

HDF(*) STACKABLE VALVES SYSTEM

1) Generalities

HDF(*) system is designed to create very compact hydraulic control groups, by the use of stackable solenoid valves (and modules), that don't need the use of a base plate.

All connections A and B to "users" are 1/4" BSPP and they are located directly on the solenoid valves bodies or on the pilot operated check valves.

The HDF(*) system is optimized to control flows up to 20 l/min with max pressure of 25 MPa.

Ideal use of HDF(*) system is on various type of minipowerpacks.

- 1.1) The basic system uses HDF-ES-*** solenoid valves, packed in a very compact overall dimensions, where the 4-way solenoid valve share common P and T lines (in parallel or in series connection) and A and B ports are located on the top of each 4-way valve.
- 1.2) The more sophisticated systems uses HDF2-ES-*** solenoid valves, where connections to A and B lines are internal and therefore it is possible to stack modules that control flow or pressure on individual A and/or B ports : typically the use of p.o. check valve is current.
- 1.3) Elements from HDF and HDF2 systems can be mixed and can be stacked together, then giving an optimum of flexibility
- 1.4) Installation normally is made by fastening, by 3 tie rods, the stack of HDF(*) valves on a plate or manifold or block where a surface presents suitably located P and T connections.
This principle permits the best installation of HDF(*) stacks on minipowerpacks, on control blocks or, as a piggy back, on banks of larger 4-way control valves.
- 1.5) In current application of HDF system, a "closing" plate is needed to seal the P and T lines that are passing through the stack of valves.
In case of repetitive or large scale application, the use of "blind" final elements could be of great help:
 - solenoid valves type HDFC-ES-*** (P and T ports on face with seals)
 - solenoid valves type HDFB-ES-*** (P and T ports on face without seals)
 - p.o. check valves type AMFC-CP-AB
 These eliminate the need of a "closing" plate and permit shorter tie rods

2) Components for the HDF system

2.1) 4-way solenoid valve (see table HD220/1)

- 2.1.1) Valves type **HDF-ES-*****, see table HD220/1. Those are the basic elements with A and B ports (1/4" BSP) on top of valve; P and T passing through.
- 2.1.2) Valves type **HDF2-ES-*****, see table HD220/1. Those valves have P and T passing through and internal connection for A and B line.
Normally the A and B 1/4" BSP ports must be plugged and a suitable control module is associated to the valve.
- 2.1.3) In the basic versions the spool can be manually shifted by acting on the emergency pins. This manual override can be replaced by lockable override nut device type G01-E

2.2) Control modules

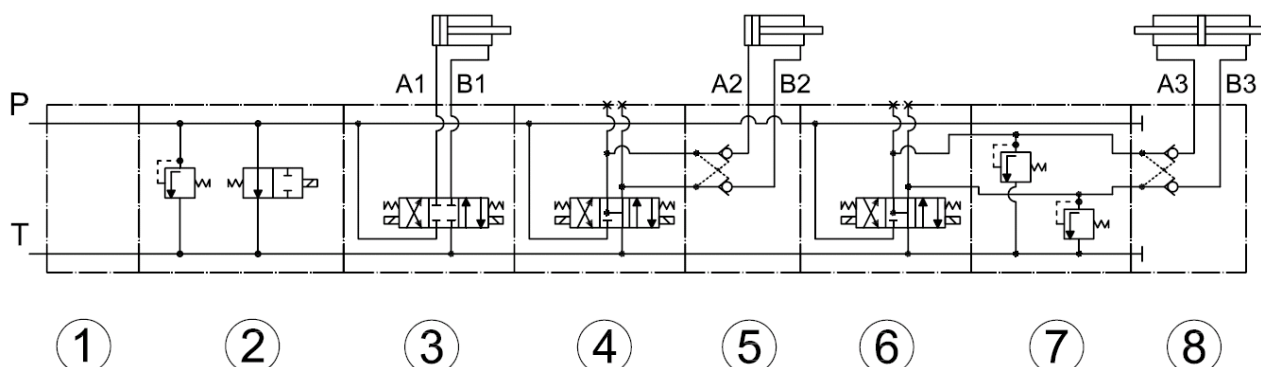
- 2.2.1) Pilot operated check valve type **AMF-CP-AB** (see table AM-F50)
Associated to HDF2-ES-*** solenoid valve, operates on A and B lines and presents A and B ports connections 1/4" BSP on sides.
- 2.2.2) Relief valves
- 2.2.2.1) **AMF-MOP/*-CC ; AMF-MOP/*-P1 ; AMF-MOP/*-T1** (see table AM-F60)

Relief valve acting on main (common) P line (passing) with discharge on (common) T line (passing). Version P1 presents an auxiliary 1/4" BSP port P on one side. In the same way Version T1 presents an auxiliary 1/4" BSP port T on one side.

- 2.2.2.2) Relief combined with variable flow control valve type **AMF-MOP/*-CF** (see table AM-F60)
This valve presents, in parallel with the relief valve, a regulated bleeding flow from P line to T line. Version with graduated knob for the throttle valve is available (**AMF-MOP/*-CV**).
- 2.2.2.3) Relief combined with pressure compensated flow control valve type **AMF-MOP/*-Q*** (see table AM-F60)
This valve presents, in parallel with the relief valve, a pressure compensated bleeding flow from P line to T line. Bleeding flow rate can be fixed (**AMF-MOP/*-Q(*)**) or adjustable (**AMF-MOP/*-QV**).
- 2.2.2.4) Relief combined with electric by-pass valve type **AMF-MOP/*-EV2*** (see table AM-F61)
This valve presents in parallel with pressure relief valve a directional valve that allows connection of P and T lines with electric command. Normally open (**AMF-MOP/*-EV2O**) and normally closed (**AMF-MOP/*-EV2C**) versions are available.
- 2.2.2.5) A and B pressure relief valve type **AMF-MO-BA** (see table AM-F65)
Relief valve acting on A and B line with discharge on (common) T line. P line is passing.
- 2.2.3) **Pressure reducing valves**
This valve type **AMF-RO-P/*** is a 3-way direct operated pressure reducing valve (see table AM-F70), that permits to obtain a lower pressure line.
- 2.2.4) **Plates**
- 2.2.4.1) Inlet/outlet modules type **AMF-SE-*** (see table AM-FSE)
This is a plate with standard HDF-ES interface (inlet) on one face and additional P and T ports (1/4" BSP) on one side. This plate is equipped with a NC 2/2 solenoid valve that discharge P line on T line (**AMF-SE-CO**);. This function is typical for simple acting cylinders.
In series with the NC 2/2 solenoid valve is possible to use a flow control valve that can be : throttle adjustable (**AMF-SE-CV**); fixed flow, pressure compensated (**AMF-SE-Q(*)**); adjustable flow pressure compensated (**AMF-SE-QV**)
- 2.2.4.2) Inlet/outlet module type **PD1-PT** (see table HD220/1).
This plate presents HDF-ES interface (inlet) on one face and P and T ports (1/4" BSP) on one side.
- 2.2.4.3) Inlet/outlet module type **PD1-03/32-5** (see table HD220/1).
This plate presents HDF-ES interface (outlet) on one face and P and T ports (3/8" BSP) on the other face.
- 2.2.4.4) Intermediate plate type **AMF-PM-TP** (see table HD220/1).
This modules permits change of circuit from "parallel" to "series" (T1→P2).
- 2.2.4.5) Steel closing plate type **PD1-03/32-0** (see table HD220/1).
- 2.2.4.6) Aluminium closing plate type **PD1-AL-0** (see table HD220/1).
Closing plate is not necessary when HDF-ES-*** or AMFC-ES-*** are used.
- 2.2.5) **In line valves and accessories**
- 2.2.5.1) In line throttle and check valve type **HFC-14** (see table AM-F14).
This valve can be screwed directly on the A and B exit ports of the HDF-ES-*** valves, obtaining free direct flow and restricted reverse flow (adjustable).
The presence of a "turning connector" allows the contemporary mounting of two valves on both ports of the solenoid valve.
- 2.2.5.2) If a fixed throttle on P or T lines is needed is possible to use the "section reducers" type **3S-***, that can be installed on the interested port under the seal.
- 2.2.5.3) To install the stack a mounting angle kit, type **MAF-KIT-2**, is available (see table HD220/1).

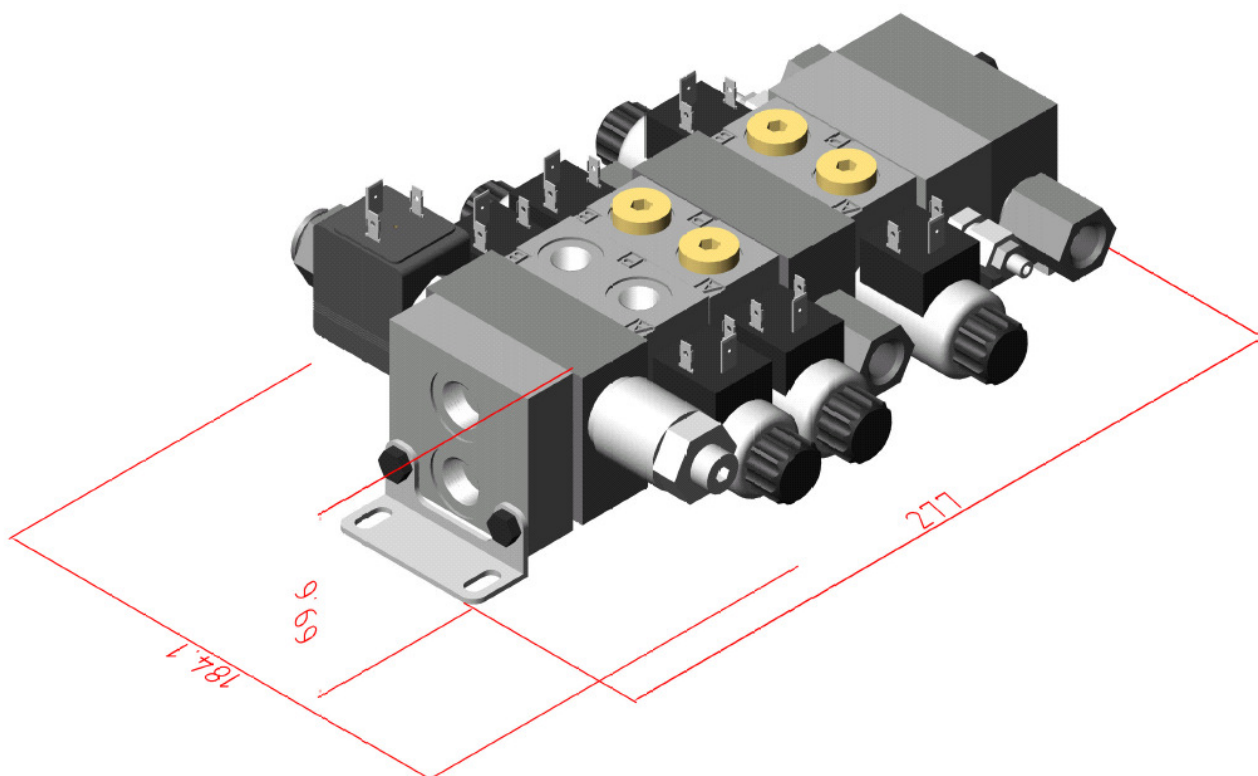
3) **Circuit examples**

The use of HDF system permits to obtain hydraulic circuits in very low dimensions. The following scheme can be taken as an example :



With HDF(*) stackable system is possible to realize this circuit using seven elements :

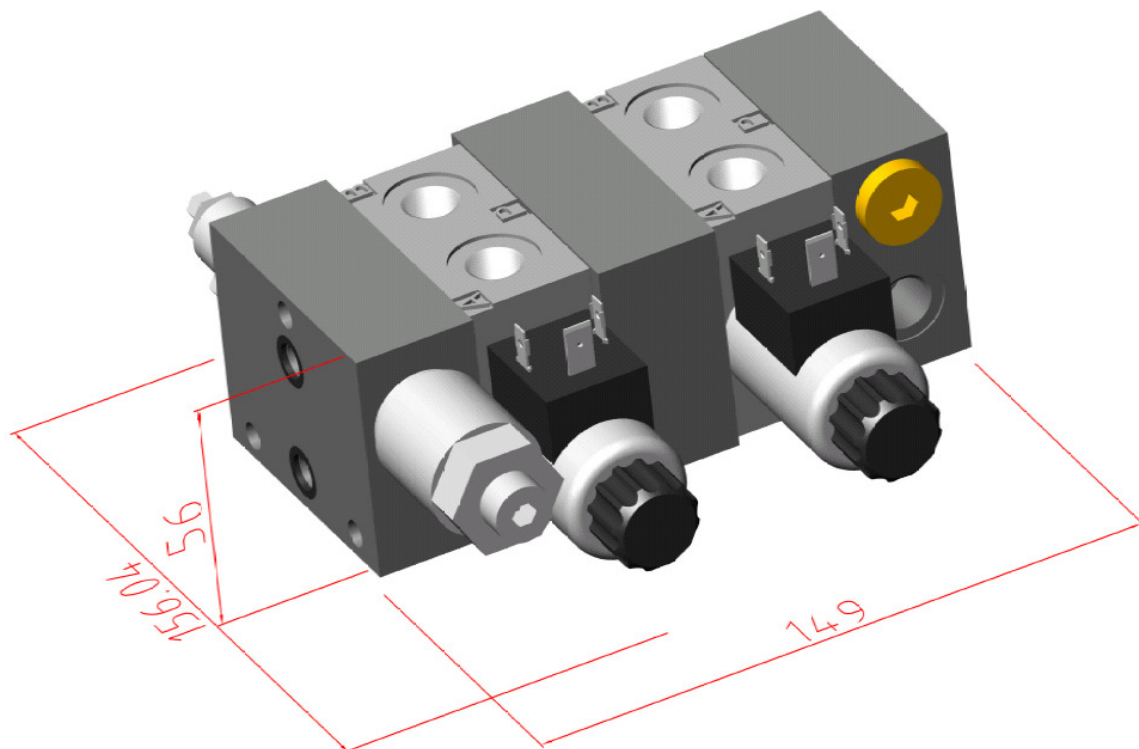
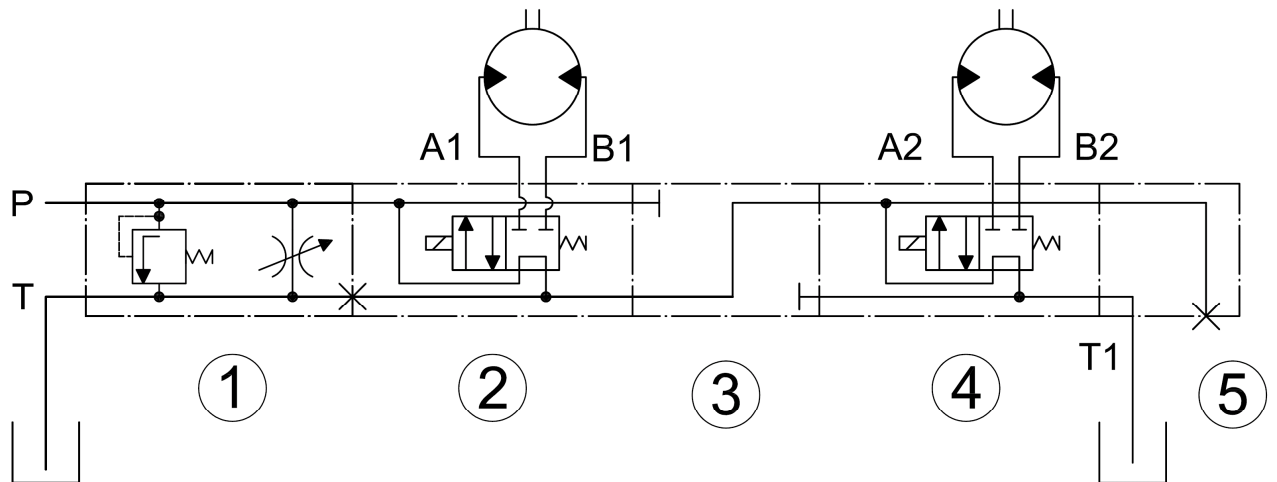
1. Inlet plate PD1-03/32-5 with P and T G 3/8 ports
2. By-pass valve in parallel with a pressure relief (AMF-MOP/*-EV20)
3. 4-way solenoid operated valve (HDF-ES-1C-****)
4. 4-way solenoid operated valve with internal A and B ports (HDF2-ES-3C-****)
5. Double p.o. check valve (AMF-CP-AB)
6. 4-way solenoid operated valve with internal A and B ports (HDF2-ES-3C-****)
7. Relief valve operating on A and B lines separately (AMF-MO-BA)
8. Double p.o. check valve, blind version(AMFC-CP-AB)
9. Mounting angle kit MAF-KIT-2



Tandem circuit example

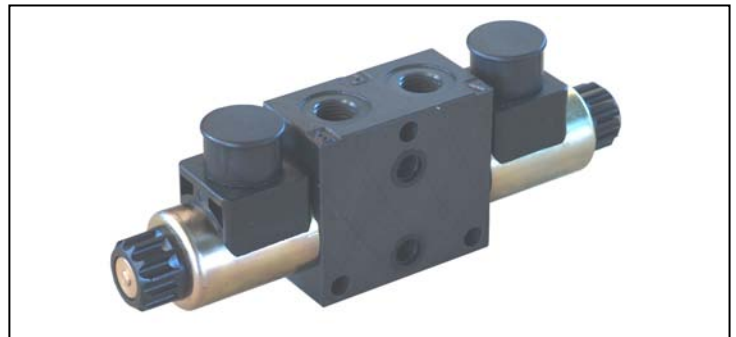
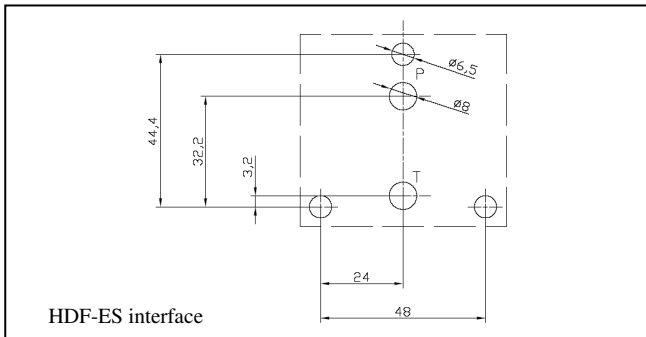
The use of AMF-PM-TP module permits to realize, shifting the flow from P to T line, a tandem circuit in very simple way. This leads to a small size of the block. This solution implies the need for an additional T port, which is available, for example in the closing element PD1-PT.

