrical fittings with ISO 228-1 threads as the connection ports.

Remember that when a steel fitting with a dented male thread is tightened, it will remove burrs from a female (aluminum) seat. These burrs are the main cause of valve malfunctions.

Connecting a DC motor

Sample connection diagram:



When wiring a motor, it is important to consider the cross-sectional area and length of the power cables. Cables with overly small cross-sections and overly long lengths may cause voltage drops that could prevent the HPU from operating properly.

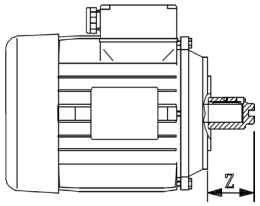
Before placing the HPU into service, we recommend cycling the start switch several times at low to medium loads to break in the switching system.

Use these tightening torque values on the motor terminals and the start switch

[Nm]	ISO M8	5 to 7
	ISO M6	3 to 5

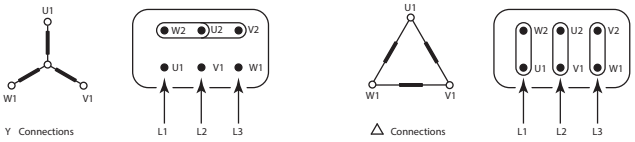
Connecting an AC motor

Mechanical connection to AC motors with form factor B14: the motor side of the transmission coupling must be mounted at the distances shown on the table



Grand.	Coupling distance Z (pump group 1) in mm	Coupling distance Z (pump group 05) in mm
63	42.8	62.7
71	42	42
80	53	53
90	63	63
100	81.5	81.5

Sample electrical connection of three-phase AC motors:



Electrical connections to the motor and to electrically actuated valves must be made by trained personnel. Before these devices are connected to the power line, the following factors must be considered:

- The laws and technical sta©ndards applicable in the installation location
- The data indicated on the motor identification plate and on the valves

The electric power feed line connected to the motor must be a multi-core cable with a cross-sectional area that is large enough to meet current regulations. The cable enters the terminal board through a special cable gland and is connected to the terminals. The voltage supplied to the motor must be the same as the voltage specified on its identification plate.

The housing for the terminal board contains metal components carrying dangerously high voltage. Be sure to close the cover of the housing after wiring the terminal board.

Single-phase AC motors must be chosen that operate at the minimum voltage supplied by the power mains. The motor will not operate properly if the voltage is too low.
Connecting electrically actuated valves

On HPU with electrically actuated valves, the coils must be supplied with the prescribed voltages with the following limits: -10 to +5% of nominal voltage. If these limits are exceeded, valve operation and coil life may be adversely affected.

Hydraulic connection

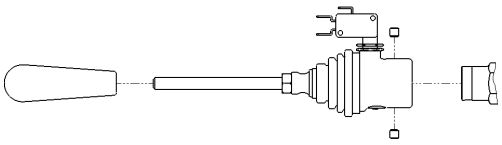
The hydraulic connection must be made with cylindrical fittings and copper sealing gaskets. We recommend using DIN EN ISO 1179-2 fittings with ISO 228-1 threads and DIN 7603 gaskets. The ports on the HPU and on the valve assemblies (if installed) are protected by plastic plugs that must be removed when the fittings are installed. Check the thread on the fittings, which must be clean and without dents. Use rigid or flexible hoses whose internal diameter is the same as or larger than the connecting orifices on the HPU. The speed of the fluid in the hoses must be as follows:

delivery (pressure): 4 to 6 m/s
return (discharge): 1.5 to 3 m/s

The recommended values must be increased if very long sections of hose (over 3 m) are used.
The system must be clean to obtain proper operation from the HPU.
The following table lists flow rates and tightening torque values for UNI-ISO 228 gas threads

Flow rate (L/min)	Thread	[Nm]
<5 to 10	G 1/4”	30
10 to 20	G 3/8”	30
>20	G 1/2"	30

Installation of manual pressure control group



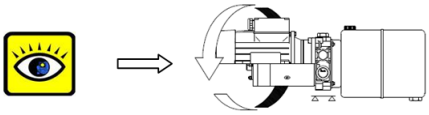
Usually, the manual pressure control group is not installed.

- Grease the internal parts of the manual pressure control and the valve where the unit will be installed (use gasket grease).
- Insert the lever until the cam hits the pin.
- Arrange as desired and fasten with the two screws: 4 Nm.

In case of malfunction (difficult operation, oil leaks, etc.), remove the manual pressure control group from the machinery when it is shut down with the power disconnected. Make sure the pressure in the hydraulic system is zero.

All operations on the HPU must be carried out with the machinery shut down and with the power disconnected. Make sure the pressure in the hydraulic system is zero.

