# MODULAR UNIT
# 6MB

## GENERAL DESCRIPTION

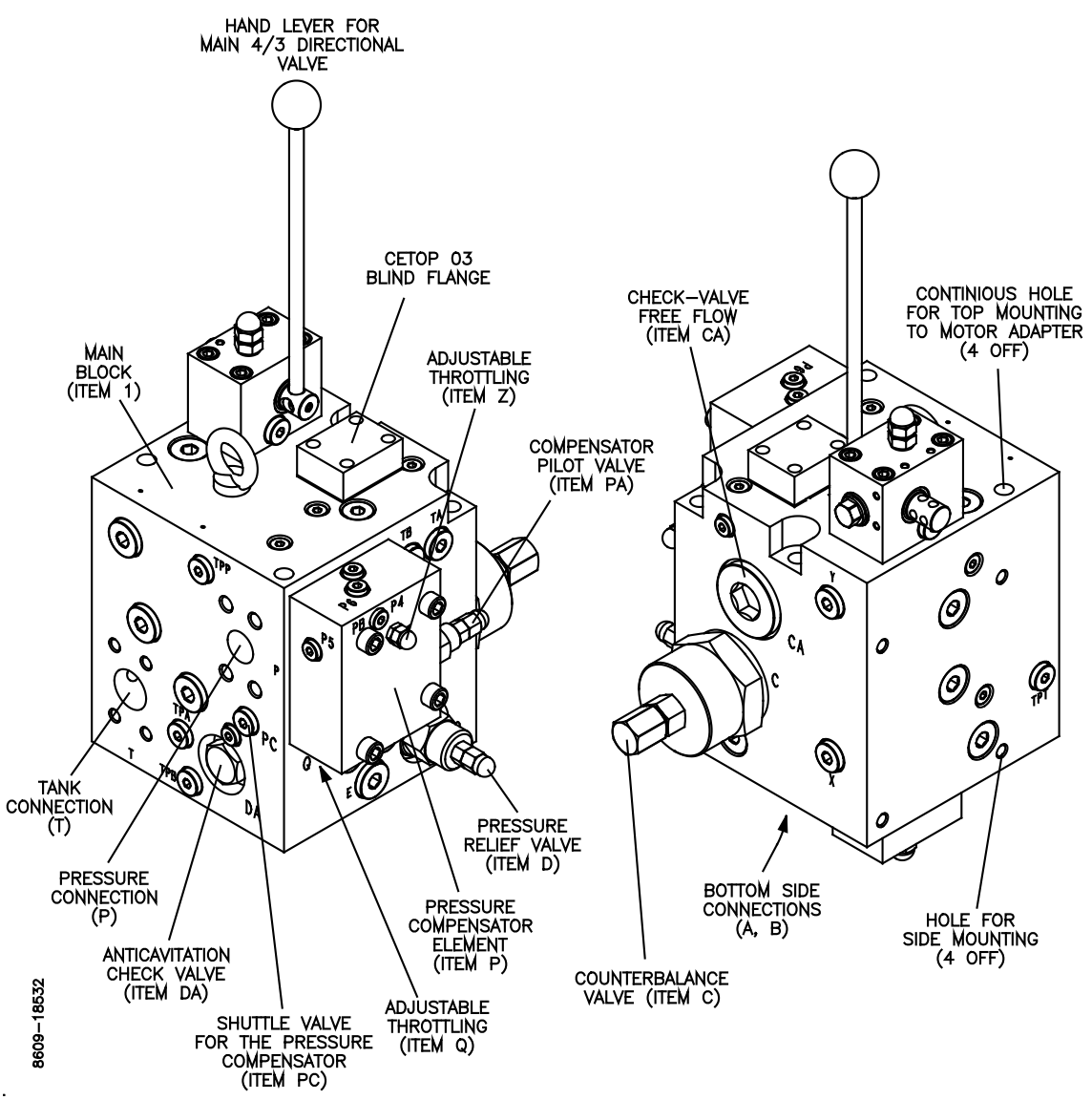



*Figure 1 6MB-200-**-2C General Arrangement*

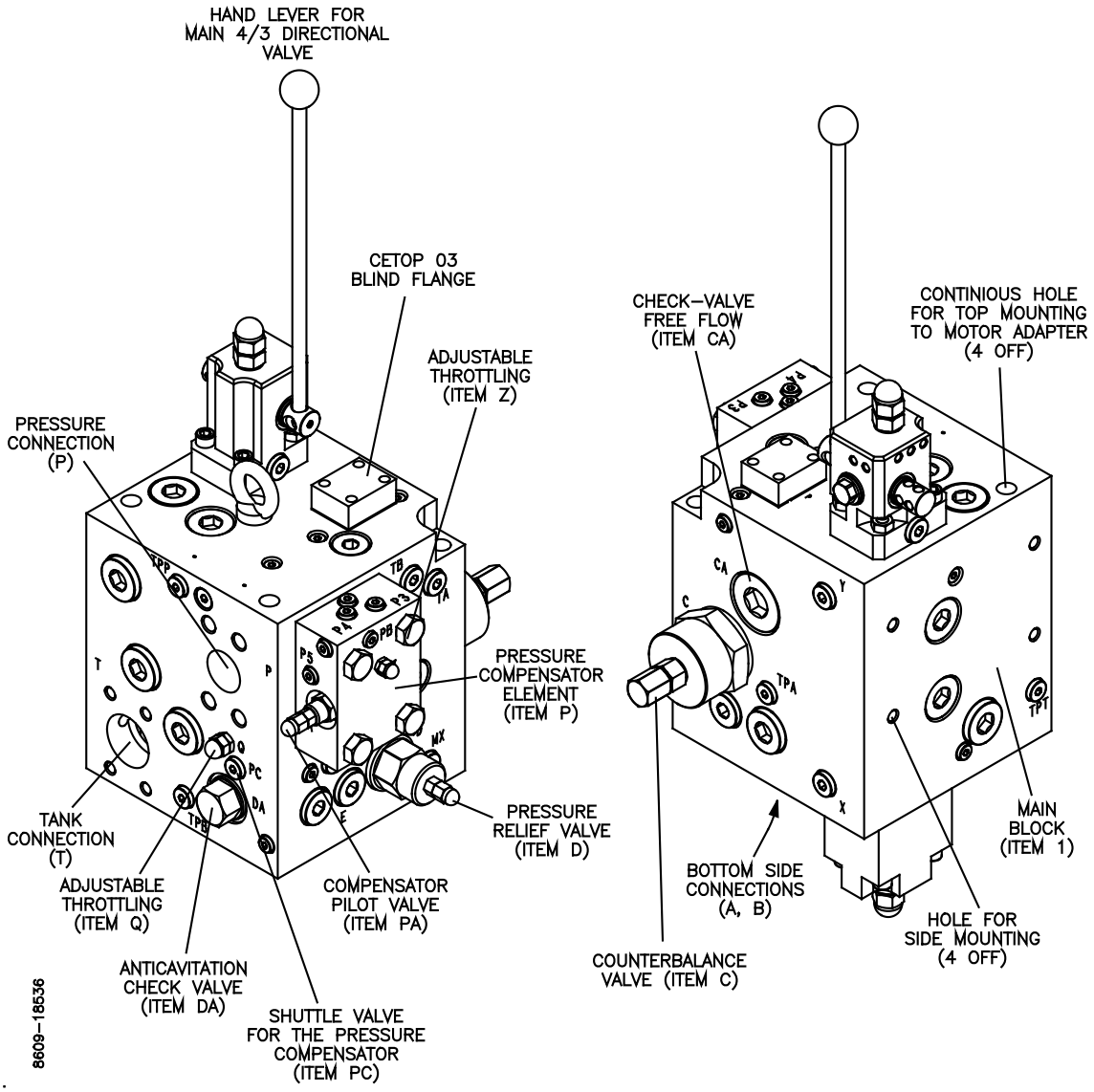


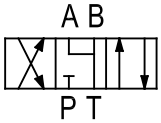

*Figure 2 General Arrangement 6MB-650-**-2C*

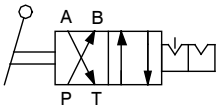
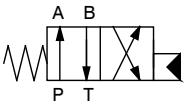
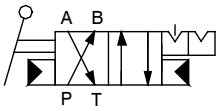
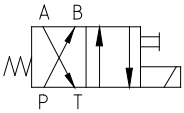
The Modular Units 6 MB is a complete unit for controlling of hydraulically driven winches and has the following improved characteristics:

- Extremely compact design.
- All valves integrated in one unit.
- Designed to withstand marine surroundings
- Pressure compensated flow control system, which gives excellent metering.
- Prepared to fit directly to motor flanges by an adapter.
- Hand lever with 39° control movement in each direction.
- Wide ranges of options.
- Extremely wide capacity range.

For more details about types and options, please refer to section ’MODULAR CODE’.

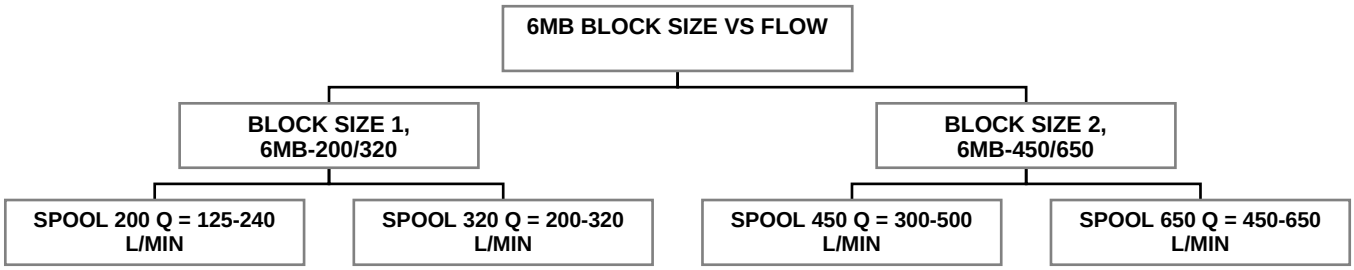
## MODULAR CODE

| Options | Remarks | Design Code | Fill in |
|---|---|---|---|
| ***Standard*** | | | |
| - Directional Control Valve | | **6MB** | |
| - Counterbalance valve in A | | | |
| -Free flow check valve (In Heave) | | | |
| - Pressure relief valve A to B | Prepared for mooring | | |
| - Anti-cavitation valve to B | | | |
| - Pressure compensator flow control | | | |
| - Max operating pressure 315 bar | | | |
| ***Size*** | | | |
| Rated flow Q = 200 l/min | | **200** | |
| Rated flow Q = 320 l/min | Pressure Δp= 32 bar | **320** | |
| P, A, B: 1” SAE 6000 | | | |
| T: 1 1/4” SAE 3000 | | | |
| Rated flow Q = 450 l/min | | **450** | |
| Rated flow Q = 650 l/min | Pressure Δp= 32 bar | **650** | |
| P, A, B: 1 1/2” SAE 6000 | | | |
| T: 2” SAE 3000 | | | |
| ***Directional Control Valve 4/3*** | | | |
| Manually operated | | **1** | |
| Manual/remote operated | | **37** | |
| Manually operated with brake release 4BA3 | | **1B** | |