An example of a circuit with series connection of two hydraulic motors is shown in the following figures :



1. Pressure relief valve in parallel with a variable bleeding flow (AMF-MOP/*-CF)
2. 4- way solenoid operated valve (HDF-ES-4ML-****)
3. Intermediate plate for tandem circuit (AMF-PM-TP)
4. 4-way solenoid operated valve (HDF-ES-4ML-****)
5. Closing plate with additional G1/4 P(plugged) and T port (PD1-PT)
6. Stop on T line (between 1 and 2) type 3S-00

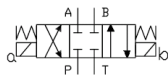
Directional Control Valves Solenoid Operated – Stackable Type HDF(*)-ES-*



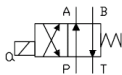
2 FUNCTIONAL SYMBOLS

Spring/Stroke combination for spool type "1"

1C



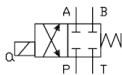
1LL



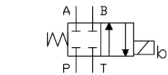
1LLb



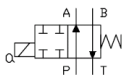
1ML



1MLb



1LM



1LMb



1 HOW TO READ THE MODEL CODE FOR VALVES HDF(*)-*

HDF	(*)	-	ES	-	(1)	(C)	*	-	(024C)	/	10
①	②		③		④	⑤	⑥		⑦		⑧

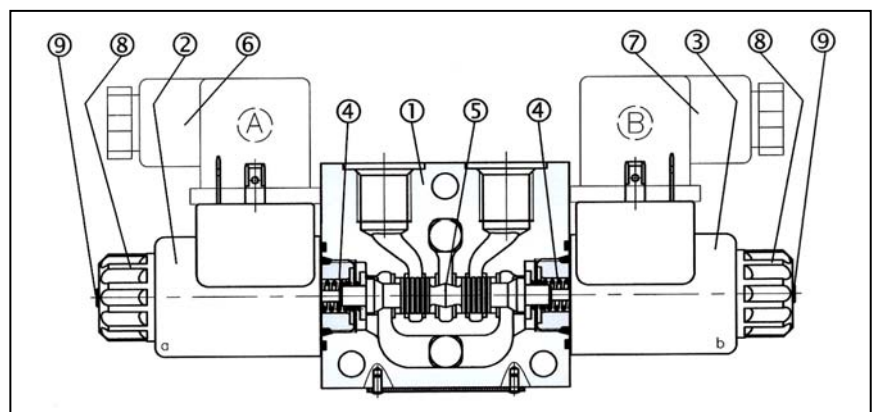
- ① **HDF**: 4-way directional control valve – Pressure 25 Mpa (250 bar)
- ② **(*)**: ports variants (see 9)
 - (C) : P and T not passing (closing element with seals)
 - (B) : P and T not passing (closing element without seals)
 - (2) : additional ports A and B on mounting surface
- ③ **ES**: electrically controlled, standard
- ④ **(1)** : spool type (see 7)
- ⑤ **(C)** : solenoid(s) and spring(s) arrangement, see also functional symbols 2.
 - C : 2 sol., spool is spring centered (3 position)
 - N : 2 sol., spool is detented (2 position)
 - LL : 1 sol. (a), spool is spring offset (2 position, end to end)
 - ML : 1 sol. (a), spool is spring offset (2 position, middle to end)
 - LM : 1 sol. (a), spool is spring offset (2 position, end to middle)
- ⑥ ***** : Code reserved for option and variants
 - b : only for version LL, ML, LM
sol. b installed (instead of sol. a)
 - S-** : calibrated orifice on P port (see 11)
 - ZT : body, solenoid tubes and coils are zinc trivalent plated
- ⑦ **(024C)** : Electric voltage and solenoid coils
 - 0000 : no coil(s)
 - 012C : coil(s) for V12DC
 - 024C : coil(s) for V24DC
 - 220R : coil(s) for V220/50 – V230/60 AC
- ⑧ Design number (progressive) of the valves

3 DESCRIPTION

The spool 5 shifts in to the valves body 1 subject to the action of springs 4 and solenoids 2 3

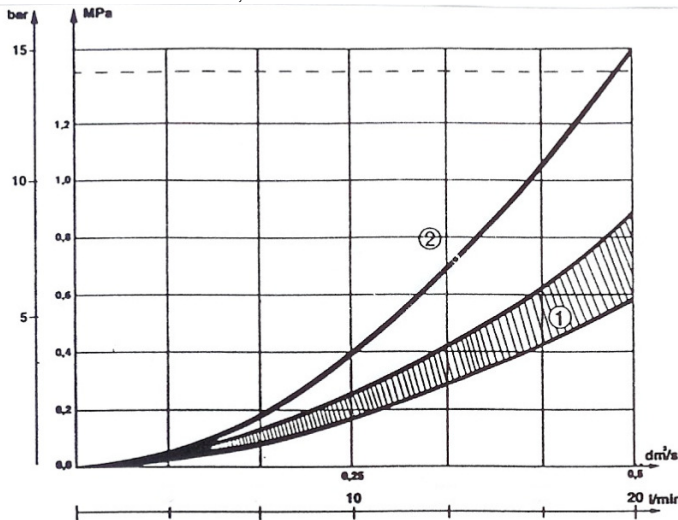
Spool 5 depending from its shape and its position in the valves body 1, opens and/or closes passages between P, A, B, T ports, thus controlling the direction of the hydraulic flow.

Solenoids 2 and 3 are energized by electric current flowing-in through connectors 6 and 7; in case of electric cut-offs, the spool can be manually shifted by acting on the emergency pins 9, located at the end of the solenoids and accessible through the retaining nuts 8.



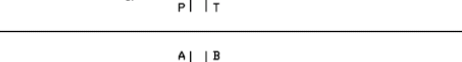
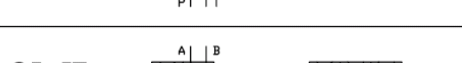
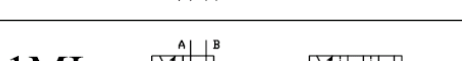
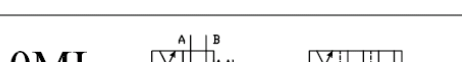
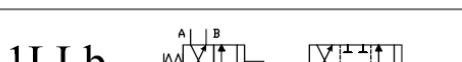
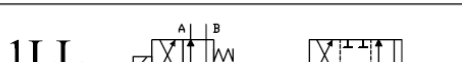
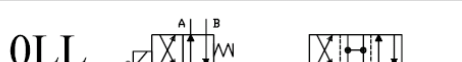
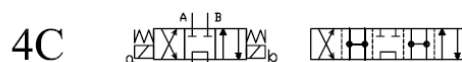
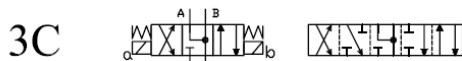
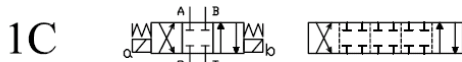
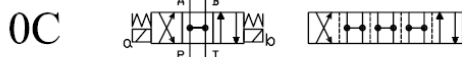
4 TYPICAL DIAGRAMS

Typical Δp -Q curves for valves HDF - ES - * in standard configuration, with mineral oil at 36 cSt and at 50°C for flow P → A/B, A/B → T



① = all spool P → A/B and A/B → T
 P → T spool 4
 ② = P → A/B spool 4

7 SPOOL IDENTIFICATION AND INTERMEDIATE POSITION TRANSITORIES



5 TECHNICAL DATA

nominal flow	20 l/min
maximum rec. flow rate	25 l/min
maximum nominal pressure (P,A,B)	25 MPa (250 bar)
maximum pressure at T port	20Mpa (200bar)
pressure drops	see 4.
electric characteristics	see 6.
protection to DIN 40050	IP 65
duty cycle	100%
service life	≥ 10 ⁷ cycles
dimensions	see
installation	see
mass	approx

6 ELECTRIC CHARACTERISTICS

Valves type HDF-ES-* are operated by solenoid that are energized:

- directly from a D.C. voltage supply:
 V 12 DC
 V 24 DC.
- by the use of connectors that incorporate a full wave bridge rectifier, from A.C. voltage supply:
 V 220/50 (V 230/60).

All connectors must conform to ISO 4400 (DIN 43650) and electric circuitry must be able to carry the following rated current values:

- V 12 DC = 1,83 A
 - V 24 DC = 0,92 A
 - V 220 R = 0,08 A
- Permissible supply voltage variation:
 +5% -10%

8 FUNCTIONAL SYMBOLS

Spools, springs and solenoids combination permit to obtain almost every type of ports (P, A, B, T) connection and sequence.

For almost all types of solenoids/springs combination and for all type of spools (with the exception of spool 4), when solenoid "a" is energized, hydraulic connections are P → B and A → T; to obtain P → A and B → T solenoid "b" must be energized.

The hydraulic connections that are obtained in the "central" (neutral) position when solenoids are not energized is the characteristic mark of the spool shape and from it derives its identification number:

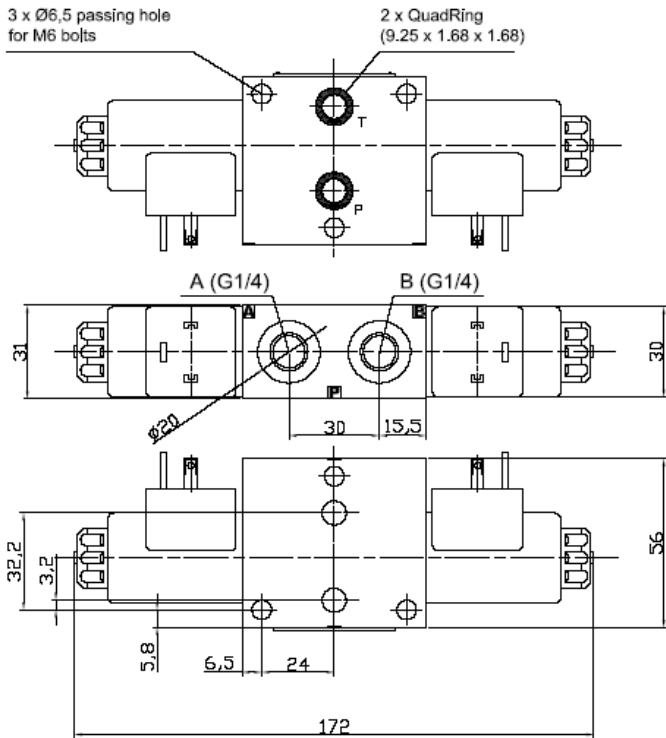
- 0 = P, A, B, T connected
 - 1 = P, A, B, T closed
 - 3 = P closed, A, B, T, connected
- for other types see 7.

9

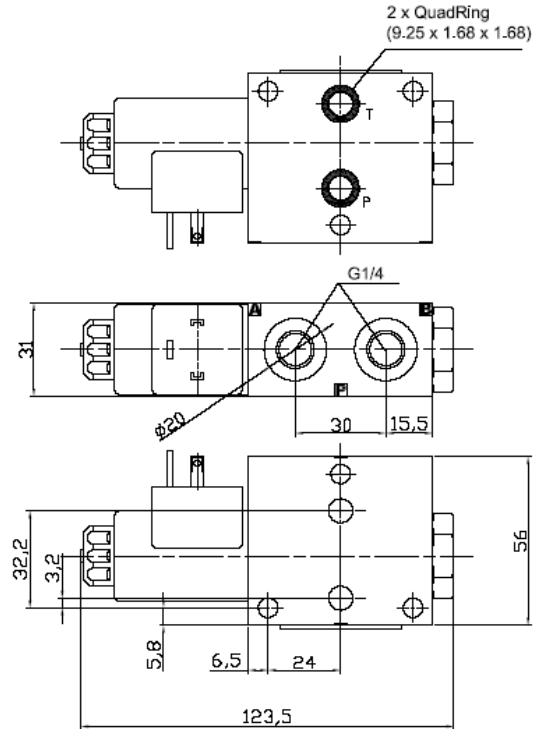
INSTALLATION DIMENSIONS

(all dimensions are mm)

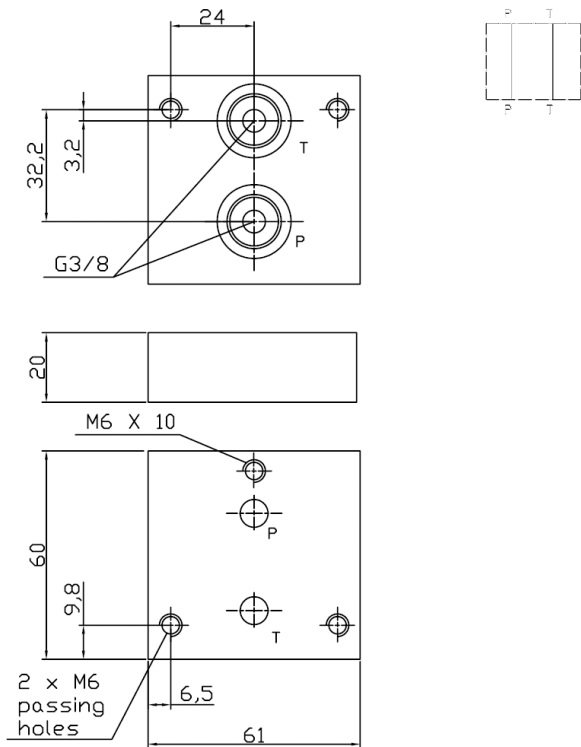
HDF-ES-(1)C-*



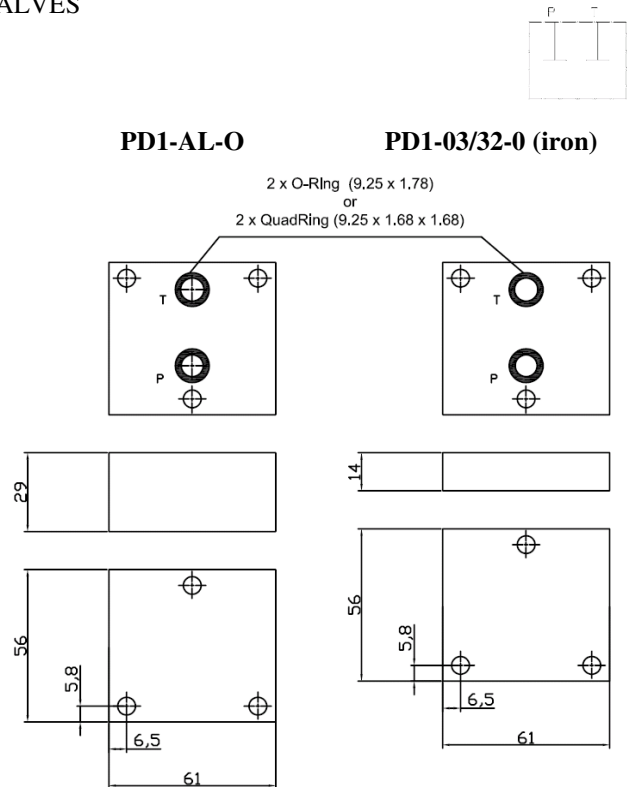
HDF-ES-(1)LL ; HDF-ES-(1)ML-* ; HDF-ES-(1)LM-*



INLET PLATE, STACKABLE WITH HDF(*)-ES VALVES, TYPE PD1-03/32-5



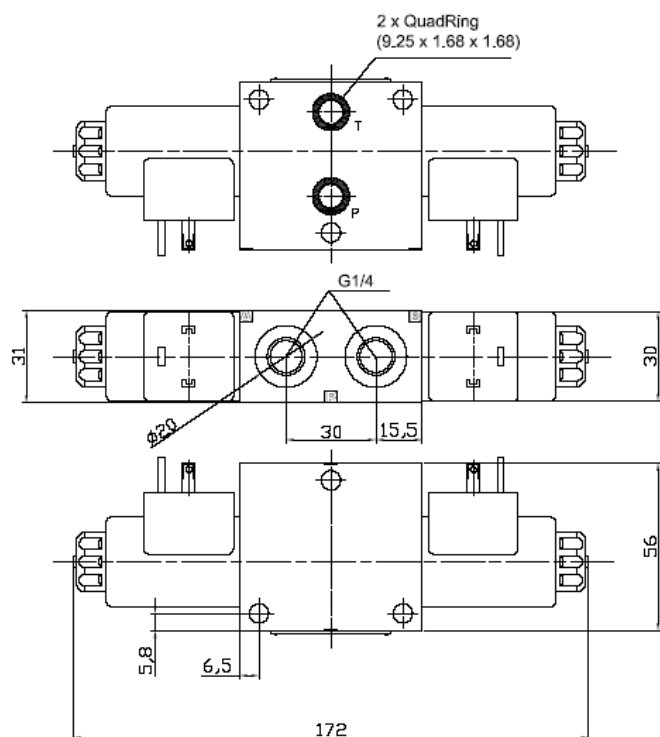
CLOSING PLATES, STACKABLE WITH HDF(*)-ES VALVES



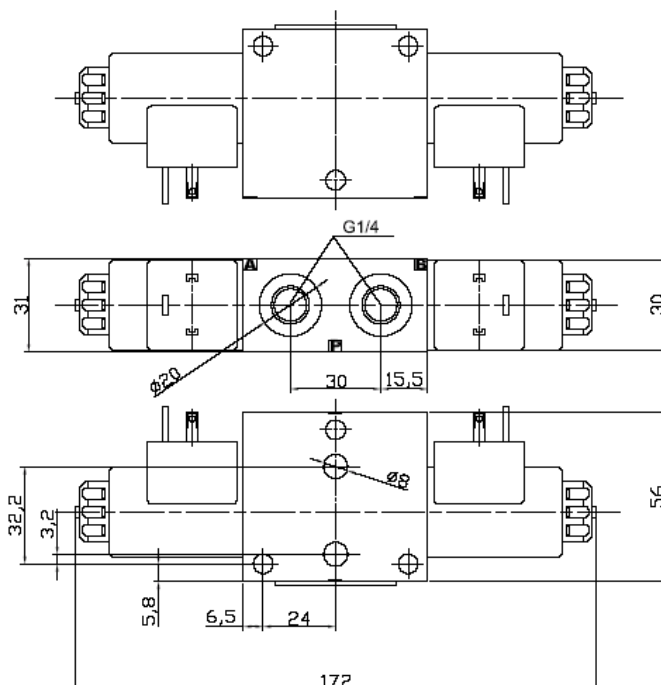
INSTALLATION DIMENSIONS

(all dimensions are mm)