START UP



The direction of motor rotation is counterclockwise CCW, as observed from the side of the HPU where the motor is located (unless a different direction of rotation was specified on the order and the different direction is determined by the type of flange on the unit). The direction of rotation must be checked on all AC motors and on DC motors with permanent magnets. It is better to check the direction of rotation when the motor is not installed; or, proceed as follows:

- Wire the motor as specified
- Adjust the RV to minimum
- Actuate the HPU with very short pulses
- Adjust the RV for normal operation

If the motor rotates in the wrong direction, the pump may be permanently damaged when it reaches operating pressure. The connections to the motor and its direction of rotation must be checked every time the HPU or the system is disconnected from the power mains.

After the system is started, make sure all the controls operate properly. When executing the first movements with the system, air must be bled from the system to prevent foam forming in the tank and possible undesired and uncontrollable movements of the actuators.
Also, recheck the fluid level and top it up if necessary. After the system has operated for a few hours, check the entire HPU for fluid seepage, recheck the fluid level in the tank, and again look for foam in the tank.

TIPS

Read the following chapters: “Prescribed use of this Power Unit”, “Limits of Use”, “Safety Specifications”, “Operational Limits”, “Installation”.
The operations described below are the recommended way to start up the unit properly.
Fill the tank with new, filtered hydraulic fluid (see the chapter, “Choosing the Hydraulic Fluid”).
Disconnect the pressure hose from the cylinder and place it into a clean container. Do not allow hydraulic fluid to flow into drains or discharge channels, or onto the ground.
Turn the motor on the HPU on and off at intervals of 1 s until hydraulic fluid is ejected from the pressure hose.
Reconnect the pressure hose to the cylinder and top up the tank.
Execute a number of complete cycles on the cylinder to purge the air from the circuit and check the level of hydraulic fluid once again.
Make sure the RV is set correctly.
The most common cause of breakage, poor operation and premature wear of hydraulic systems is lack of cleanliness. For this reason, make sure all hoses and cylinders are perfectly clean during assembly.

MAINTENANCE

Proper operation of the HPU (and of the system it is installed in) also depends on correct maintenance. After a short period of operation, make sure all the screws and fittings are tight, since pulsation and vibration may cause these components to loosen, which may lead to leakage and seepage of hydraulic fluid. It is important to keep the HPU clean so that leaks and seepage can be more easily seen. Only use clean cloths for cleaning.
Never use solvents or detergents.

Check the level and the condition of the hydraulic fluid. We recommend changing the fluid the first time after the first 10 hours of operation. Afterwards, change the fluid every 3000 hours of operation (or once a year).

Whenever the hydraulic fluid is changed, replace the intake filter (and the other filters, if installed) and clean the inside of the tank. It is a good idea to change the fluid by removing the tank (see the chapters, " Removing and reinstalling the tanks " and "Replacing the Filter").

Before changing the hydraulic fluid, empty the entire system completely. The fluid change interval described above applies at operating temperatures of 30° C to 60 °C (temperature of the hydraulic fluid).

Higher temperatures may seriously reduce the service life of the fluid.
Replacing the filter
The filter can be replaced with a new filter of the same type or it can be washed, cleaned and reused (see the section, "Safety Specifications").
Proceed as follows:

- Unscrew the filter while holding on to the intake hose to prevent it from unscrewing
- Clean or replace the filter
- Screw the filter back into place onto the same section of threading on the hose. Use enough force so that the metal thread on the filter is snugly seated on the hose.

Removing and reinstalling the tanks

Removal

- Unscrew the mounting system
- Pull out the tank, but without the aid of levers that could cause dents

Reinstallation

- Make sure the tank is clean
- Make sure the sealing gasket is in good condition
- Make sure the opening on the collar of the tank is in good condition (it must be clean, free from dents and without unusual grooves)
- Grease the opening on the collar of the tank
- Install the tank
- Secure the tank tightening the screw evenly

It is a good idea to grease the opening of the tank and not the gasket. The HPU will be cleaner because the grease will flow toward the inside of the tank.

The tanks have different mounting systems

Direct mounting using the threading on the tank (usually made of sheet metal)	M6	[Nm]	6
Mounting with a bracket (usually for PP tanks)			
Mounting with a collar band (usually for PE tanks)			

Screwing plugs into the tank

Plastic plug with key	Thread G 1/2" G 3/4"	[Nm]	10
Manually tightened plastic plugs			By hand
Metal plugs			30

Recommended tightening torque values
If components on the HPU must be removed and reinstalled, tighten them at the torque values listed on the following table:

Tightening torque values to be used on the screws or tie rods used to fasten motors

	M8	M6	M5	1/4-20 UNC
[Nm]	25	10	6	10

For tightening torque values used on the terminals of DC motors and start switches, see the paragraph, "Connecting a DC motor