| Manually/remote operated with brake release 4BA3 | | **37B** | |
| Proportionally electrical remote controlled | Includes separate R | **37E** | |
| Proportionally electrical remote controlled | With integrated R | **37ER** | |
| Proportionally electrical remote controlled, with brake release 4BA3 | Includes separate R for Proportional valve (item E) | **37BE** | |
| Proportionally electrical remote controlled, with brake release 4BA3 | With integrated R | **37BER** | |
| ***Spool type*** | | | |
|  | No option | **2C** | |

| Options | Remarks | Design Code | Fill in |
|---|---|---|---|
| ***Manual control safety lock, mechanical*** | | | |
| 0 position only | | **L** | |
| 0 + 100% in A | | **L1** | |
| 0 + 30% in A | | **L3** | |
| 100% in A and B | | **L7** | |
| 0 + 10-15% in A | | **L8** | |
| ***Pressure relief valve*** | | | |
| Mooring valve, direct manually<br>Operated by hand wheel | | **MAM** | |
| ***Two-speed valve*** | | | |
| Manually operated |  | **T** | |
| Manually operated with reduced pressure | | **TR** | |
| Hydraulic operated |  | **TH** | |
| Hydraulic operated with reduced pressure | | **THR** | |
| Manually/Hydraulic operated with reduced pressure |  | **TMHR** | |
| Electric operated |  | **TE** | |
| Electric operated with reduced pressure | | **TER** | |
| Pressure reducing valve only | | **R** | |
| ***Options*** | | | |
| Boosting external (E to B) | | **BE** | |
| Double counterbalance valve (A+B) | | **C2** | |
| Pressure relief valve in (A+B) | | **D2** | |
| ***Modification*** | | | |
| Code | | **(001-999)** | |

In example a 6MB intend for flow 180 l/min, remote operated, two speed valve with reduced pressure, will have modular code: **6MB-200-37-2C-TR**

**Selecting the size:**
When selecting the size of the 6MB modular unit, the pressure drop in the system must be taken into consideration. Proper control of the winches is another important factor. To achieve this, a certain pressure drop over the main direction valve is necessary.  Refer to pages for pressure drop curves.