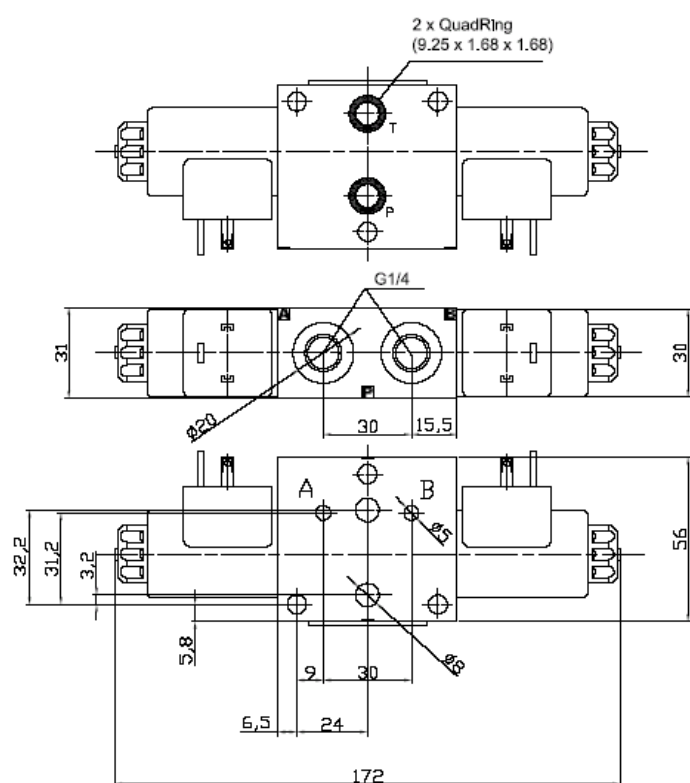
HDFC-ES-*



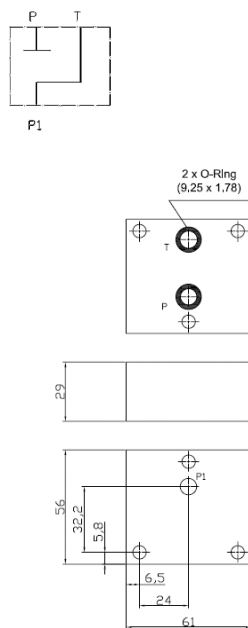
HDFB-ES-*



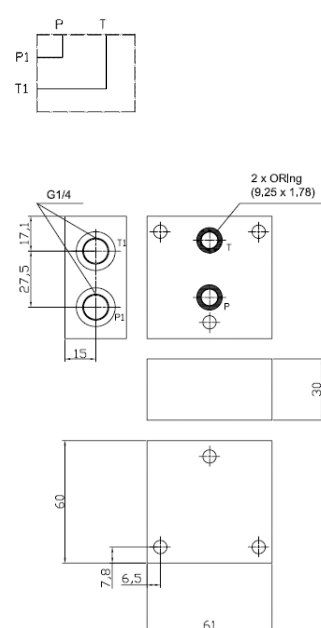
HDF2-ES-*



TANDEM CIRCUIT
PLATE, STACKABLE
WITH
HDF(*)-ES VALVES,
TYPE AMF-PM-TP



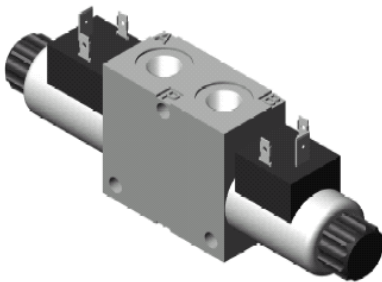
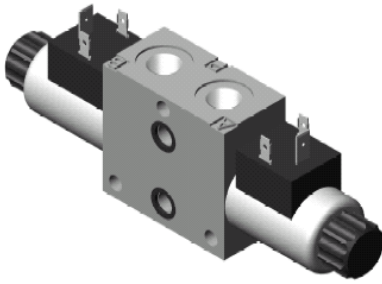
INLET/OUTLET PLATE,
STACKABLE WITH
HDF(*)-ES VALVES, TYPE
PD1-PT



10

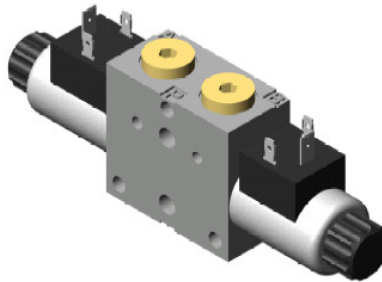
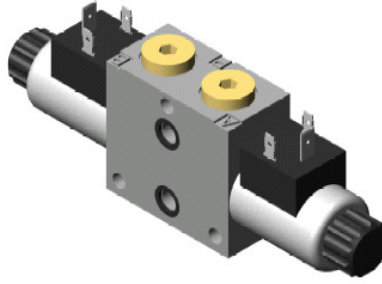
PORTS VARIANTS

HDFC-ES-*



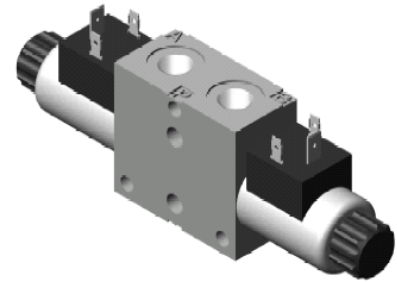
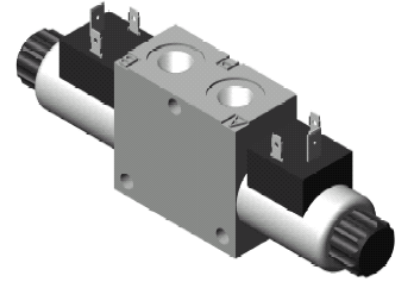
Suitable to be used as closing element in a stack of HDF-ES-* valves

HDF2-ES-*



Especially designed (with A and B additional ports) to be stacked with the double pilot operated check valve type AMF-CP-AB (see table AM-F50). HDF2-ES-* valves are supplied with G1/4 A and B ports plugged

HDFB-ES-*

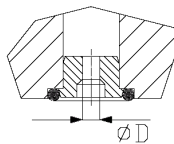


Suitable to be used as closing element in a stack of HDF-ES-* valves

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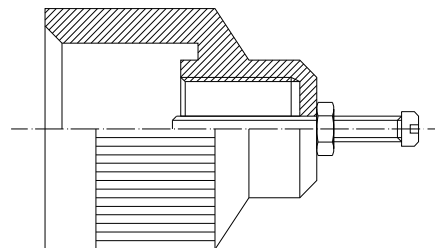
OPTIONS

Available for P and T lines “section reducer” or “stop” with O ring



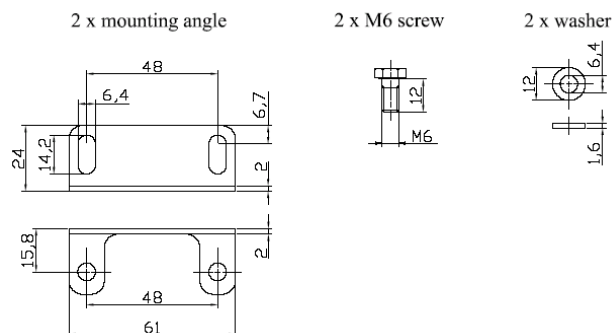
D (mm)	CODE
0	3S-00
1,0	3S-10
1,5	3S-15
2,0	3S-20
2,5	3S-25

Standard retaining nut can be replaced by a mechanical override nut device, code G01-E:



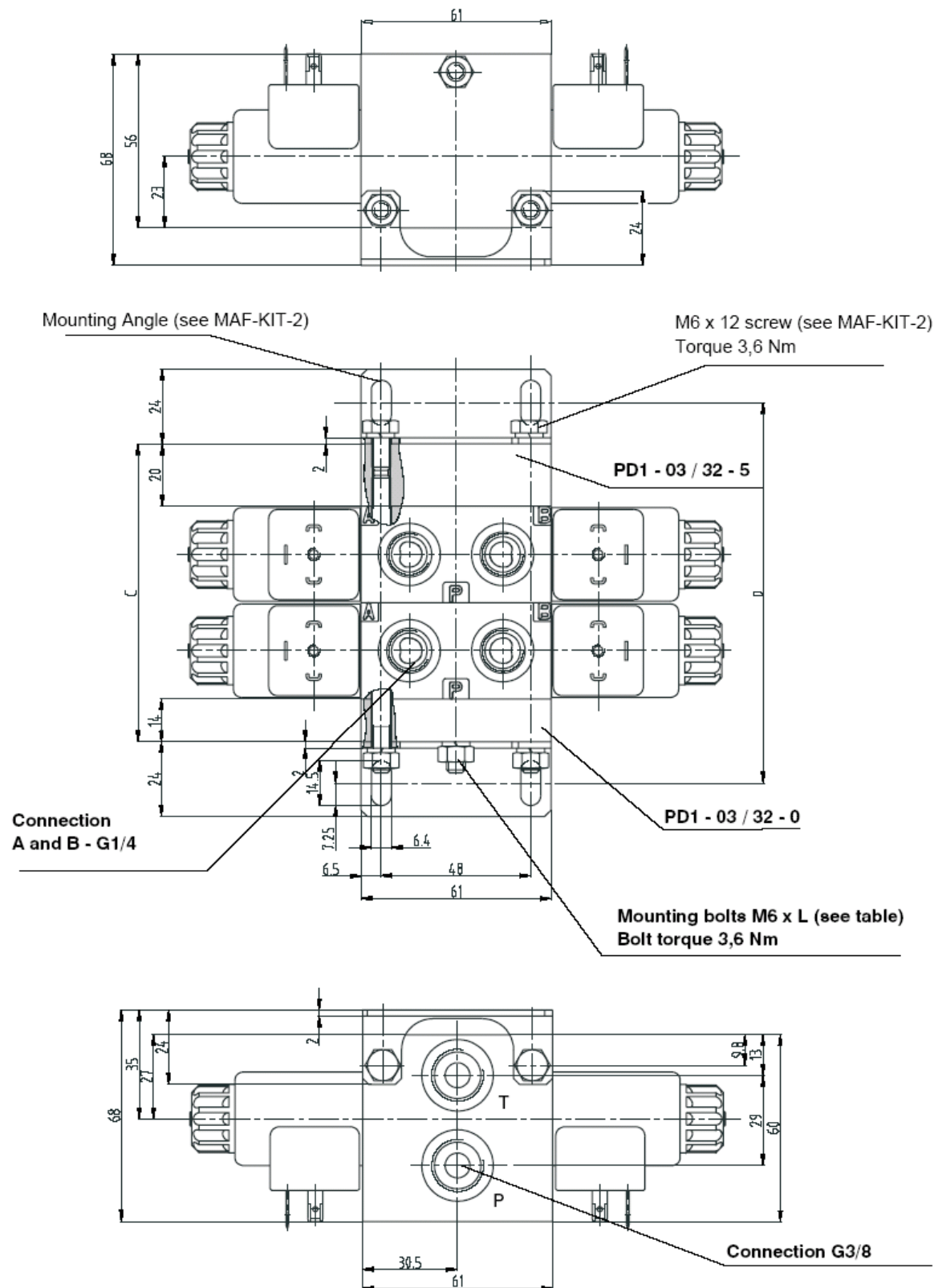
MOUNTING ANGLES KIT TYPE MAF-KIT-2

Fixing elements for HDF-ES-* stack :



Block Assembly

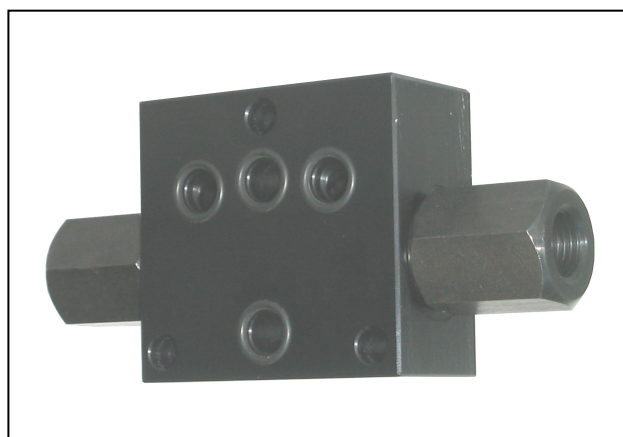
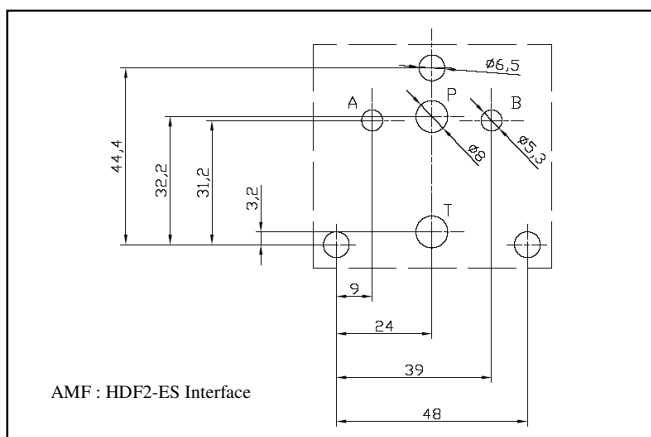
Dimensions in millimeters



Dimensions

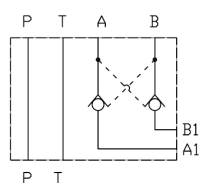
Number of section	1	2	3	4	5	6	7	8
Dimension C [mm]	65	96	127	158	189	220	251	282
Dimension D [mm]	91,5	122,5	153,5	184,5	215,5	264,5	277,5	308,5
Dimension L [mm]	55	100	133	163	194	224	256	287

Stackable Valves AMF Pilot Operated Check Valve Type AMF(C)-CP-AB

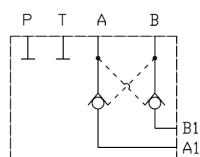


FUNCTIONAL SYMBOLS

AMF-CP-AB



AMFC-CP-AB



DESCRIPTION

Fluid flows freely on P and T lines (AMF-CP-AB).

Fluid is blocked on P and T lines (AMFC-CP-AB).

On service lines A and/or B with p.o. check, fluid flows A → A1 (and/or B → B1) overcoming the force of spring 1 acting on poppet 2 and fluid is blocked A1 → A (and/or B1 → B).

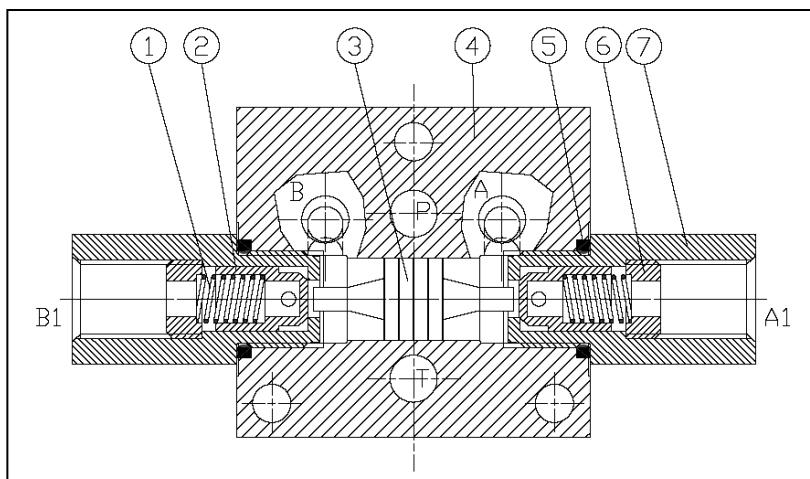
When, by switching the solenoid 4-way directional valve, pressure is made available, at, for instance, port B, fluid flows B → B1 and the pilot piston 3, shifting from its central position, forces poppet 2, on service line A, to open and permit flow A1 → A.