Tightening torque values to be used on the flange body

	M6	M8	M10x1.5	M16x1.5	3/4 -16UNF	G1/4	G3/8
[Nm]	10	25	45	30	30	30	30*

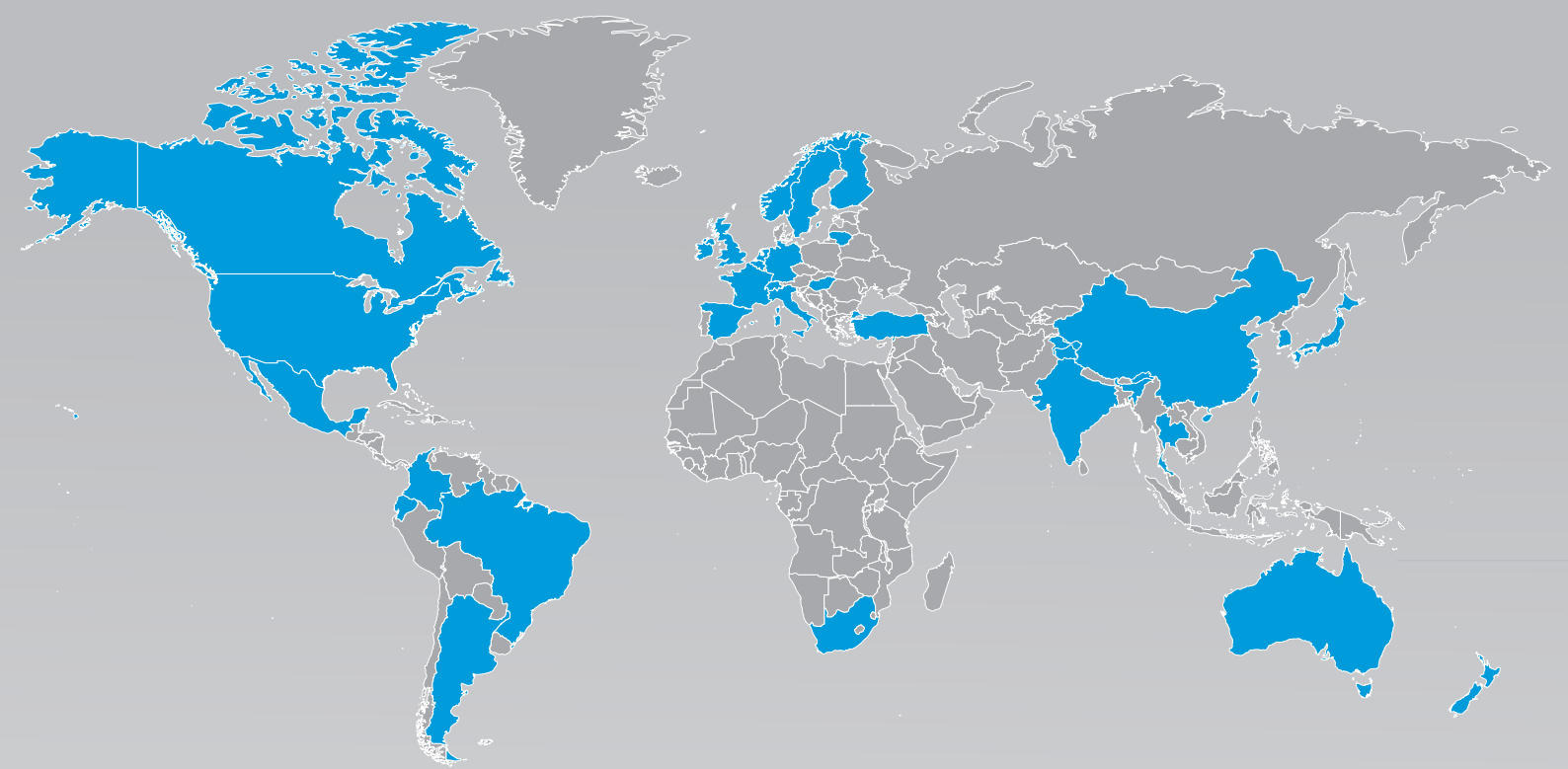
The recommended tightening torque values on the table are differentiated according to material and type of thread on the flange body and apply to the components that are most commonly removed. The values do not apply to other components made of different materials (plastic) or components that are tightened using other methods (such as slot-head or Philips head screwdrivers, or other tools), or unless otherwise specified. The torque values do not apply to plugs and fittings with tapered threads.

DISMANTLING AND DISPOSAL

If the HPU must be dismantled, empty the fluid and dispose of it according to the laws that apply in the country where it will be disposed of. The same holds true for the other parts of the HPU; that is, dispose of them according to the laws that apply to disposal of plastic and ferrous materials, as the case may be.
When dismantling the unit, separate the plastic parts from the electrical components, which must be disposed of separately in accordance with current regulations.
The large metal sections of the HPU should be separated into parts made of steel and parts made of other metals or alloys, so that they can be correctly melted down for recycling. Dismantling is not a particularly risky operation, as long as it is performed by properly trained personnel using adequate tools (see the chapter, "Safety Specifications").

Note

Note



Technologies Customized to **Every Part of the Globe**

With a presence in 31 countries, Dana Incorporated boasts more than 150 engineering, manufacturing, and distribution facilities. Our worldwide network of local service centers provides assurance that each customer will benefit from the local proximity and responsiveness.

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