## VALVE DESCRIPTION 6MB (remote operated version)

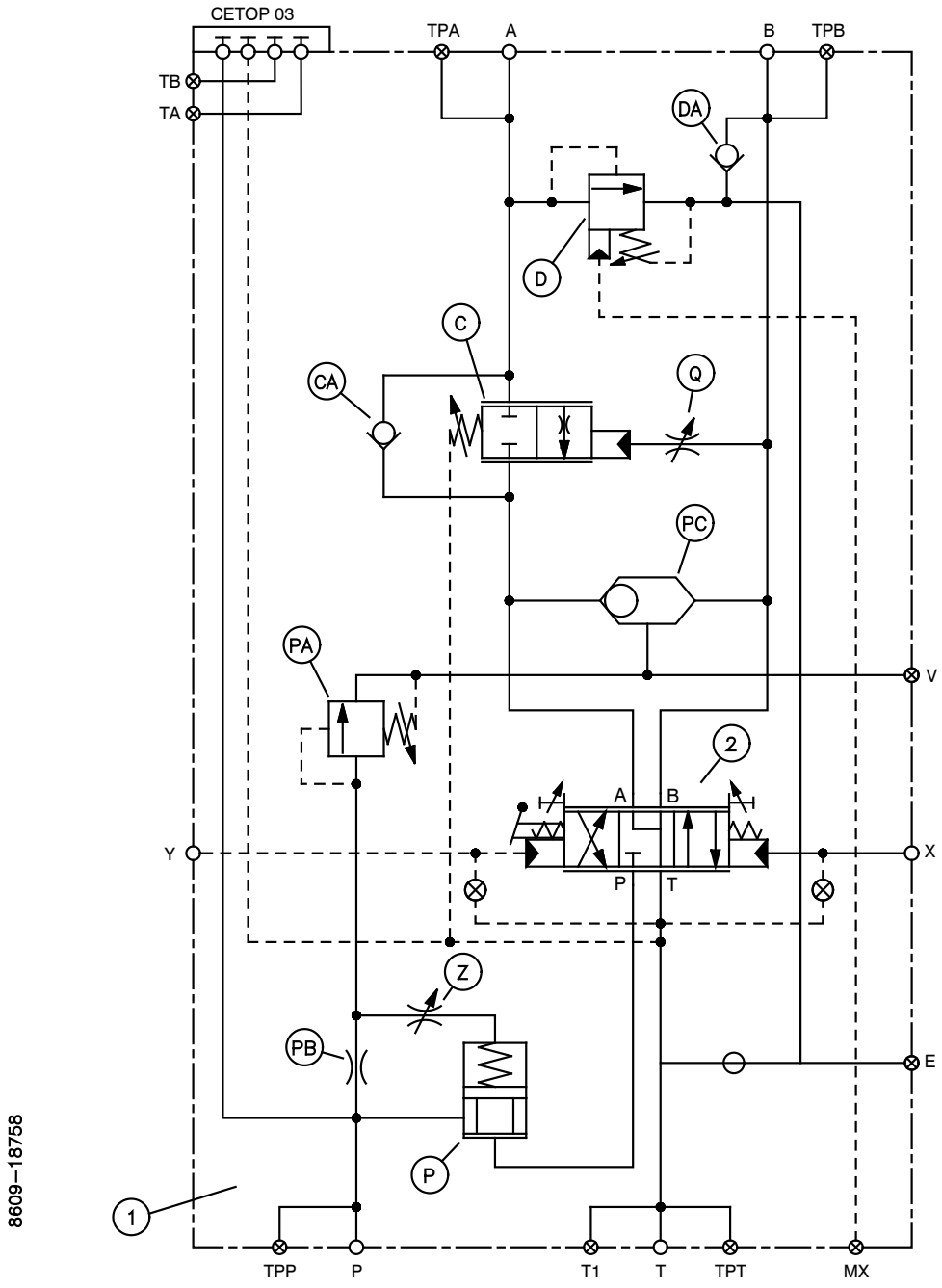



*Figure 3 6MB Hydraulic Schematic (remote operated version shown)*

6MB modular unit includes in basic version directional control valve (2), pressure compensation flow control system (P, PB, PA, PC and Z), free flow check valve (CA), load control (C and Q), pressure relief (D) and boosting DA.

**Item 1** **Main block.**

**Item 2** **Directional control valve 4/3.**
This is a three positions directional spool valve with hand lever. When activating the directional valve handle, the operator controls the direction and drive speed of the drum. Throttling grooves in the main spool open progressively for flow either to A or B port. The spool has adjustable end stoppers in both end covers for limiting of the spool stroke. A shorter travel of the spool will result in an increase of the pressure drop through the spool and an increase of maximum flow thought the valve.

*Option code 37:*
Directional valve is prepared to be hydraulically proportional remote controlled.
Pilot pressure 5-20 bar.