HOW TO READ MODEL CODE FOR VALVES AMF-CP-AB

AMF(C) – CP – AB – * – * / 10

(1) (2) (3) (4) (5) (6) (7)

- (1) AMF: module stackable with 4 way solenoid valve type HDF2-ES (with P and T passing)
- (2) (C) : end of stack module (P and T plugged)
- (3) CP : check valve, pilot operated (hydraulically);
- (4) AB : service lines where the controls operate;
- (5) * : check valve opening pressure for free flow A → A1 and B → B1;
- (6) * : code reserved for options and variants;
- (7) 10 : design number (progressive of the valve);



DATA AND OPERATING LIMITS

Maximum rec. flow rate	20 l/min
Maximum nominal pressure	25 MPa (250 bar)
Pilot area ratio piston/check valve	approx 4.7
Piloting pressure	to shift the pilot piston and to open the check in A the piloting pressure must be, at B :

$$P_p = P_b = \frac{P_{a1} + P_m - P_a}{4.7} + P_a$$

where : P_p = piloting pressure
 P_b = pressure in B
 P_a = pressure in A
 P_{a1} = pressure in A1
 P_m = check valve opening pressure (spring)

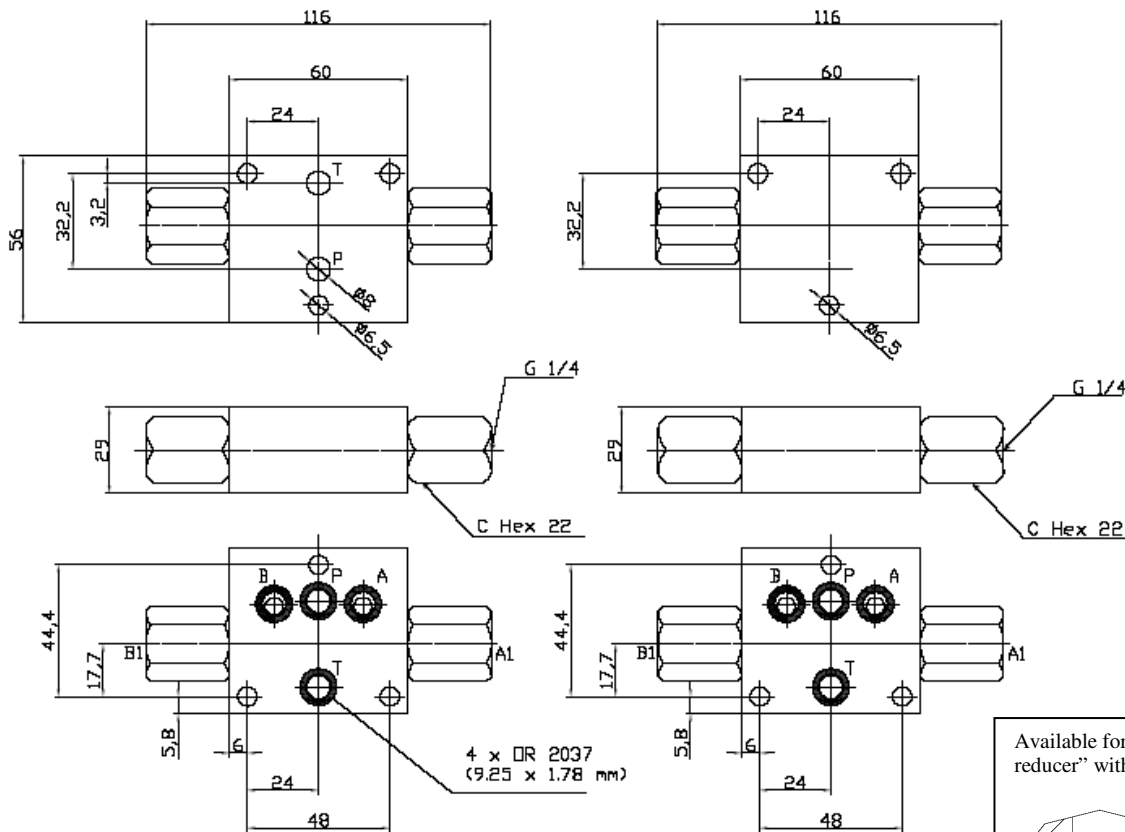
HYDRAULIC FLUIDS

Seals and materials used on standard valves AMF are fully compatible with hydraulic fluids of mineral oil base, upgraded with antifoaming and antioxidant agents.
 The hydraulic fluid must be kept clean and filtered to ISO 4406 class 21/18/15, or better, and used in a recommended viscosity range from 10 cSt to 60 cSt.

INSTALLATION DIMENSIONS

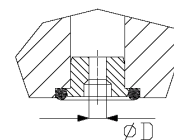
AMF-CP-AB

AMFC-CP-AB



A1 = 1/4" BSPP
 B1 = 1/4" BSPP

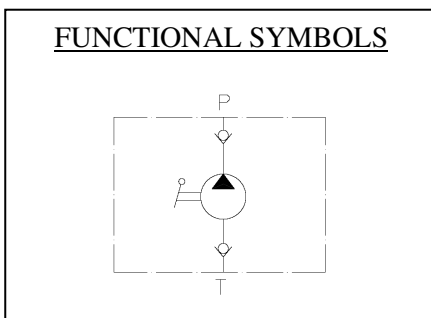
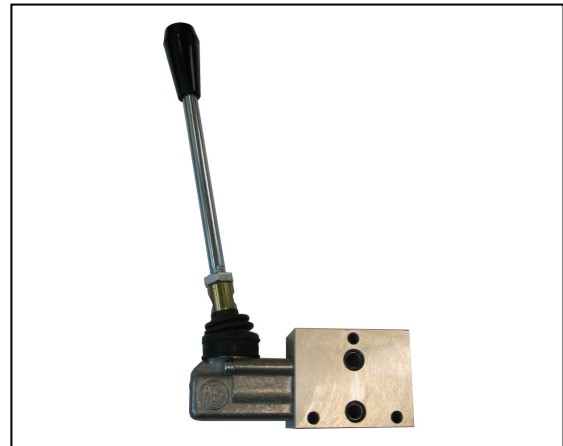
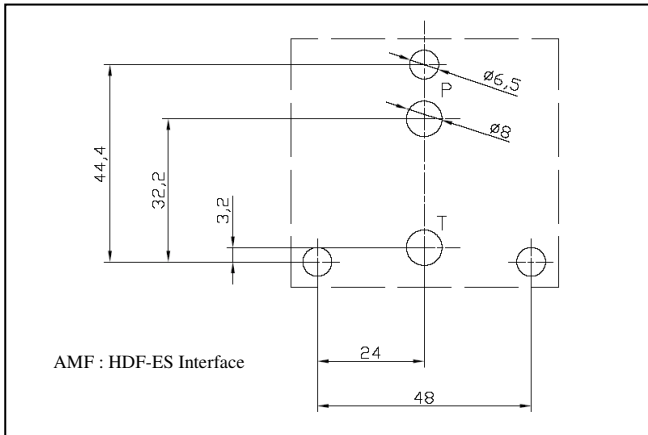
Available for P and T lines "section reducer" with O ring



D (mm)	CODE
1,0	3S-10
1,5	3S-15
2,0	3S-20
2,5	3S-25

All dimensions are mm

Stackable Hand Pump Type AMF-HP2

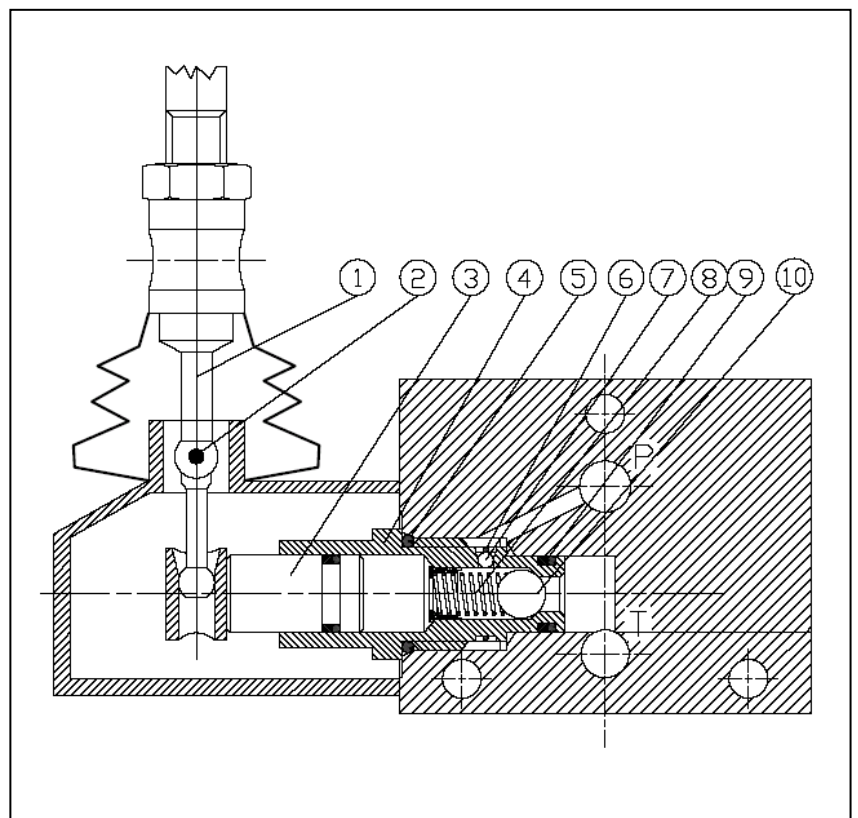


HOW TO READ MODEL CODE FOR AMF-HP2-*/10

- AMF : module stackable with 4 way solenoid valve type HDF-ES
- HP2 : hand pump 2 cm³
- * : code reserved for options and variants
- 10 : design number (progressive) of the pump module

DESCRIPTION

On the intake stroke piston 3 moves backward and fluid flows from port T through check valve 10, while check valve 6 is kept close. When lever moves piston 3 forward, check valve 10 is kept close by spring 8, while check valve 6 opens and permits fluid to flow in pressure line.



DATA AND OPERATING LIMITS

Displacement 2 cm³ each (double) stroke

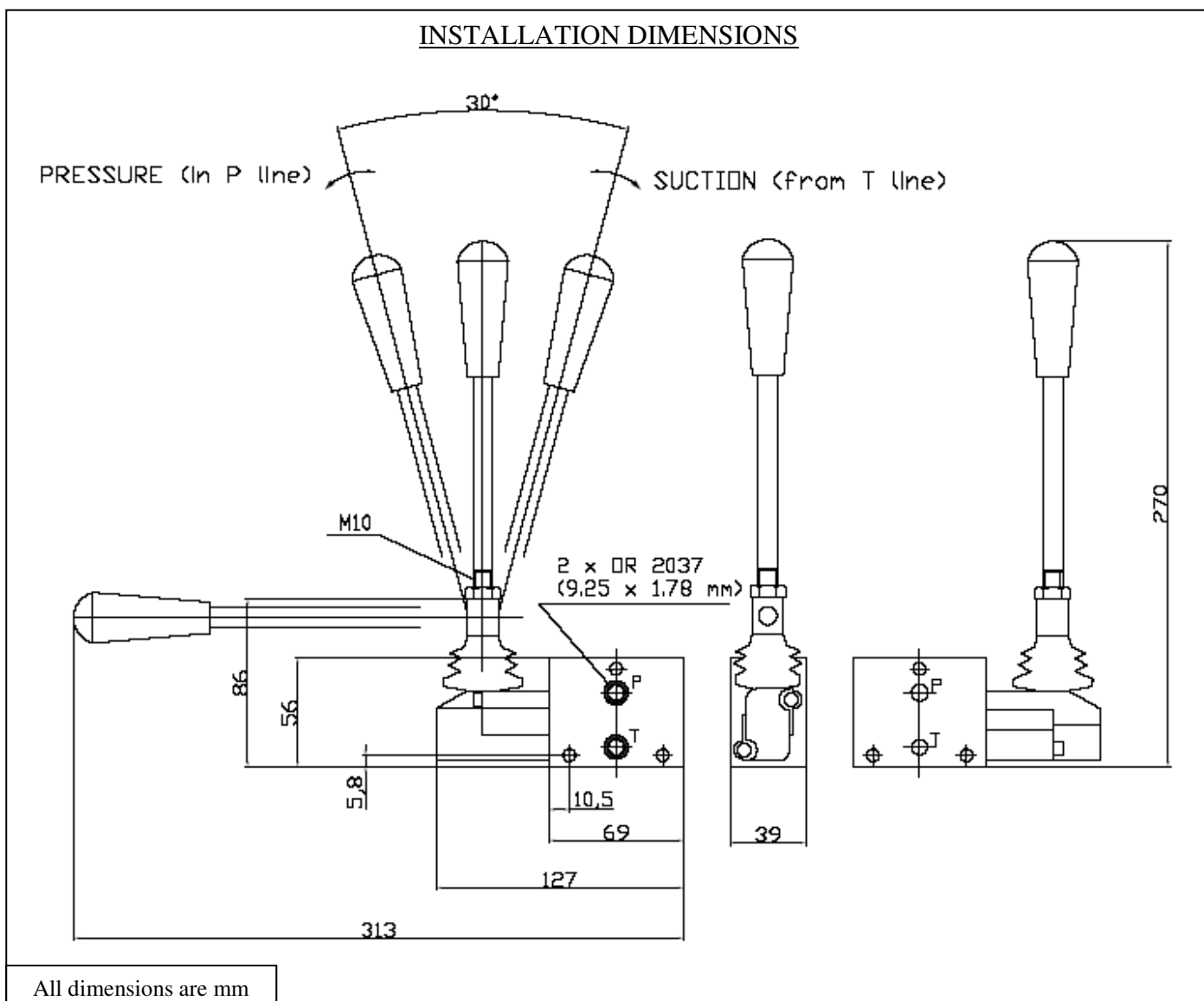
Maximum pressure 200 bar

Lever is normally used only in case of emergency and can be screwed in two different positions (vertical or horizontal)

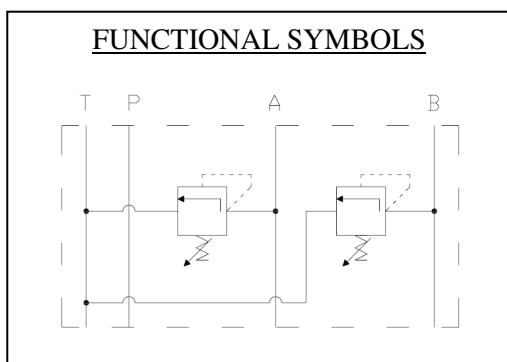
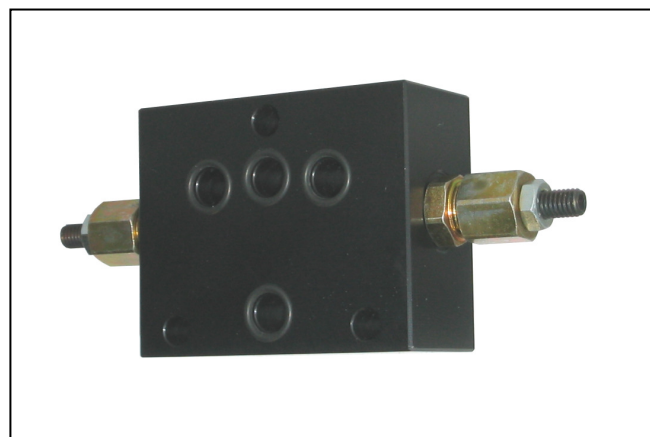
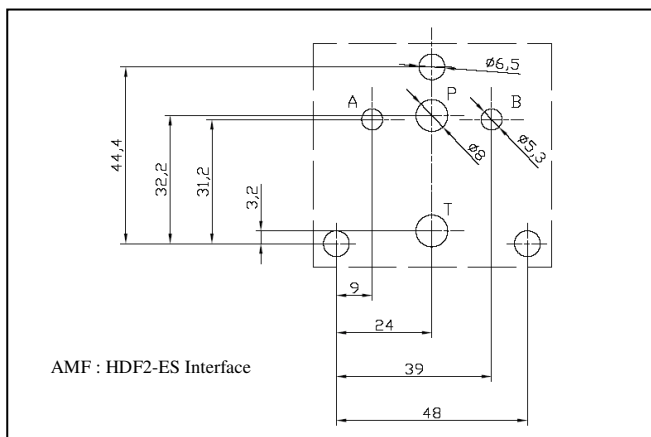
HYDRAULIC FLUIDS

Seals and materials used on standard valve AMF are fully compatible with hydraulic fluids of mineral base, upgraded with antifoaming anti oxidizing agents.

The hydraulic fluid must be kept clean and filtered to ISO 4406 class 21/18/15, or better, and used in a recommended viscosity range from 10 cSt to 60 cSt.



Stackable Valves AMF Pressure Relief Valve Type AMF-MO-BA



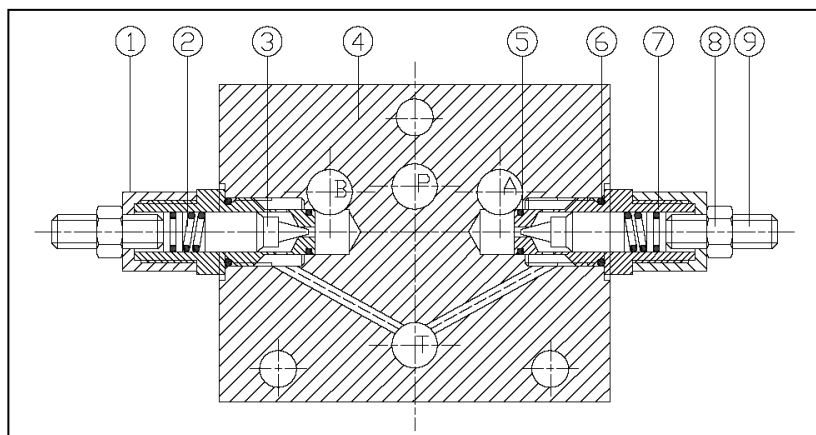
HOW TO READ MODEL CODE FOR VALVES AMF-MO-BA

AMF - MO - BA - (*) - (*) / 10
(1) (2) (3) (4) (5) (6)

- (1) AMF : module stackable with 4 way solenoid valve type HDF2-ES
- (2) MO : pressure relief valve
- (3) BA : service lines where the control operates : A → T and B → T
- (4) - : standard pressure range up to 250 bar
- (5) (*) : code reserved for options and variants
- (6) 10 : design number (progressive) of the valve

DESCRIPTION

Fluid flows freely on A, B, P and T lines.
When on service line, protected by the relief valve, the pressure exceeds the settled value, the piston 3 is pushed by axial hydraulic forces, overcomes the force of spring 2, and shifts in its cylindrical seat and opens to the pressurized fluid annular passage to T, thus keeping the pressure level at the requested value



DATA AND OPERATING LIMITS

Maximum rec. flow rate in P and T lines 20 l/min
 Maximum rec. flow rate in A and B lines 6 l/min
 Maximum nominal pressure 25 MPa (250 bar)

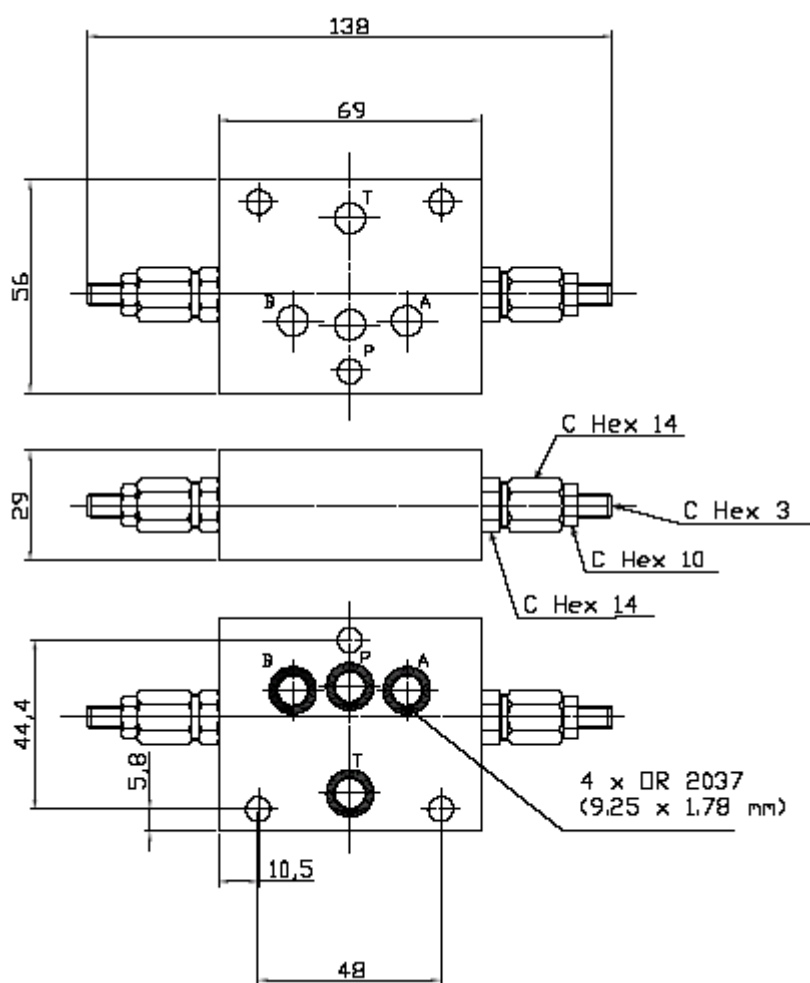
ADJUSTMENT OF THE RELIEF PRESSURE

Relief pressure is reached when the axial hydraulic forces on piston 3 equal the force on spring 2 ; the value of the relief pressure can be therefore changed, within the range, by changing the compression of spring 2.
 To increase the relief pressure, turn clock wise the adjustment screw 9, after having unlocked its nut 8.

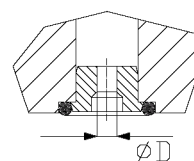
HYDRAULIC FLUIDS

Seals and materials used on standard valves AMF are fully compatible with hydraulic fluids of mineral oil base, upgraded with antifoaming and antioxidizing agents.
 The hydraulic fluid must be kept clean and filtered to ISO 4406 class 21/18/15, or better, and used in a recommended viscosity range from 10 cSt to 60 cSt.

INSTALLATION DIMENSIONS



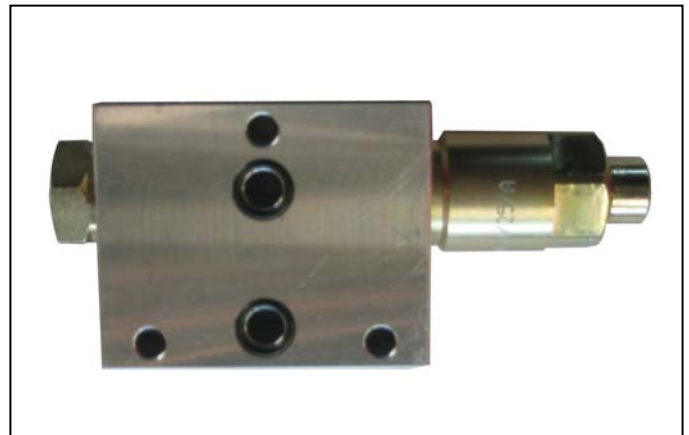
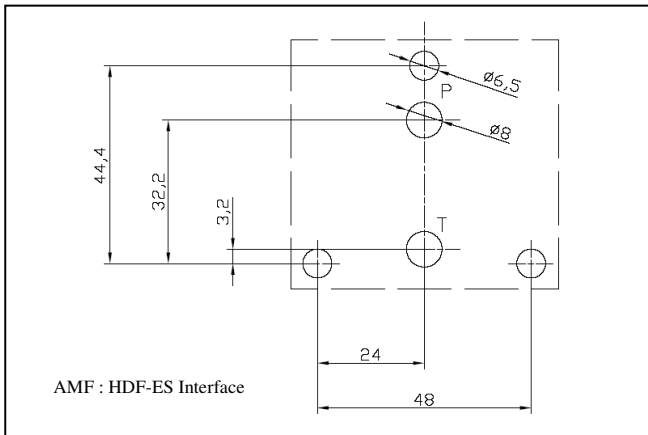
Available for P,T,A and B lines “section reducer” with O ring



D (mm)	CODE
1,0	3S-10
1,5	3S-15
2,0	3S-20
2,5	3S-25

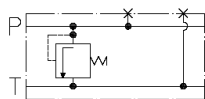
All dimensions are mm

Stackable Valves AMF Combined Pressure Relief Type AMF-MOP/*

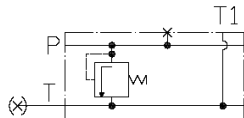


FUNCTIONAL SYMBOLS

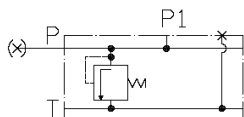
AMF-MOP/*-CC



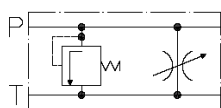
AMF-MOP/*-T1



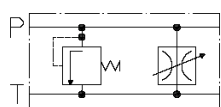
AMF-MOP/*-P1



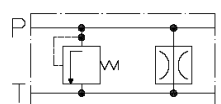
AMF-MOP/*-C*



AMF-MOP/*-QV



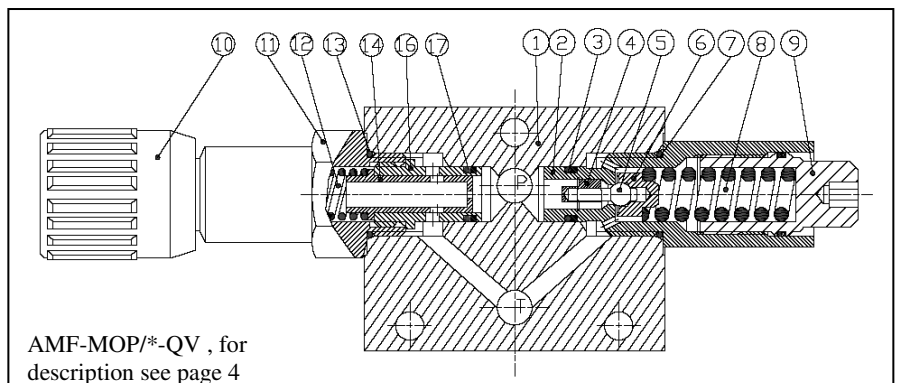
AMF-MOP/*-Q(*)



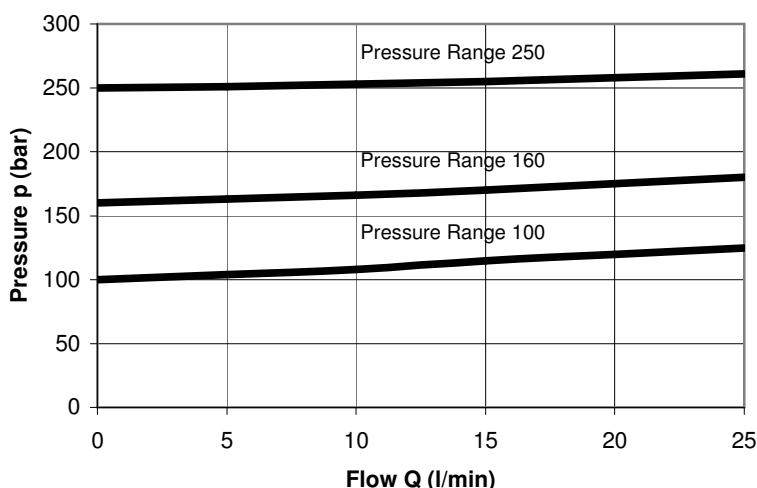
HOW TO READ MODEL CODE FOR VALVES AMF-MOP

AMF - MOP / (10) - (QV) - * / 10
(1) (2) (3) (4) (5) (6)

- (1) AMF : module stackable with HDF-ES 4 way solenoid valve
- (2) MOP : pressure relief on P line
- (3) (10) : pressure adjustment ranges
10 : from 32 to 100 bar
16 : from 63 to 160 bar
25 : from 100 to 250 bar
- (4) (QV) : additional port or bleeding arrangement
CC : no auxiliary port
P1 : P auxiliary port 1/4" BSPP
T1 : T auxiliary port 1/4" BSPP
CF : bleeding P → T by variable throttle
CV : bleeding P → T by variable throttle with graduated knob
QV : bleeding P → T by variable pressure compensated flow control
Q(1) : bleeding P → T by fixed pressure compensated flow control (1=1 l/min, 2=2 l/min, 3=3 l/min,
- (5) * : code reserved for options and variants
- (6) 10 : design number (progressive) of the valves



TYPICAL DIAGRAMS OF PRESSURE RELIEF VALVE



DATA AND OPERATING LIMITS OF PRESSURE RELIEF VALVE

Maximum rec. flow rate 20 l/min

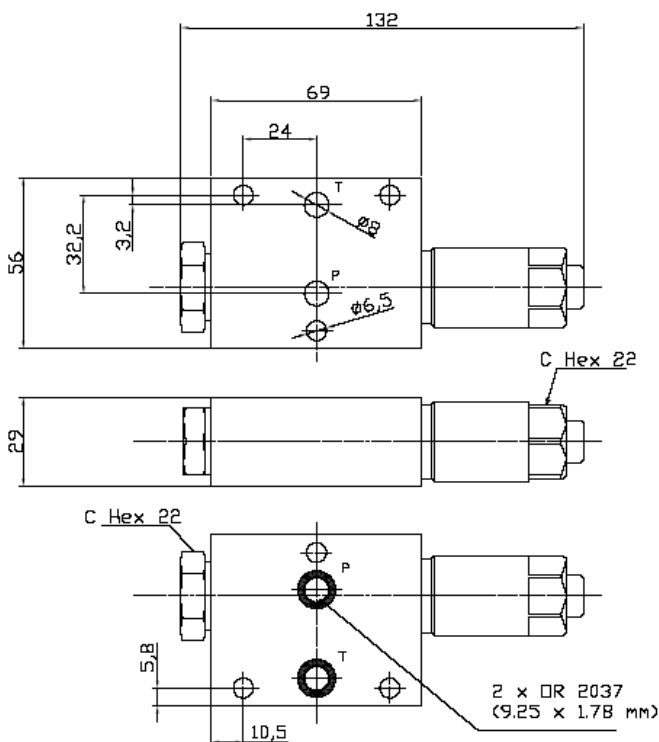
Maximum nominal pressure 25 Mpa (250 bar);

ADJUSTMENT OF THE RELIEF PRESSURE

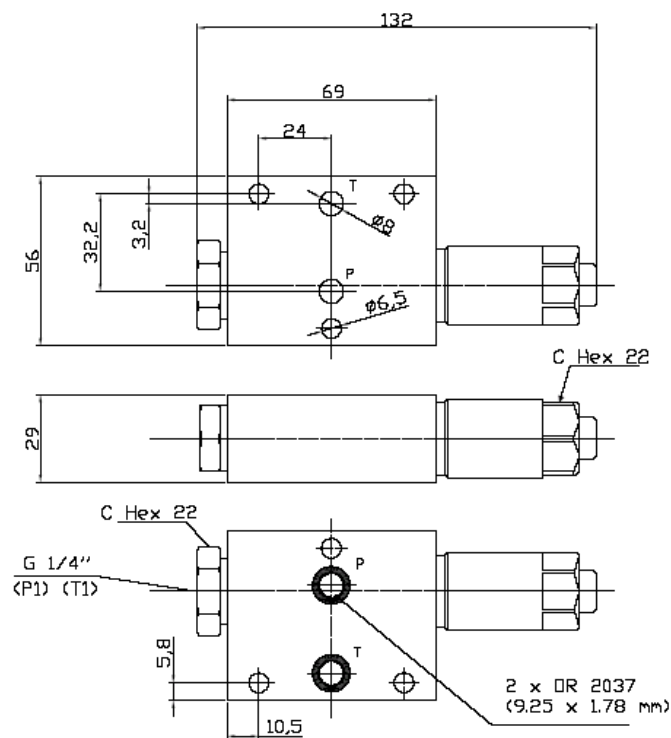
Relief pressure is reached when the axial hydraulic forces on piston 5 equal the force on spring 8; the value of the relief pressure can be therefore changed, within the range, by changing the compression of spring 8. To increase the relief pressure, turn clock wise the adjustment nut 9.

INSTALLATION DIMENSIONS

AMF-MOP-CC

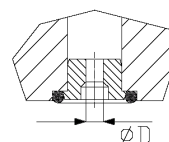


AMF-MOP-P1 ; AMF-MOP-T1



(P1) = 1/4" BSPP
(T1) = 1/4" BSPP

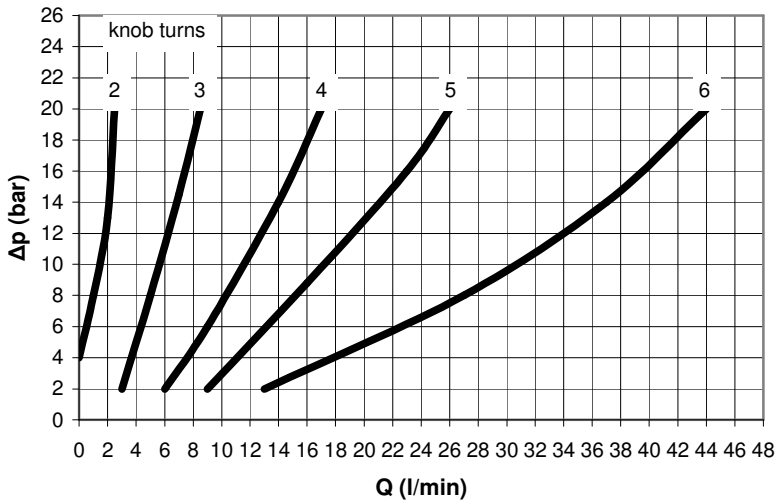
Available for P and T lines "section reducer" with O ring



D (mm)	CODE
1,0	3S-10
1,5	3S-15
2,0	3S-20
2,5	3S-25

All dimensions are mm

TYPICAL DIAGRAMS OF FLOW CONTROL VALVE TYPE FT-266/2-34



DATA AND OPERATING LIMITS OF FLOW CONTROL VALVE

Maximum rec. flow rate in service lines 20 l/min

Maximum flow rate in bleeding line 16 l/min

Maximum nominal pressure 25 MPa (250 bar)

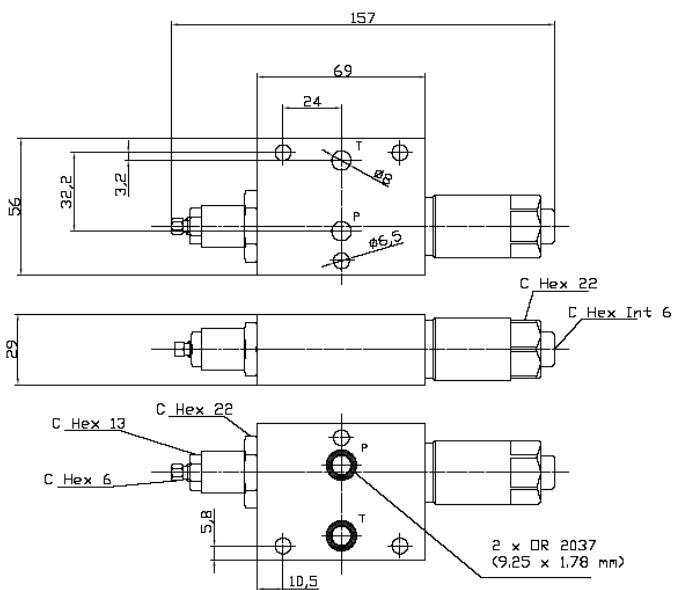
ADJUSTMENT OF THE BLEEDING FLOW

Bleeding flow, taken from main P line, is regulated by a variable throttle valve (type VCF-34 or FT266/2-34) that changes the section of an annular passage to T line.

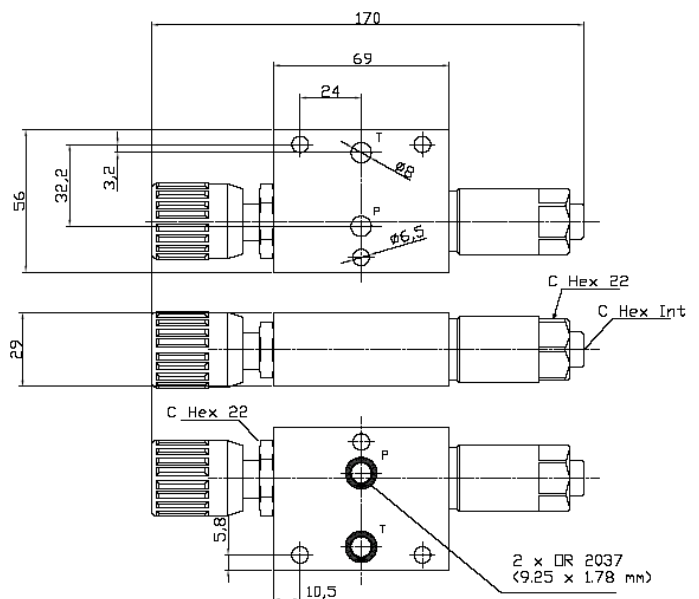
To decrease bleeding flow rate, from main P line to main T line, turn clockwise the graduated knob or the adjustment screw, after having unlocked its nut.