**Item C** **Counterbalance valve A→T.**
The counter balance valve keeps the load under control during lowering operations.
Throttling groves in the counter balance spool open progressively for flow from A→T port, and thus give a smooth lowering operation and low pressure rise with full flow. The counterbalance spool opens by a pilot pressure taken from line B.
*Factory preset to 40 bar.*

**Item Q** **Adjustable throttling.**
Throttling for the counter balance pilot channel.
*Factory preset to ½ turn counter clockwise (ccw) from closed position.*

**Item CA** **Check-valve free flow P→A**
Bypassing the counter balance valve in Heave.

**Item D** **Pressure relief valve A→B**
This pilot operated pressure relief valve will in some application be used as a mooring valve, to keep a constant tension on the drum, or freewheeling of the hydraulic motor. Tension pressure can either be adjusted by a hand wheel (option MAM) or remote controlled by port MX.
*If presetting is not stated in the order, the pressure relief valve item D is set to its minimum.*

**Item DA** **Anti-cavitation check valve**
Boosting from T to B

**General**
Measures must be taken to ensure that cavitation cannot occur in a hydraulic system. Therefore, a certain flow must be applied to A or B to replace internal leakage. It is important to prevent boosting oil from running out of the boosting system. A check valve with opening pressure of 2-3 bar in T will usually satisfy this. As far as possible, internal leakage from the hydraulic motor should be connected before the check valve in T. Remember to check max motor casing return pressure against system return pressure.

**Standard Boosting 6MB**
6MB has internal boosting from T to B as standard. Also a certain flow will leak through nozzle PB, and shuttle valve PC to either A or B.

**Generally about the pressure compensator system.**
This is a load independent system, which means that a fixed spool stroke on the directional valve will give equal flow independent of the load at the motor/drum.
The main directional spool (2) in conjunction with pressure compensator flow control system (P, PA, PB, PC and Z), regulates proportional oil flow to either A (Heave rotation) or B (Lower rotation) by sensing the pressure either in A or B line through the shuttle valve (PC). When operating directional valve (2), the spool will open progressively to A or B. Pressure compensation element will maintain equal Δp across the directional valve. Maximum flow over the main directional valve is depending on the force induced on the pressure compensator element (P). This force is made up of a spring force in the compensator element item (P), and an adjustable spring force in the compensator pilot valve (PA) and the load pressure sensing in A or B via (PC). When setting is altered on the compensator pilot valve (PA), the flow will change.
When adjusting pressure relief valve PA, the Δp through the directional valve will alter, and thus maximum flow to the hydraulic motor.

**Item PC** **Shuttle valve for the pressure compensator.**
Port V can be used for load sensing or in some applications for a hydraulically operated brake release valve.

**Item P** **Pressure compensator element.**
Normally opens the modulating element, which acts as a pressure compensator to maintain a constant pressure drop across the directional valve (together with PC, PB, PA and Z).

**Item Z** **Adjustable throttling.**
Adjustable throttle for the pressure compensator element, if the element is fluctuating.

**Item PB** **Nozzle**
Maintains flow to compensator pilot valve PA.

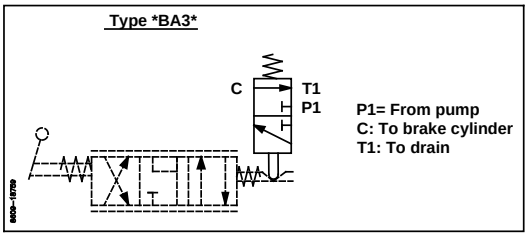
**Item PA** **Compensator pilot valve.**
The spring on the compensator is rather weak. Therefore, pressure created by an adjustable pressure relief valve is added to the spring force.

## OPTIONS- DESCRIPTION 6MB

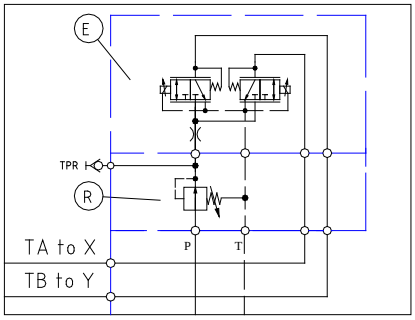
**Code 37** Manually/remote operated.

**1B** Manually operated, with brake release 4BA3

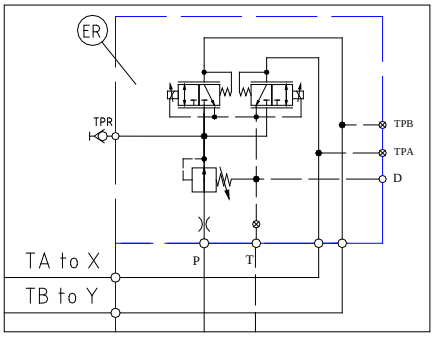
**37B** Manually/remote operated, with brake release 4BA3.
Ports dimension for brake release valve 4BA3: ⅜" BSPP




**Code 37E** Manually/Proportionally electrical remote operated.
Proportional reducing valve item E is Hydranor 8FGB4131021-11/11.
Pressure reducing valve not integrated in 8FGB4131021-11/11, but separate sandwich component.




**Code 37ER** Manually/Proportionally electrical remote operated with integrated pressure reducing valve and external drain port D. T from ER to main block is plugged.
Proportional reducing valve item ER is Hydranor 8FGBR4431021-11/11-D




**Code L** Manual control safety lock for locking in 0 position only. This is a mechanical device for preventing operation of the directional valve unless the safety lock is manually released.
For other locking device, see model code L, L1 etc.

**Code MAM** Mooring valve operated by a hand wheel to control pressure in A.

**Code C2** Counterbalance valve in A and B.

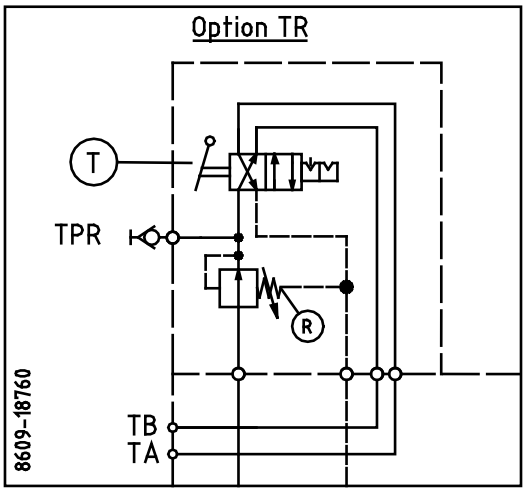
**Code D2** Pressure relief valves in A (A→B) and B (B→A).

**Code BE** If it is necessary to increase the boosting, 6MB has an option to have an external boosting, by using port E.