INSTALLATION DIMENSIONS

AMF-MOP-CF
(With VCF-34)

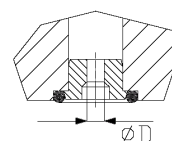


AMF-MOP-CV
(with FT-266/2-34)



All dimensions are mm

Available for P and T lines "section reducer" with O ring



D (mm)	CODE
1,0	3S-10
1,5	3S-15
2,0	3S-20
2,5	3S-25

DATA AND OPERATING LIMITS OF VARIABLE PRESSURE COMPENSATED FLOW CONTROL VALVE

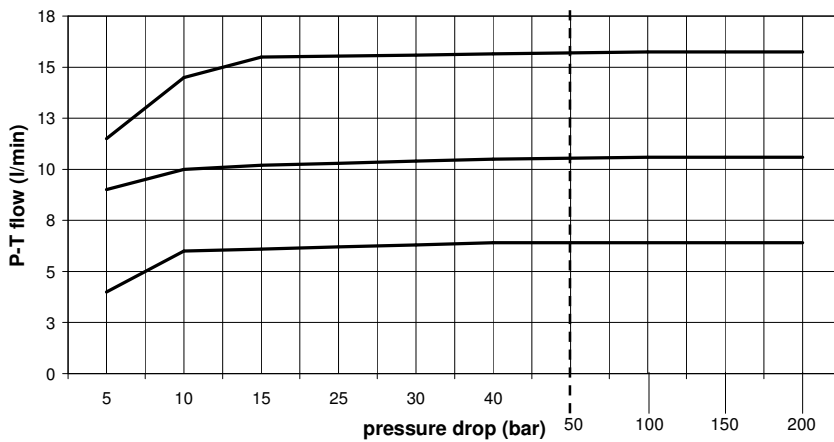
Maximum rec.flow rate	20 l/min
Maximum rec. flow rate in Bleeding lines	16l/min
Maximum nominal Pressure	25 MPa (250 bar)

ADJUSTMENT OF THE BLEEDING FLOW

Bleeding flow, taken from main P line, is regulated by a variable pressure compensated flow control valve (type FT 268/2), that changes the flow rate to T line.

To decrease bleeding flow rate, from main P line to main T line, turn anticlockwise the graduated knob of valve FT-268/2-34

TYPICAL DIAGRAMS OF VARIABLE PRESSURE COMPENSATED FLOW CONTROL VALVE TYPE FT-268/2-34



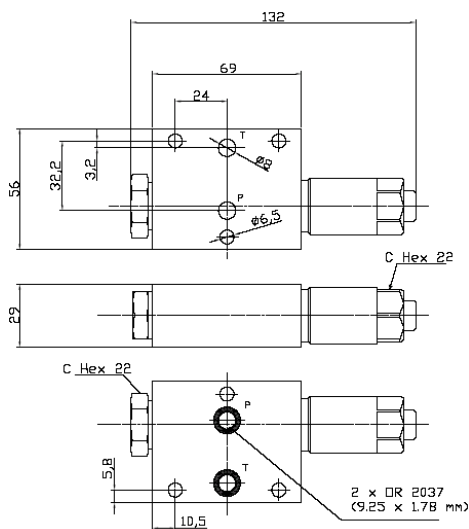
DESCRIPTION

Fluid flows in P line and a part a of it bleeds to T line trough orifice of the throttle 14. When pressure difference between P and T increases the throttle 14 moves against the spring 12 reducing the area of lateral orifices, thus keeping bleeding flow rate constant at the requested value.

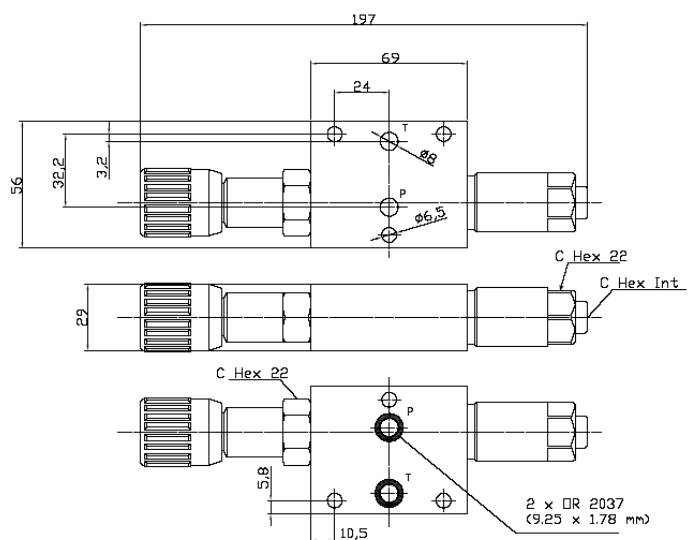
When on line P the pressure exceeds the settled value the piston 5 is pushed by hydraulic axial forces, overcomes the force of spring 8 and shifts, opening to the pressurized fluid annular passage to T, thus keeping the pressure level at the requested value

INSTALLATION DIMENSIONS

AMF-MOP-Q(*)
(with VSC-34/*)

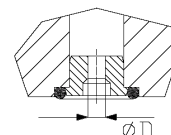


AMF-MOP-QV
(with FT-268/2-34)



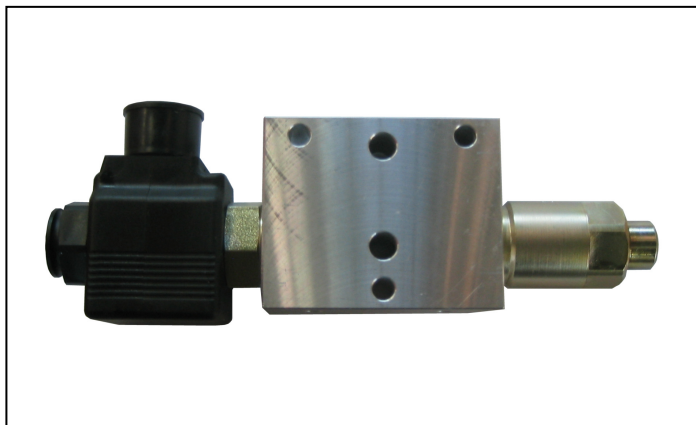
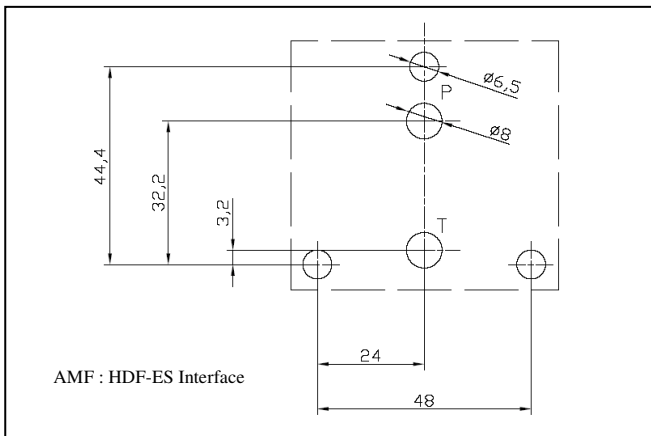
All dimensions are mm

Available for P and T lines "section reducer" with O ring



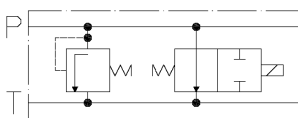
D (mm)	CODE
1,0	3S-10
1,5	3S-15
2,0	3S-20
2,5	3S-25

Stackable Valves AMF Pressure Relief Combined With Electric By-pass Type AMF-MOP/*-EV2*

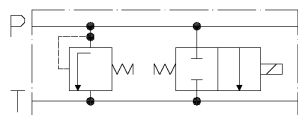


FUNCTIONAL SYMBOLS

AMF-MOP/(*)-EV2O



AMF-MOP/(*)-EV2C



DESCRIPTION OF AMF-MOP/*-EV2O

Fluid flows freely from P line to T line

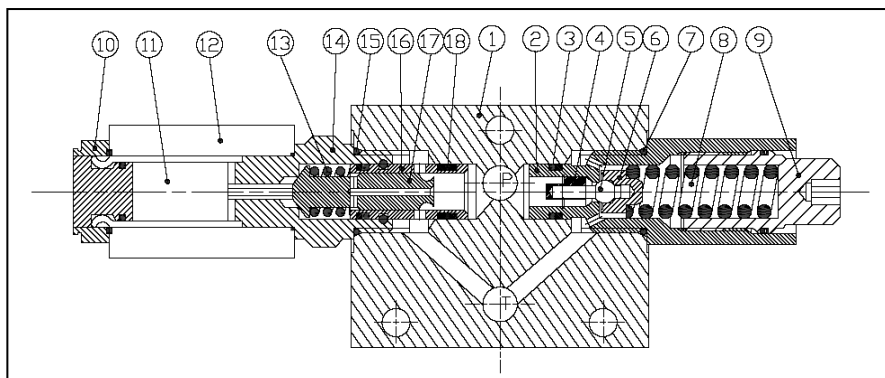
The spool 17 is normally kept open by spring 13. When the solenoid 12 is energized, the mobile armature 11 overcomes the force of spring 13 and moves spool 17 thus closing passage between P and T.

When on line P the pressure exceeds the settled value, the piston 5 is pushed by axial hydraulic forces, overcomes the force of spring 8 and shifts in its cylindrical seat and opens to the pressurized fluid annular passage to T, thus keeping the pressure level at the requested value.

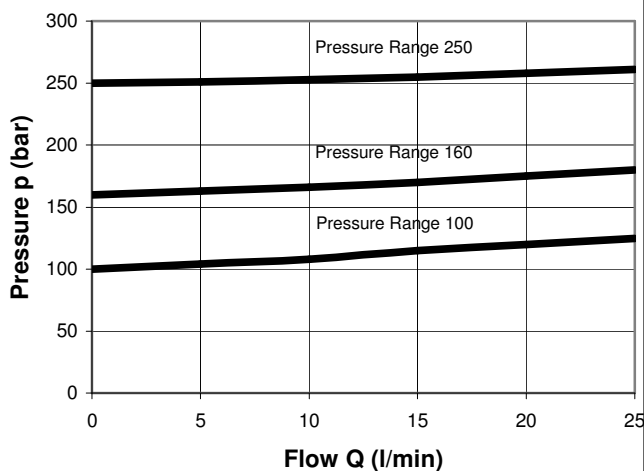
HOW TO READ MODEL CODE FOR VALVES AMF-MOP/*-EV2*

AMF - MOP / (10) - EV2(O) - * - (012C) / 10
 (1) (2) (3) (4) (5) (6) (7)

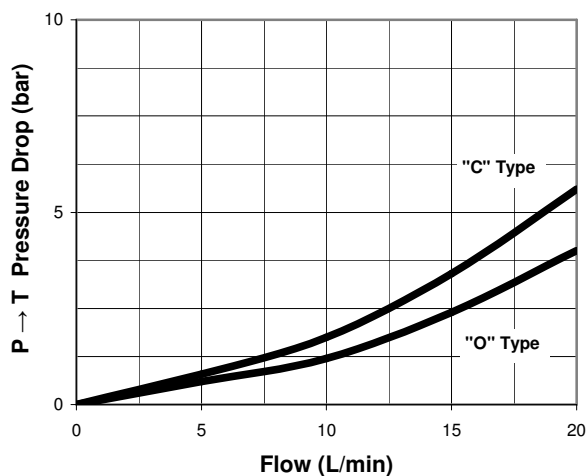
- (1) AMF : module stackable with 4 way solenoid valve type HDF-ES
- (2) MOP : pressure relief on P line
- (3) (10) : pressure adjustment ranges
 10 : from 32 to 100 bar
 16 : from 63 to 160 bar
 25 : from 100 to 250 bar
- (4) EV2(O) : spool type 2/2 by-pass solenoid operated valve
 EV2O : normally open
 EV2C : normally closed
- (5) * : code reserved for options and variants
- (6) (012C) : electric voltage and solenoid coils
 0000 : no coil
 012C : coil for V12DC
 024C : coil for V24DC
 220R : coil for V220-230 RAC
- (7) * : design number (progressive) of the valves



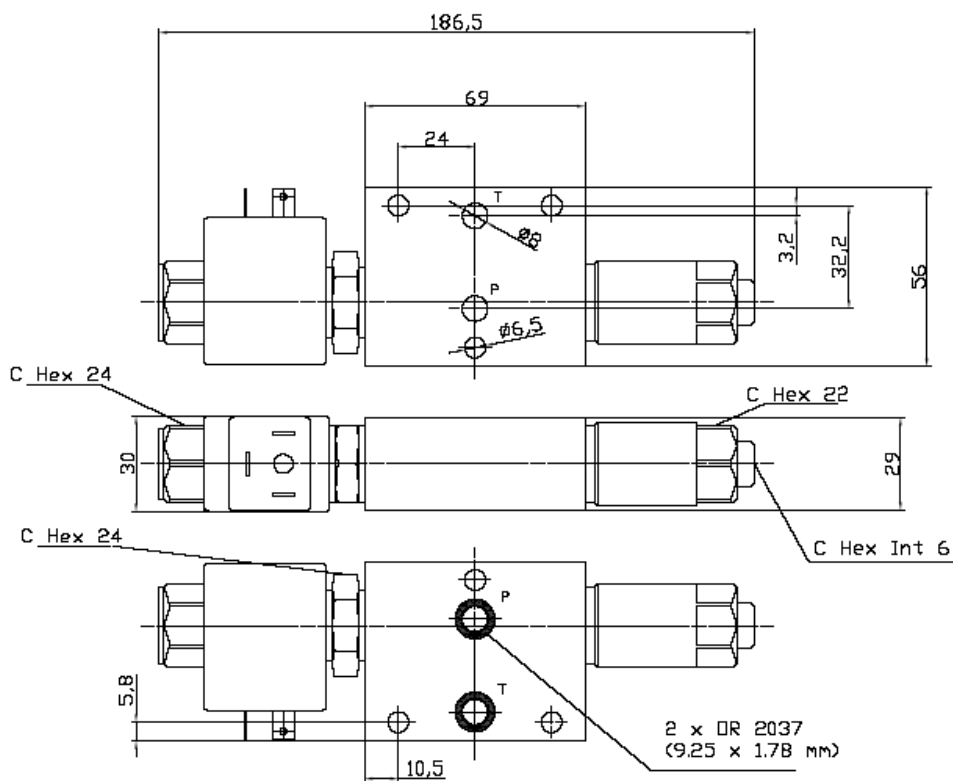
TYPICAL DIAGRAMS OF PRESSURE RELIEF VALVE



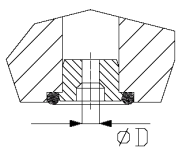
TYPICAL DIAGRAMS OF ELECTRIC BY-PASS VALVE



INSTALLATION DIMENSIONS



Available for P and T lines "section reducer" with O ring



D (mm)	CODE
1,0	3S-10
1,5	3S-15
2,0	3S-20
2,5	3S-25

All dimensions are mm

DATA AND OPERATING LIMITS

Maximum flow rate	20 l/min
Maximum nominal pressure	25 MPa (250 bar)

ADJUSTMENT OF THE RELIEF PRESSURE

Relief pressure is reached when the axial hydraulic forces on piston 5 equal the force on spring 8; the value of the relief pressure can be therefore changed, within the range, by changing the compression of spring 8.

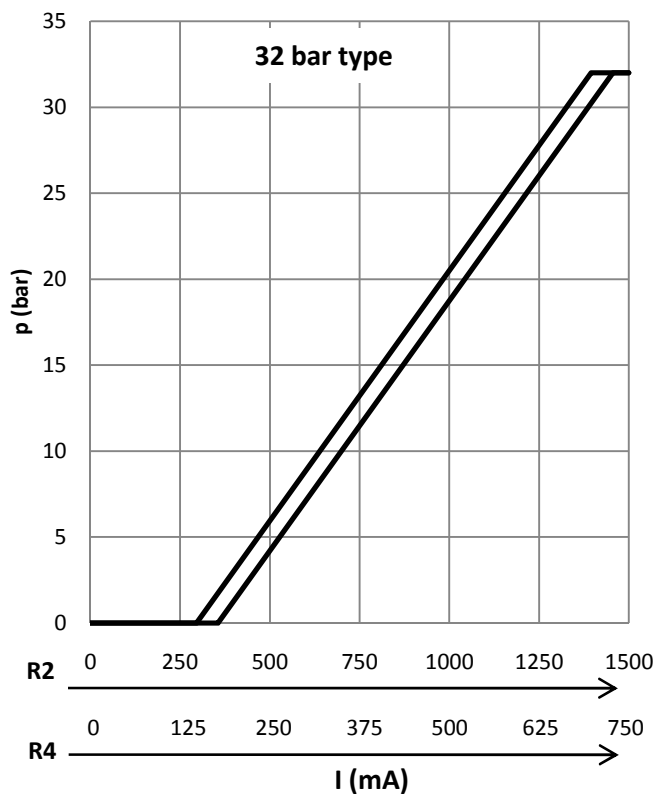
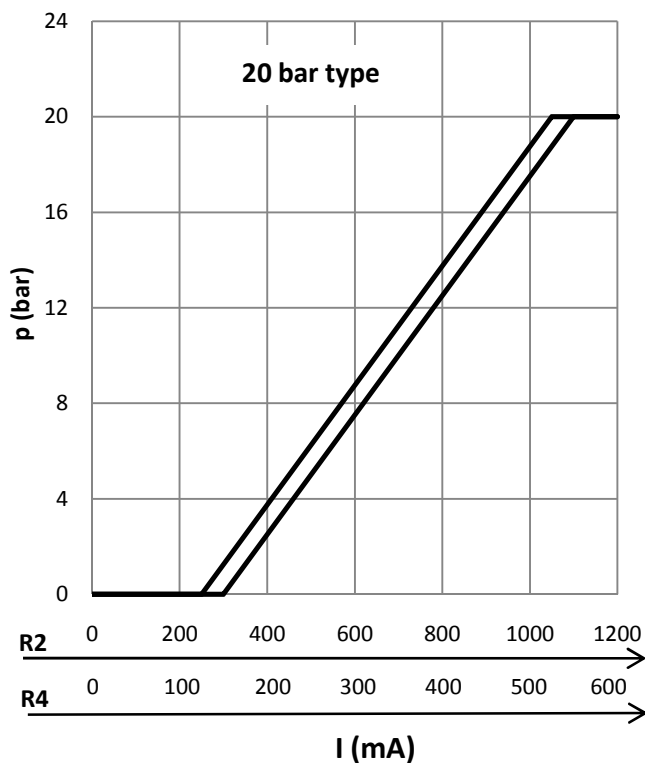
To increase the relief pressure, turn clock wise the adjustment nut 9.

HYDRAULIC FLUIDS

Seals and materials used on standard valve AMF are fully compatible with hydraulic fluids of mineral base, upgraded with antifoaming agents.

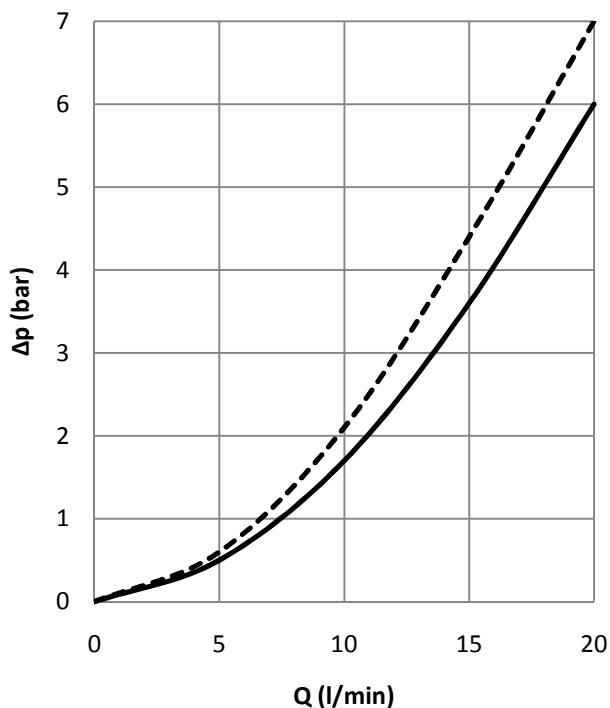
The hydraulic fluid must be kept clean and filtered to ISO 4406 class 21/18/15, or better, and used in a recommended viscosity range from 10 cSt to 60 cSt.

4 **TYPICAL DIAGRAMS** (measured at $v = 36 \text{ cSt}$ and 50°C)



p – Q characteristics

--- PR → T (no current)
 — P → PR (max current)



5 **DATA AND OPERATING LIMITS**

Maximum nominal flow rate	20 l/min
Max input pressure	5 MPa (50 bar)
Regulated pressure range	AMF-RE-P/2-* : up to 2,0 MPa (20 bar) AMF-RE-P/3,2-* : up to 3,2 MPa (32 bar)

6 **SOLENOID TECHNICAL DATA**

Control	PWM signal 100 Hz
Max current	12 V : 1,5 A 24V : 0,75 A
Resistance at 20°C	12 V : 7,2 Ω 24 V : 21 Ω
Duty cycle	100 %
Insulation class	F
Enclosure type to DIN 40050	IP 65

7 INSTALLATION

Leakage between valve and mounting surface is prevented by the positive compression on their seats of 2 seals of OR type 2037 (9.25 x 1.78 mm) or Quad-Ring (9.25 x 1.68 x 1.68 mm).

8 HYDRAULIC FLUIDS

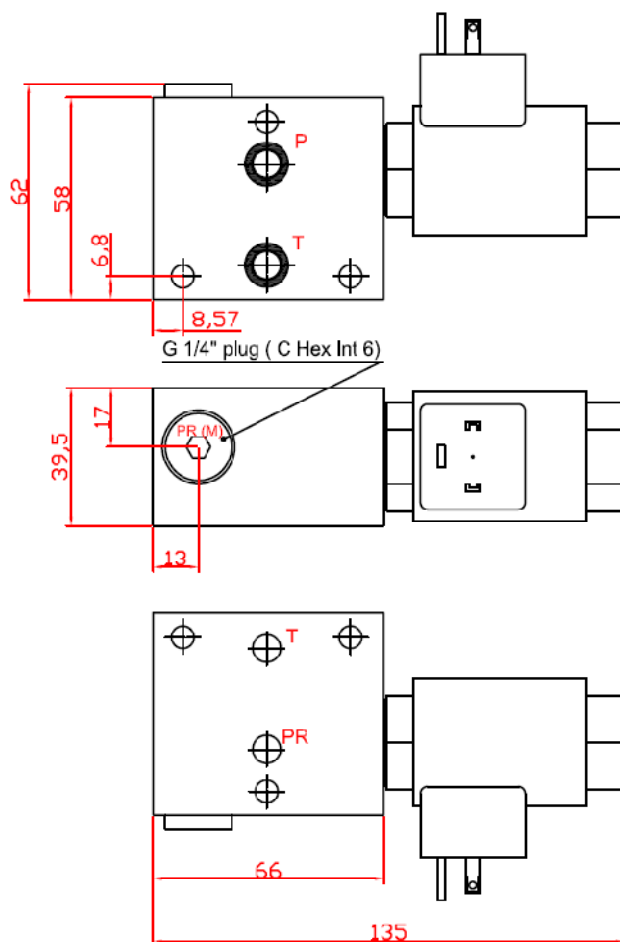
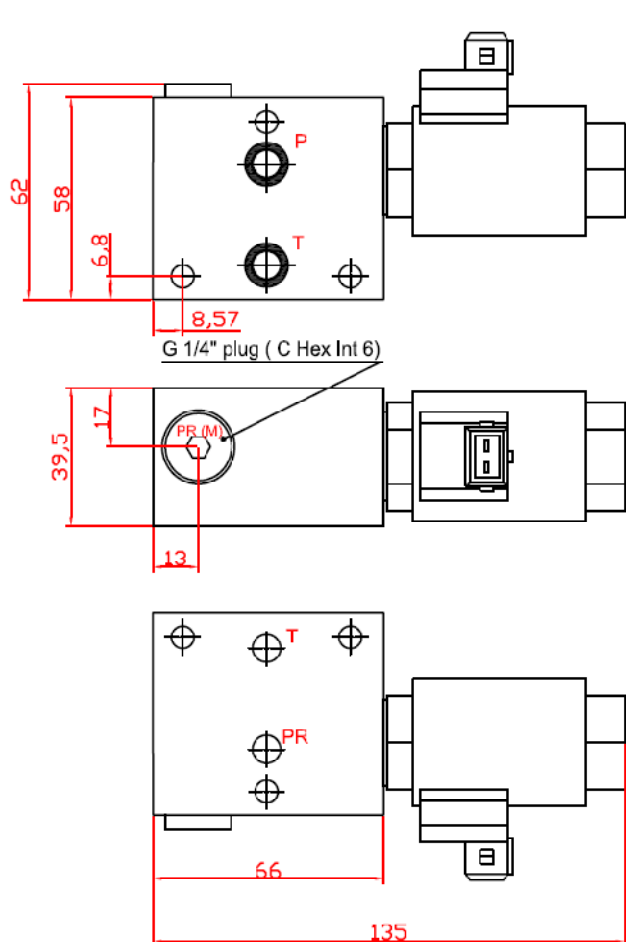
Seals and materials used on standard valves AMF-* are fully compatible with hydraulic fluids of mineral oil base, upgraded with antifoaming and antioxidantizing agents.

The hydraulic fluid must be kept clean and filtered to ISO 4406 class 19/17/14, or better, and used in a recommended viscosity range from 10 cSt to 60 cSt.

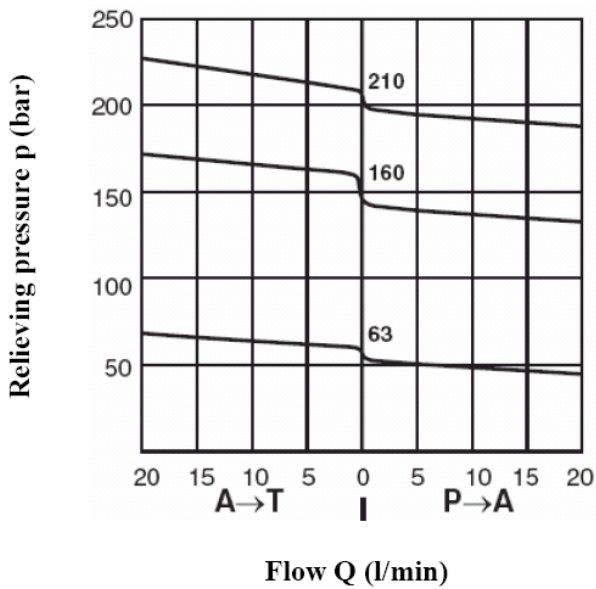
9 INSTALLATION DIMENSIONS (all dimensions are mm)

AMF-RE-P/*-R*AMP

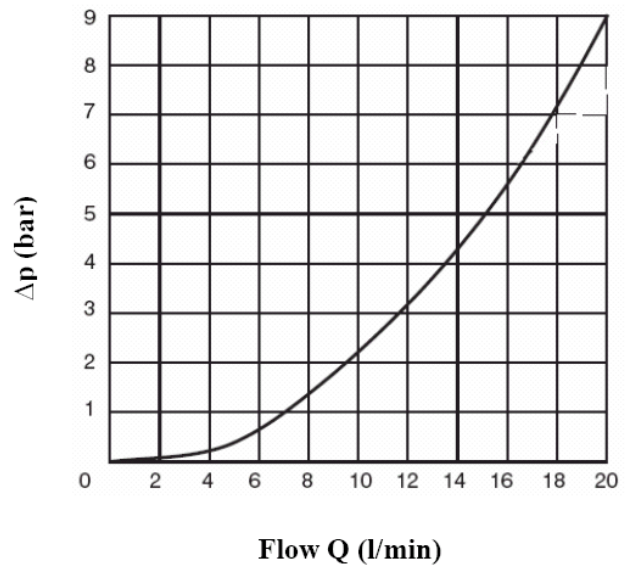
AMF-RE-P/*-R*



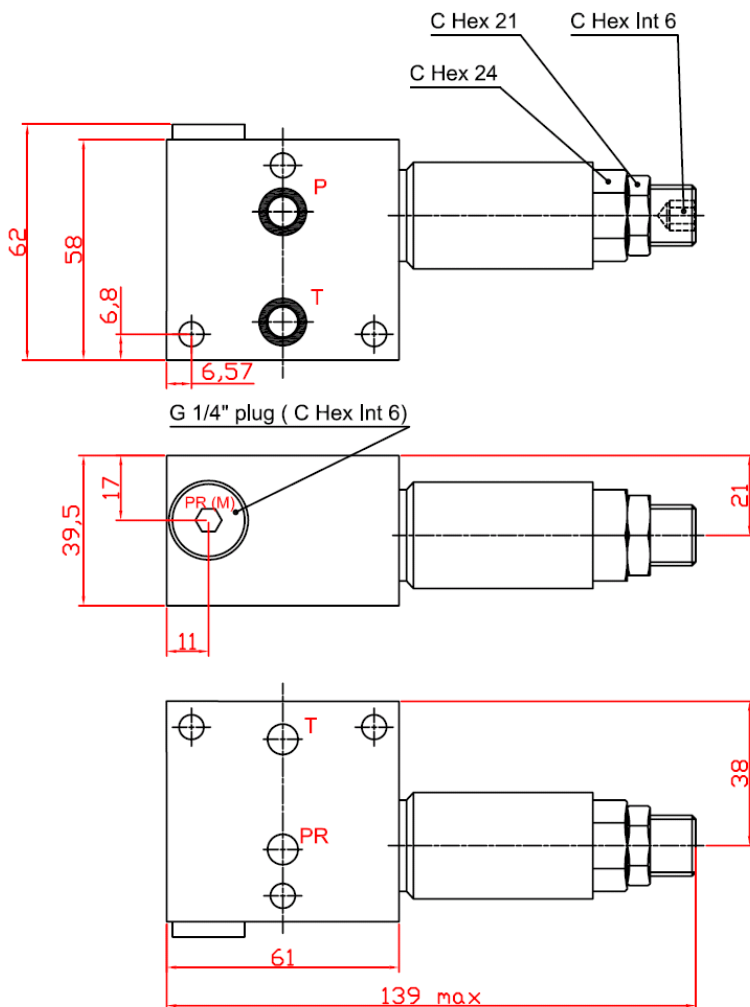
4 TYPICAL DIAGRAMS (measured at $\nu = 36 \text{ cSt}$ and 50°C)



$P \rightarrow PR \text{ min. } \Delta p$ (fully open control section)



5 INSTALLATION DIMENSIONS (all dimensions are mm)



6 DATA AND OPERATING LIMITS

Maximum nominal flow rate 20 l/min

Regulated pressure see **1**

Max. input pressure (P line)
 for /6,3 → 16 MPa (160 bar)
 for /16 → 25 MPa (250 bar)
 for /20 → 32 MPa (320 bar)

7 ADJUSTMENT OF THE REGULATED PRESSURE

The pressure in PR line can be set by acting on the adjustment element **13** (screw with internal hexagon 6mm), after having unlocked its retaining nut **14**. Clockwise rotation → PR pressure increases

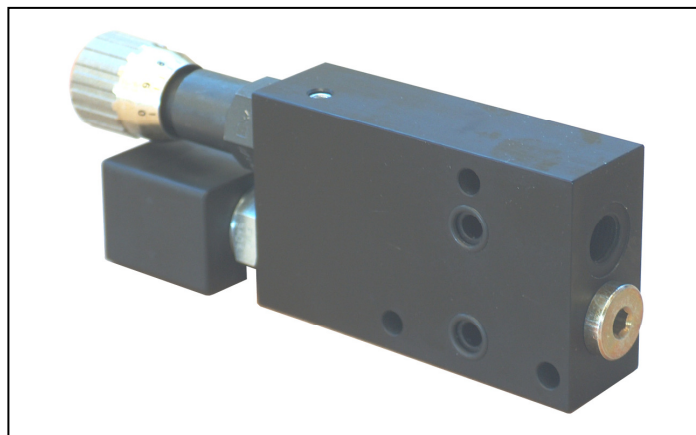
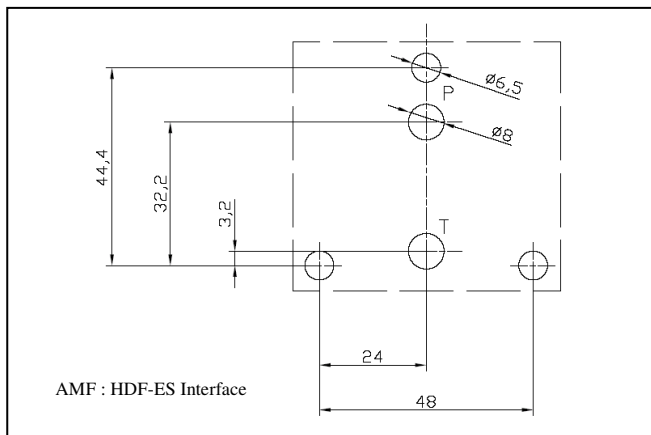
8 INSTALLATION

Leakage between valve and mounting surface is prevented by the positive compression on their seats of 2 seals of OR type 2037 (9.25 x 1.78 mm) or Quad-Ring (9.25 x 1.68 mm).

9 HYDRAULIC FLUIDS

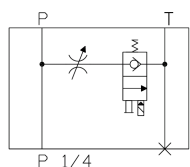
Seals and materials used on standard valves AMF-* are fully compatible with hydraulic fluids of mineral oil base, upgraded with antifoaming and antioxidantizing agents. The hydraulic fluid must be kept clean and filtered to ISO 4406 class 19/17/14, or better, and used in a recommended viscosity range from 10 cSt to 60 cSt.

Inlet/Outlet Modules Stackable With HDF(*)-ES Valves Type AMF-SE-**-*

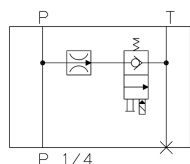


FUNCTIONAL SYMBOLS

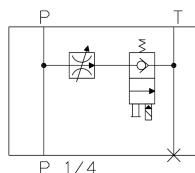
AMF-SE-CV



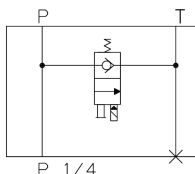
AMF-SE-Q(*)



AMF-SE-QV



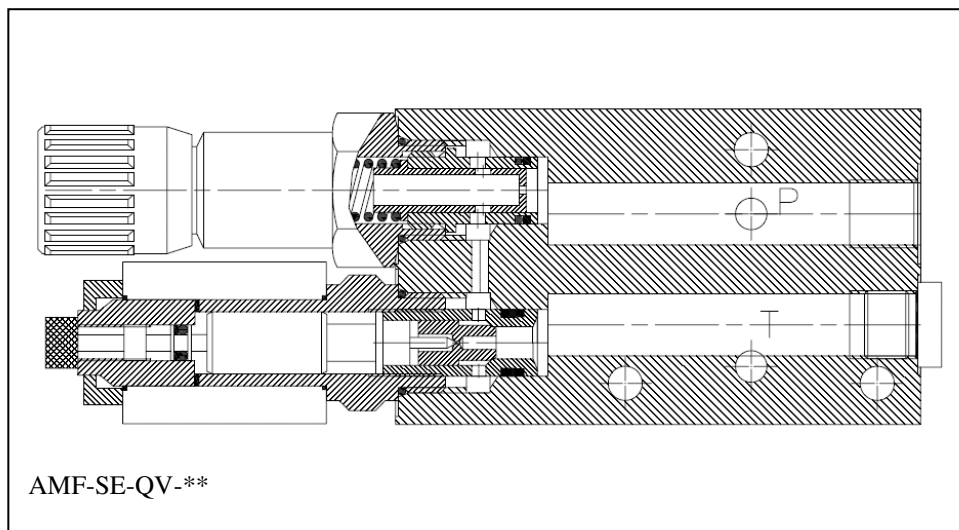
AMF-SE-CO



HOW TO READ THE MODEL CODE FOR MODULES AMF-SE

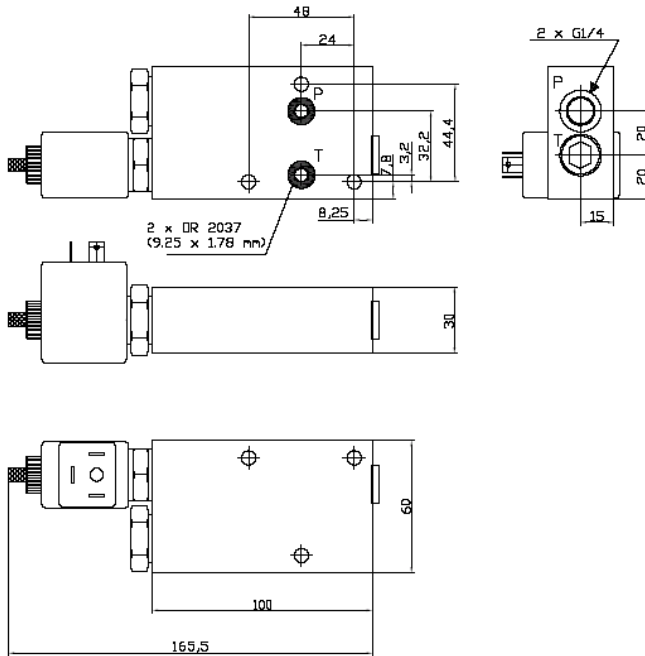
AMF - SE - (CV) - (012C)
(1) (2) (3) (4)