**Two-speed valve module**
This is a 4/2 directional valve for selecting the speed when using two-speed motor.

**Code T** Manually operated 4/2-direction valve.
- **TR** Manually operated 4/2-direction valve with reduced pressure.
- **TH** Hydraulic operated 4/2-direction valve.
- **THR** Hydraulic operated 4/2-direction valve with reduced pressure.
- **TMHR** Manually/Hydraulic operated 4/2-direction valve with reduced pressure.
- **TE** Electric (solenoid) operated 4/2-direction valve.
- **TER** Electric (solenoid) operated 4/2-direction valve with reduced pressure.
- **R** Pressure reducing valve only, e.g. for external functions. The reduced pressure is led to port TA.
  Pressure reducing valve is in some cases to be used together with brake release valve for reduced pressure to the brake.

Port connection two-speed system:
TA/TB: ⅜" BSPP



## DIMENSIONS

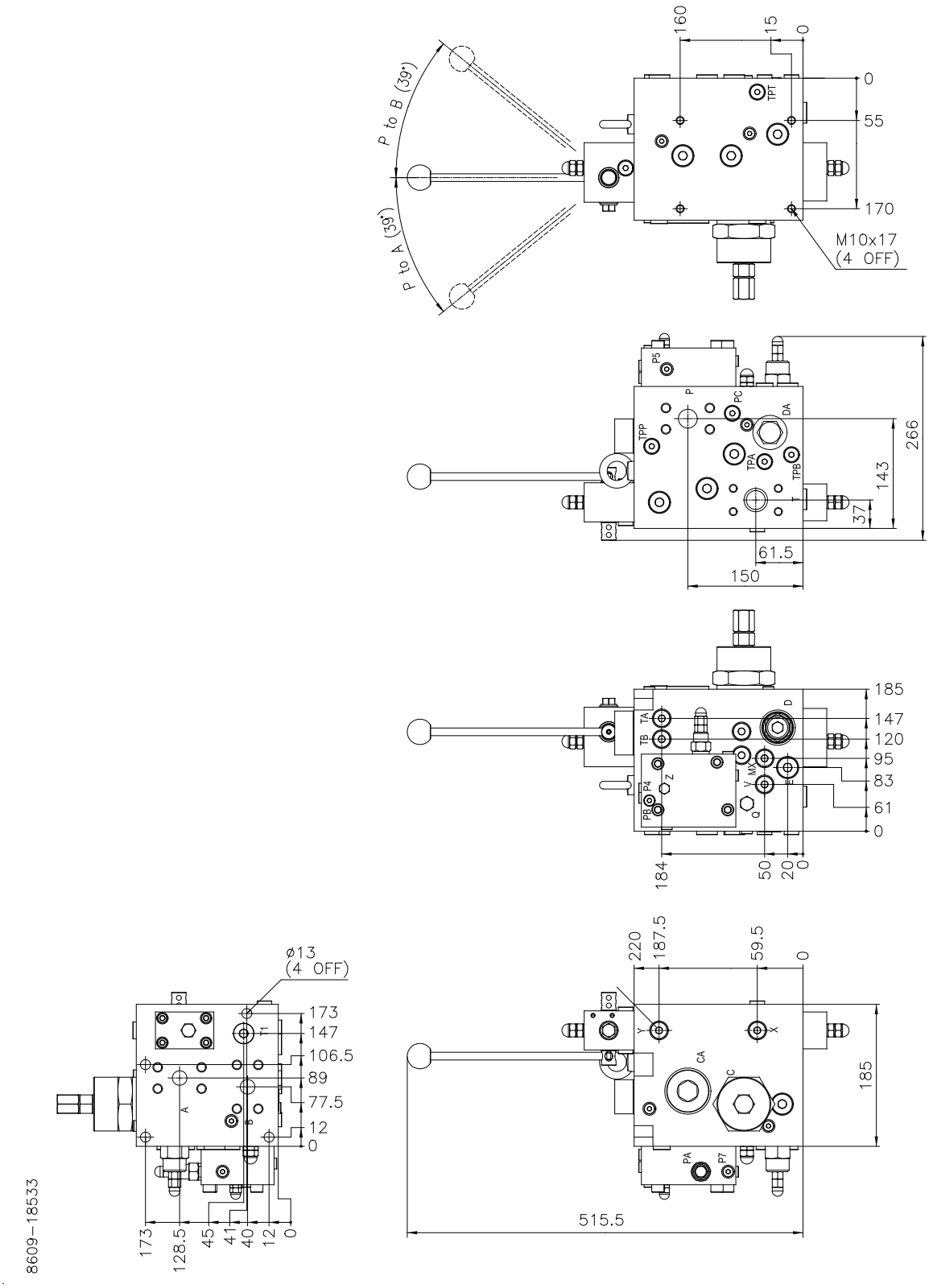



*Figure 4 Dimensions 6MB-200/320*

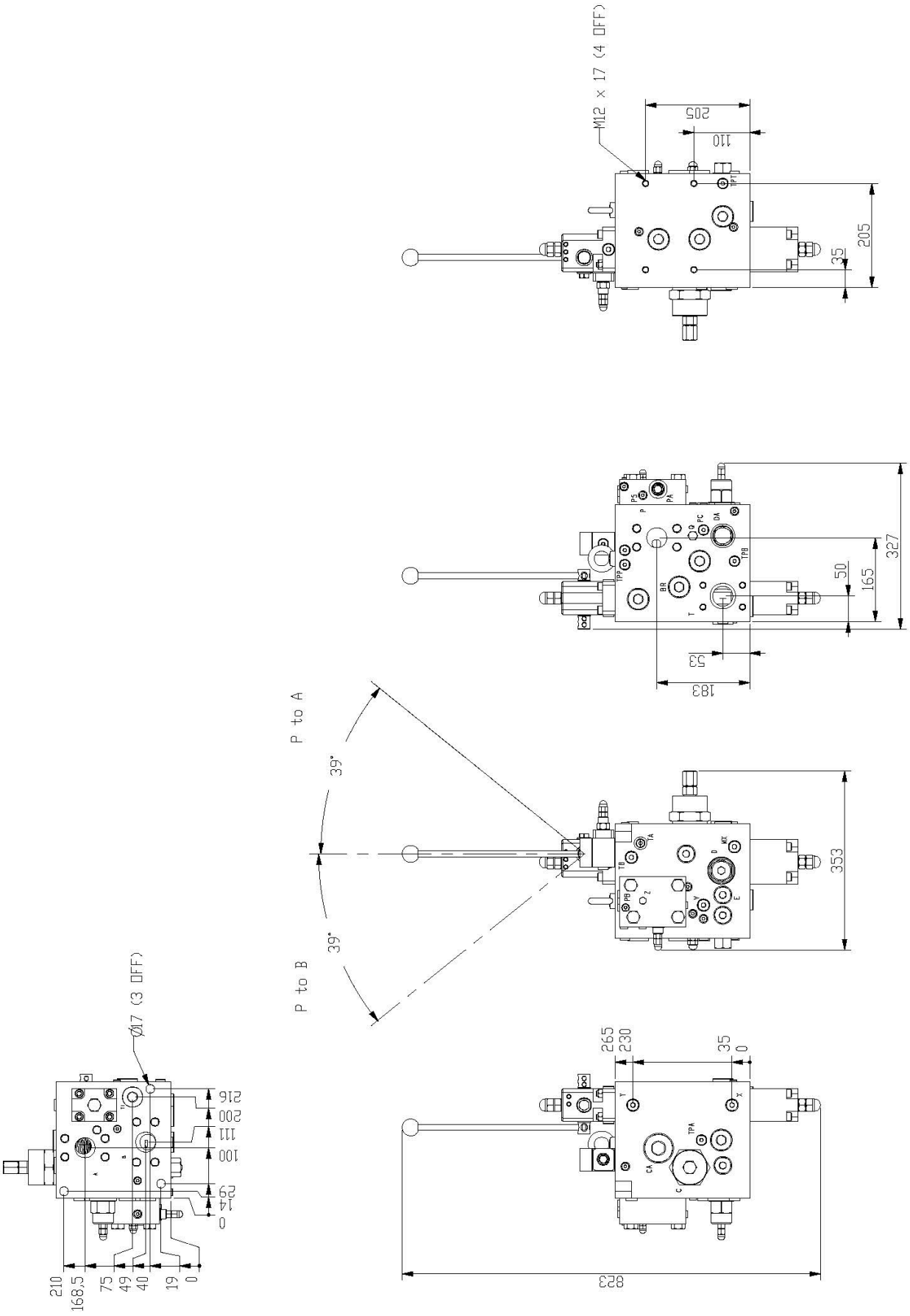



*Figure 5 Dimensions 6MB-450/650*

## PRESSURE DROP 6MB

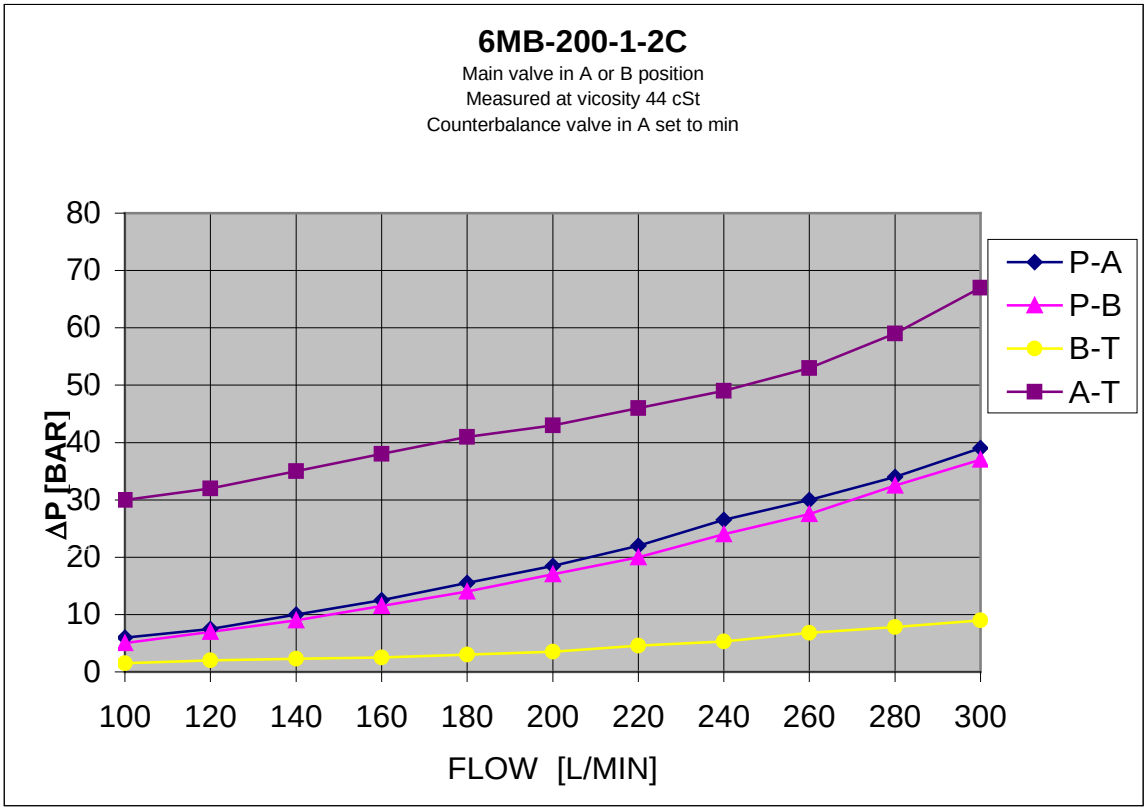



*Figure 6 Pressure drop 6MB-200-1-2C*

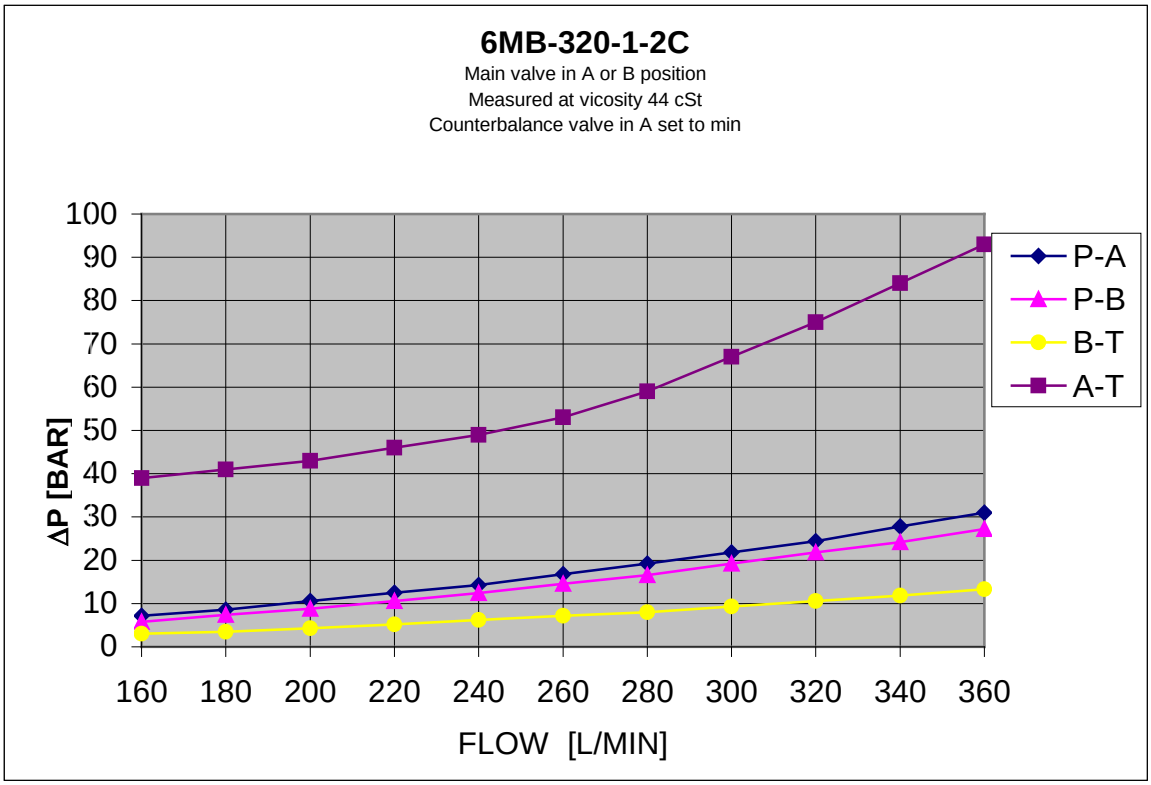



*Figure 7 Pressure drop 6MB-320-1-2C*