- (1) AMF : plate stackable with 4 way solenoid valve type HDF-ES and/or minipowerpacks type SCLA
- (2) SE : with NC 2/2 solenoid valve ; function typical for simple acting cylinders
- (3) (CV) : CV : throttle adjustable
 Q1 : fixed flow 1 l/min, pressure compensated
 Q2 : fixed flow 2 l/min, pressure compensated
 Q4 : fixed flow 4 l/min, pressure compensated
 QV : adjustable flow, pressure compensated
 CO : no flow control
- (4) (012C) : solenoid valve voltage : 012C = 12V DC
 024C = 24V DC

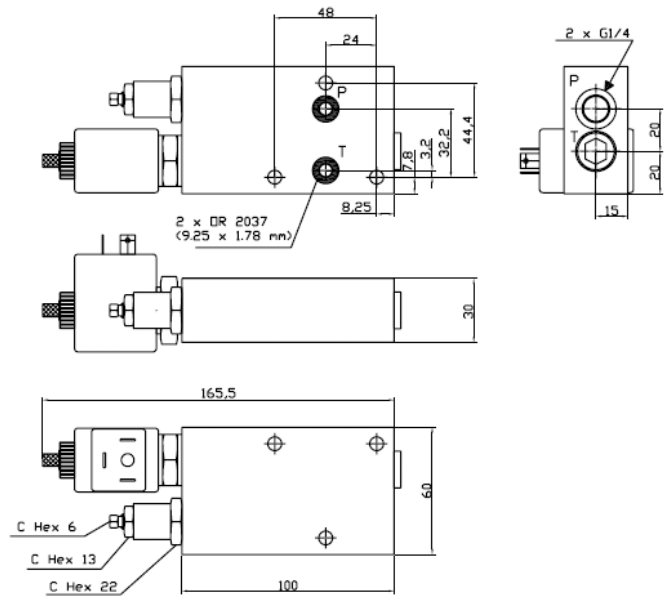


INSTALLATION DIMENSIONS

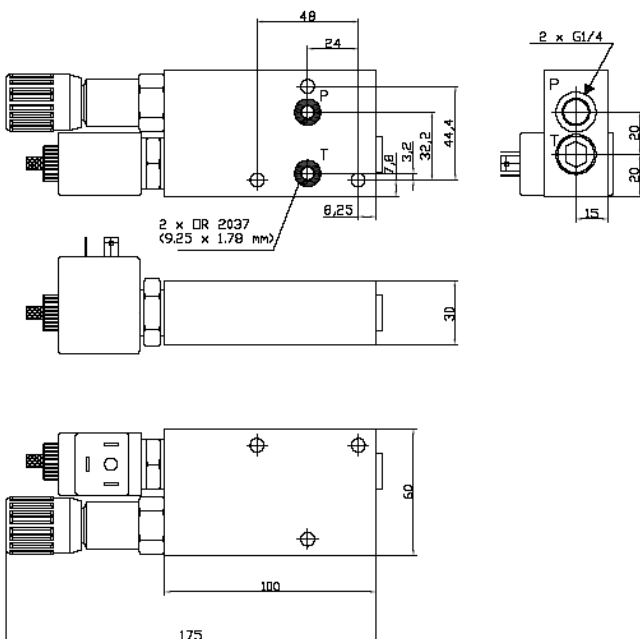
AMF-SE-Q(*)-** ; AMF-SE-CO



AMF-SE-CV-**



AMF-SE-QV-**



FLOW CONTROL VALVES

- CV Type : flow from P to T line is regulated by a VCF-34 throttle valve that changes the section of an annular passage to T line. To decrease the flow rate, from P to T line, turn clockwise the adjustment screw, after having unlocked its nut.
- Q(*) Type : flow is regulated by a VSC-34 fixed pressure compensated flow control valve
- QV Type : flow from P to T line is regulated by a FT-268/2-34 variable pressure compensated flow control valve. To decrease the flow rate, from P to T line, turn anticlockwise the graduated knob.

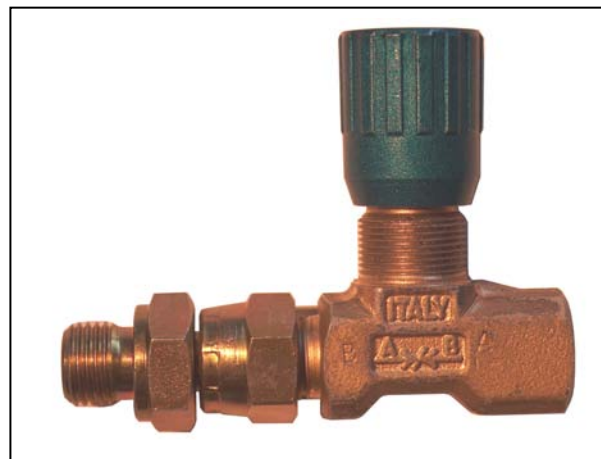
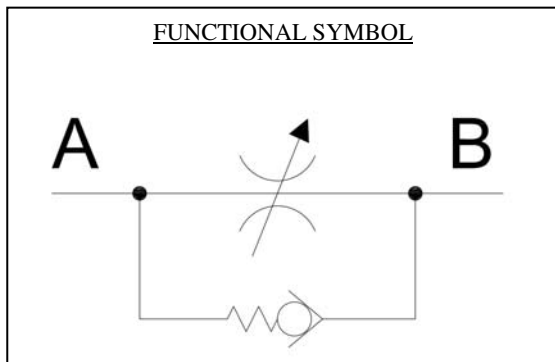
SOLENOID VALVE

2/2 NC solenoid valve is type EVC.34.04.0000 plus coil
 type : C30-012C (V 12 DC)
 C30-024C (V 24 DC)

This solenoid valve includes emergency manual override of screw type.

All dimensions are mm

In line throttle valve Type HFC-14

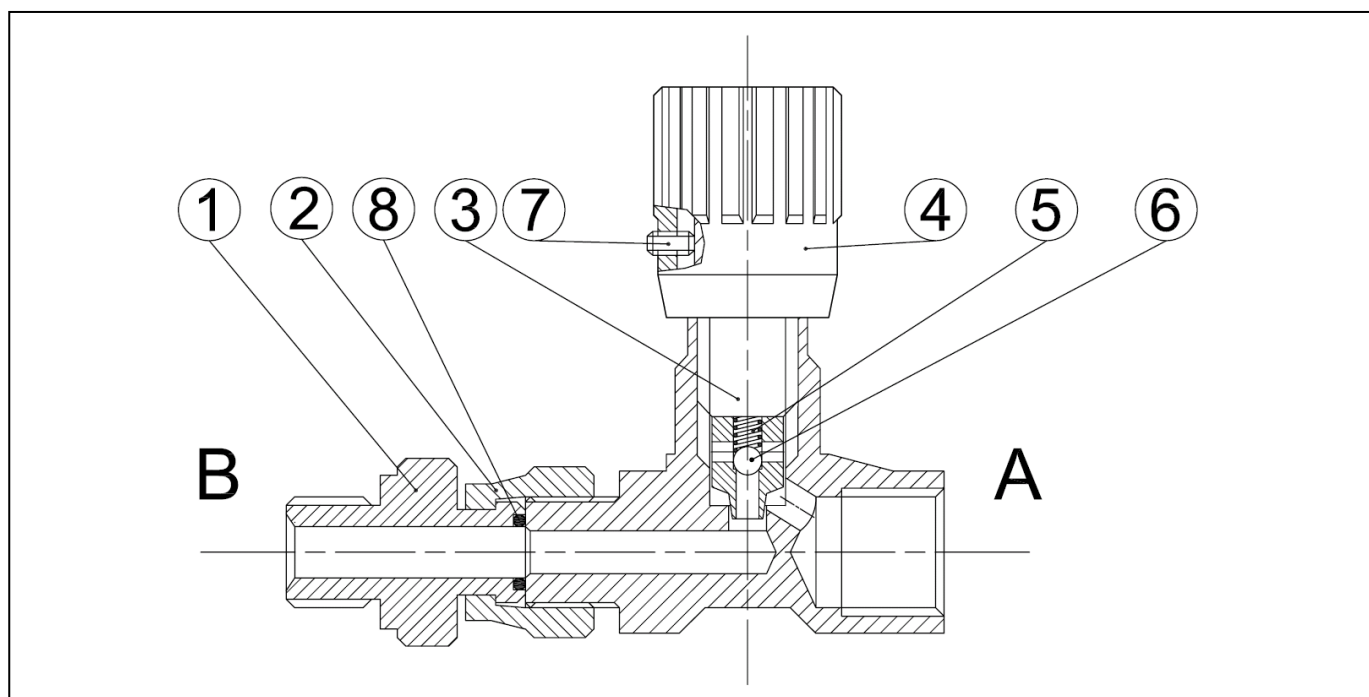
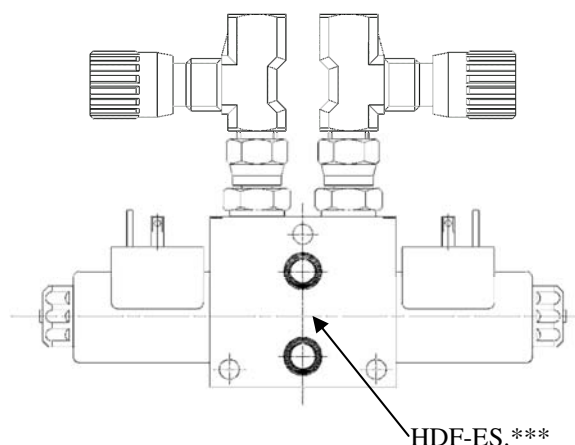


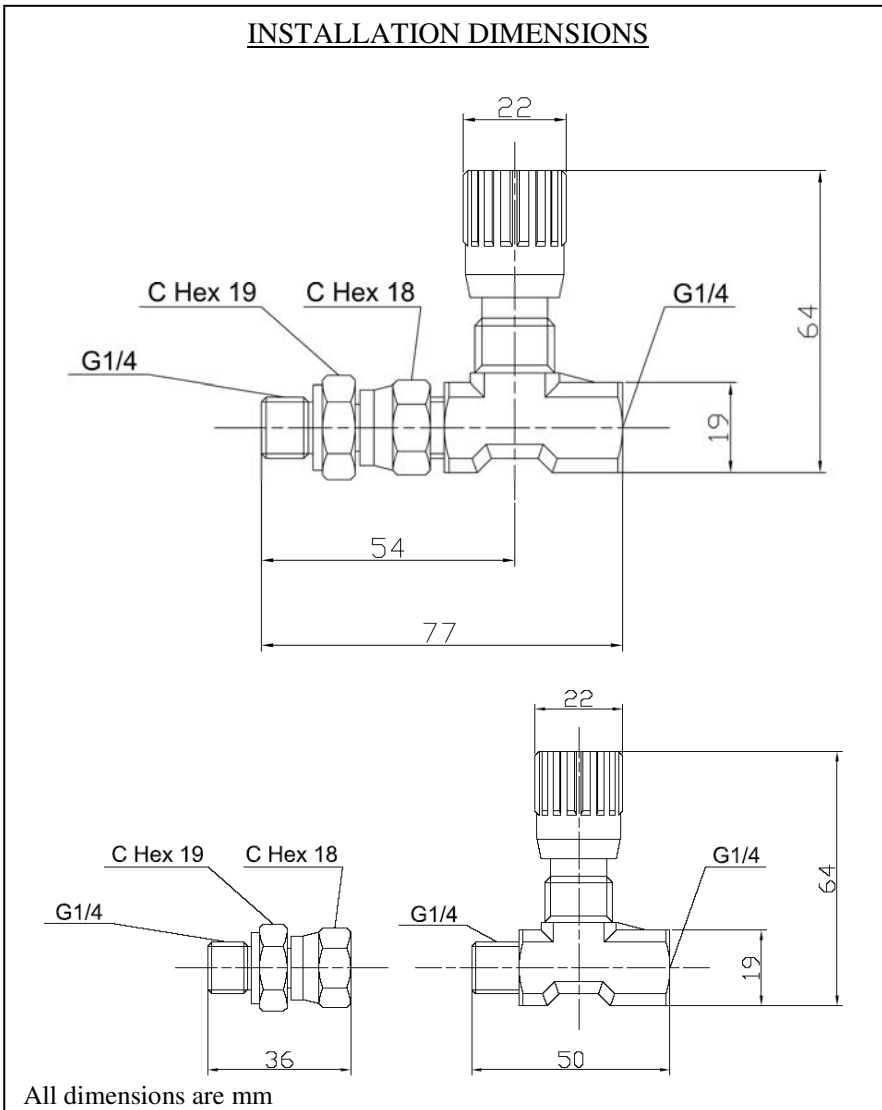
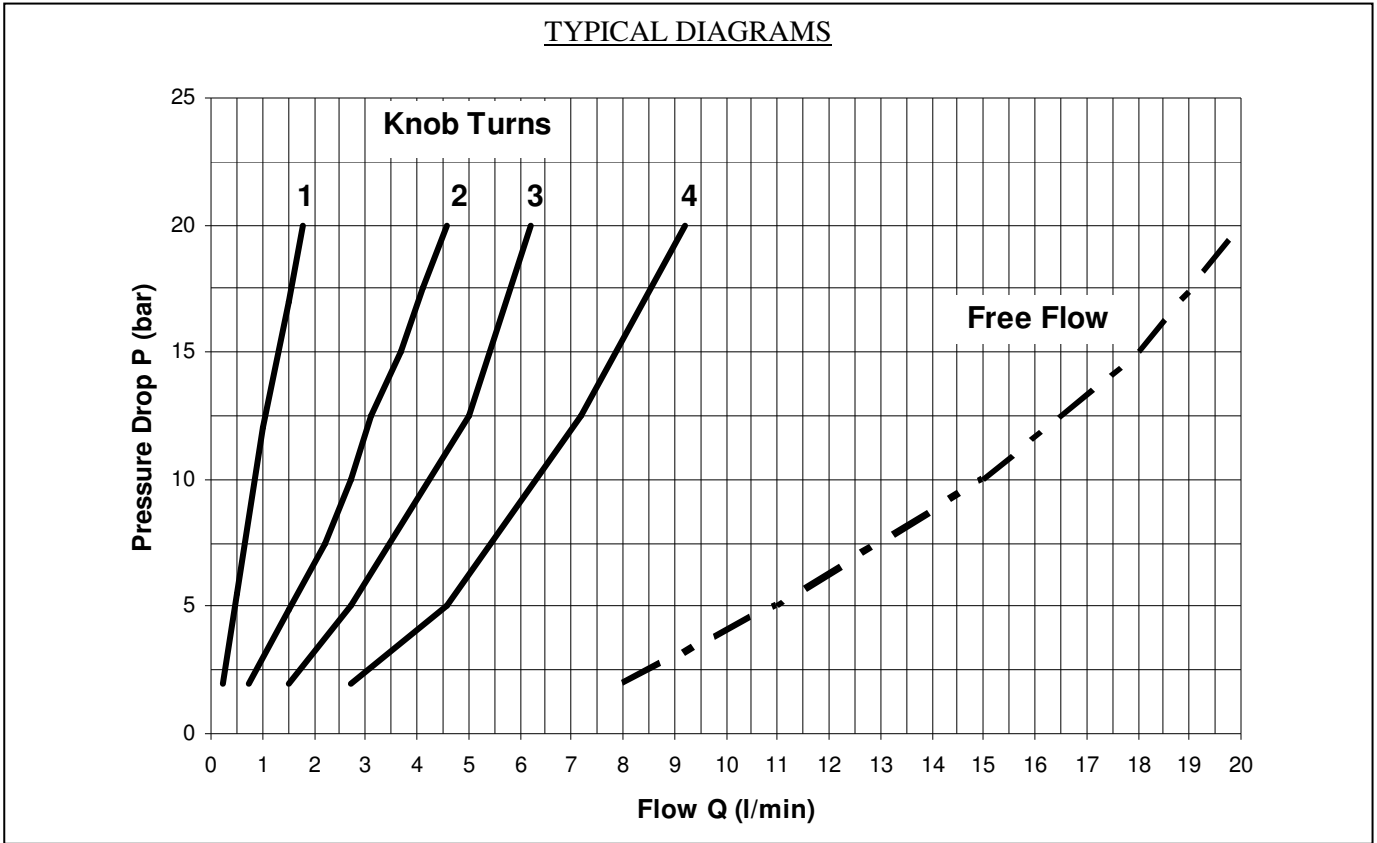
DESCRIPTION

When fluid flows from A to B the check ball ⑥ (kept in its position by the spring ⑤) closes the main passage, thus the fluid passes through the restricted annular section, which area depends on the position of the throttling spool ③.

During flow from B to A the fluid shifts the check ball ⑥ against the spring ⑤ thus permitting free flow.

Typically HFC-14 valves are mounted on the A and B ports of HDF-ES-*** solenoid valves; the presence of “turning connector” ②, acting on nipple ①, allows easy installation and contemporary mounting of flow valves on both A and B ports.





INSTALLATION

1. Lock the nipple ① in a G1/4 port.
2. Put O-Ring ② in its seat.
3. Fit the male thread of the valve in the turning connector.
4. While keeping the valve in the desired final orientation, screw the turning connector until blocking.

ADJUSTMENT OF THE REGULATED FLOW

To reduce the flow rate in the regulated direction (A→B) turn clockwise knob ④, after having unlocked its retaining screw ⑦.