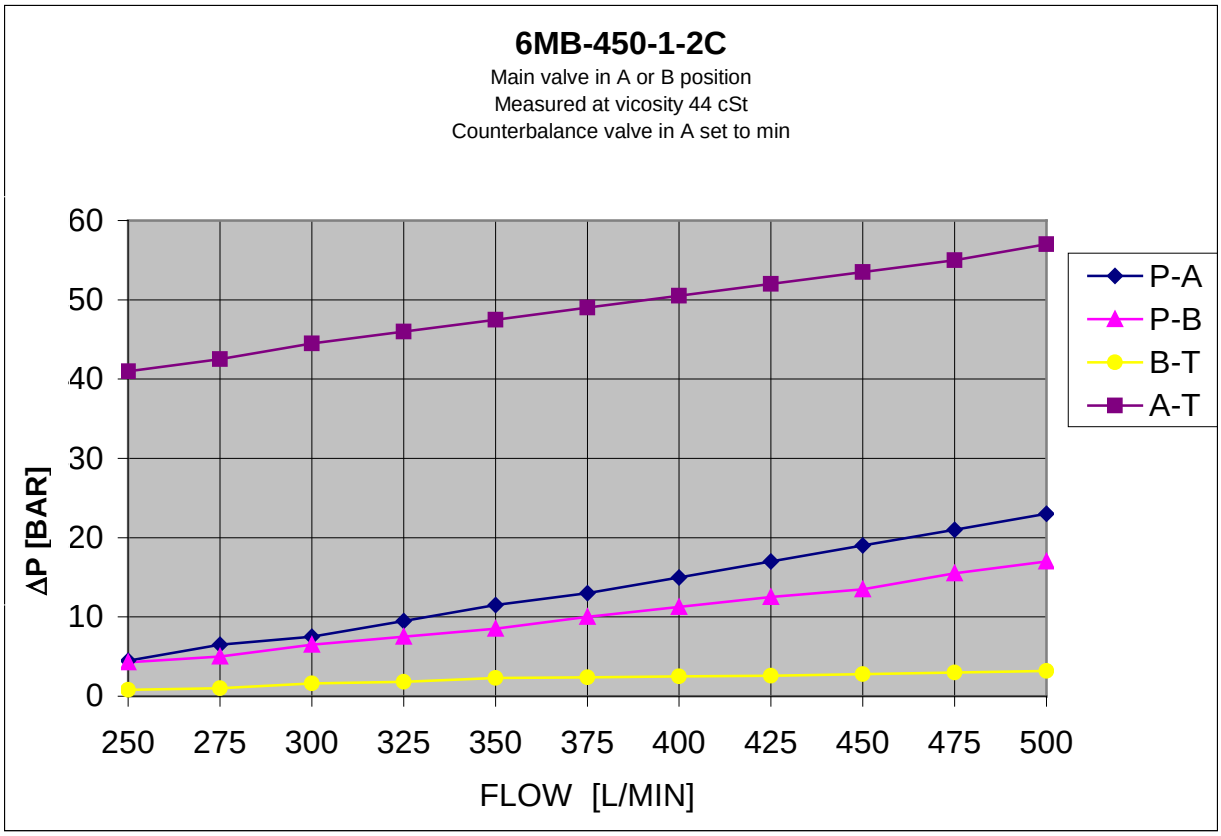



*Figure 8 Pressure drop 6MB-450-1-2C p*

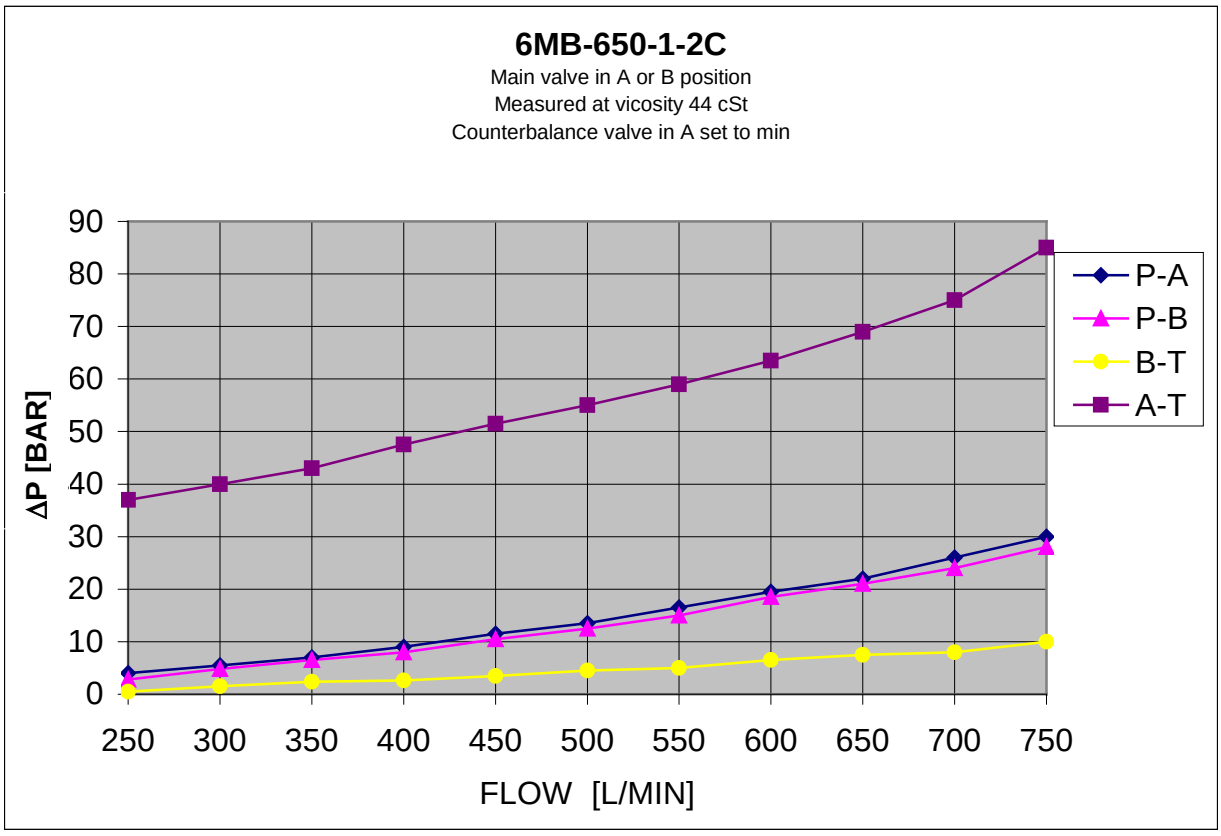



*Figure 9 Pressure drop 6MB-650-1-2C*

## TECHNICAL DATA

| Description | Symbol | Unit | Value | | | |
|---|---|---|---|---|---|---|
| Flow ( Δp 32 bar) | $Q_{max}$ | l/min | 6MB-200 | 6MB-320 | 6MB-450 | 6MB-650 |
| Flow area | | l/min | 125-240 | 200-320 | 300-500 | 450-650 |
| Max. operating pressure in ports P, A and B | $P_{max}$ | bar | 315 | | | |
| Recommended max. pressure in port T. (See Note 1.) | $T_{max}$ | bar | 20 | | | |
| Directional valve pilot pressure | P | bar | 5-20 | | | |
| Weight basic version | m | kg | 6MB-200/320 | | 6MB-450/650 | |
| | | | 56 | | 96 | |
| Hydraulic fluid | | | Mineral oils for hydraulic system | | | |
| Viscosity range: | v | $m^2/s$ | 10 to 350 (cST) | | | |
| Viscosity index: | VI | > 120 | | | | |
| Filtration, recommended filter with β 20 ≥ 100 | | Class 9 according to NAS 1638, 18/15 according to ISO 4406 | | | | |
| Fluid temperature range: | T | | -20°C to + 70°C | | | |
| Ambient temperature range | T | | -20°C to + 50°C | | | |
| Standard Body Material | | | EN-GJS-400-15 (GGG 40) | | | |
| Standard O-rings | | | Nitrile shore 70 | | | |

Note1: Be aware that pressure on the tank port T is direct additive to valve setting for pressure relief valve item D, and pressure reducing valve item R (If selected option R). Pressure peaks in T port can influence on the stability of the system, particular proportional remote control of main directional valve.

**Interfaces:**

| Connections | | |
|---|---|---|
| **Ports** | **Dimensions 6MB-200/320** | **Dimensions 6MB-450/650** |
| P, A and B | 1” SAE 6000 | 1½” SAE 6000 |
| T | 1¼” SAE 3000 | 2” SAE 3000 |
| MX, V, X, Y, TA, TB | ⅜” BSPP | ⅜” BSPP |
| E | ½” BSPP | ¾” BSPP |
| L (When having adapter for direct motor mounting) | ½” BSPP | ½” BSPP |
| TPP, TPT, TPA and TPB | ¼” BSPP | ¼” BSPP |
| ***Mounting Screws:*** | 4 of M 10 (Thread depth 17 mm) | 4 of M 12 (Thread depth 17 mm) |

## INSTALLATION

The Modular unit 6MB is installed with 4 screws to a bracket, or mounted to a motor flange by an adapter plate. Please refer to 'Interfaces' in section 'TECHNICAL DATA', for details about screws and o-rings.

## OPERATION

Manual control is performed by the hand lever. The valve is delivered with a centring spring, which means that main spool will return to the neutral position after operating the hand lever.

*Option 37 (*Manual/remote operated)*:*
The directional valve is prepared to be hydraulically proportional remote controlled. An external pilot pressure moves the spool to the requested position Pilot pressure 5-20 bar. The valves are equipped with a hand lever for overriding the pilot pressure.

## VALVE ADJUSTMENTS

If presetting is not stated in the order, the pressure relief valve (item D) is set to its minimum. The counterbalance valve is preset to 40 bar opening pressure, which is minimum recommended opening pressure.
Throttling item Q is factory preset to ½ turn ccw from closed position.

## MAINTENANCE

Check the valve for proper function. Visually check the valve and if required, paint unpainted (damaged) areas.

**CAUTION: Do not paint the hand levers shaft seals.**

## SPARE PART

Seal Kit Set is available.

## STORAGE

If storage longer than 6 months is expected, the valve must be kept in a dry room, free from dust and protected against sudden large temperature variations. For storage longer than 12 months, the valve must be filled with inhibition oil. Before use check all visible seals and flush with clean oil.

## MARKING

Inlets and outlets are marked, refer to figure in section 'GENERAL DESCRIPTION'.