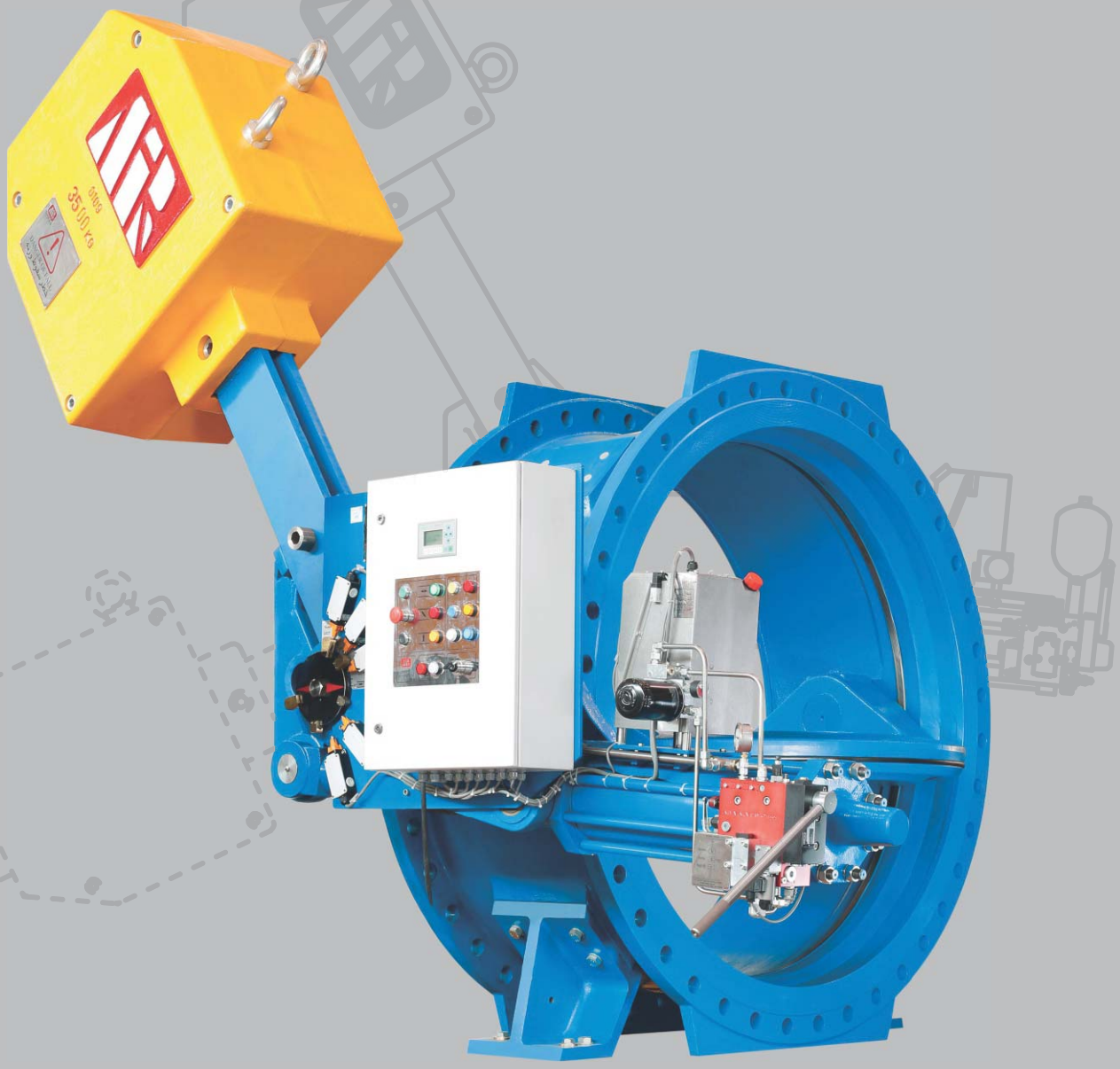
MIRAB CO.®

Manufacturer of Industrial Valves
and Relevant Equipment

Emergency Butterfly Valve with Weight Loaded Hydraulic Actuator



www.mirab-valves.com

Hydraulic actuator installation positions

Normally open (fail to close) emergency
Excess shot of valve DN 1800, PN 25
Water supply project in Algeria, Contractor:
EFACED Portuguese corporation.

Normally open (fail to close) emergency
Excess shot of valve DN 350, PN 16
Water supply project in ZAHAK
(SYSTAN & BALOUCHESTAN, IRAN),

Normally open (fail to close) emergency
Excess shot of & pump control valve DN 1800, PN 25
DOUSTI Dam, IRAN, KHORASAN

Normally close (fail to open) emergency
Rapid drain valve DN 1800, PN 10
DAMAVAND powerhouse, IRAN

Normally open (fail to close) emergency
Excess shot of valve DN 1800, PN 25
IDOGHMOUSH Dam, IRAN.

Weight loaded with Hydraulic actuator

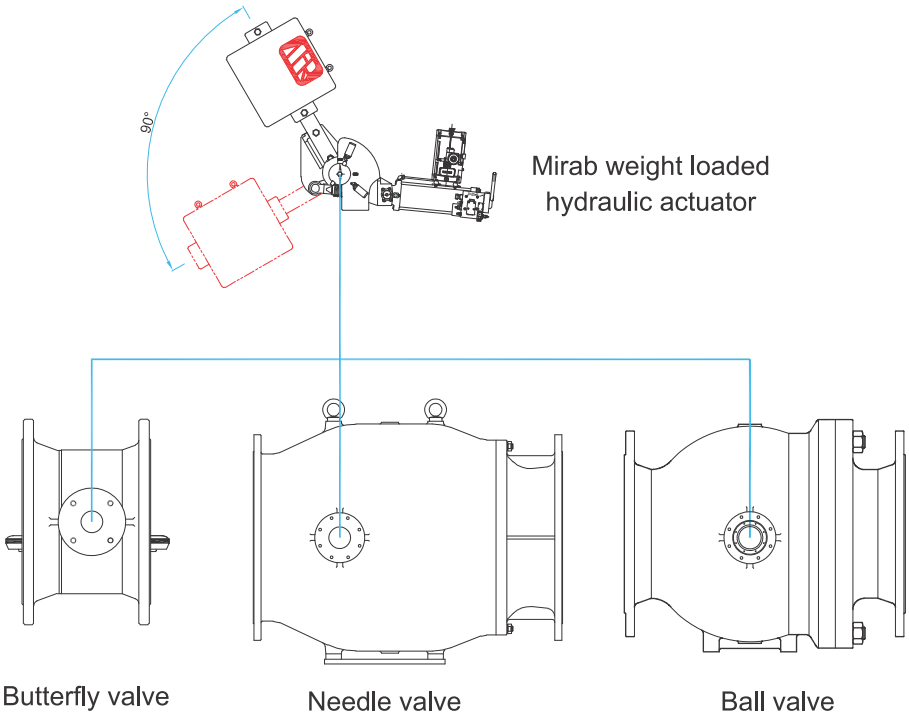
Valve specification:

Mirab Valves Weight loaded Hydraulic Actuators are used wherever valves installed at critical points of pipe networks have to close or open in a secure and reliable manner even in case of failure of external operating energy. They have to meet the most stringent requirements in terms of functional safety. Weight loaded actuator can be used in emergency valves for closing or opening the valve in emergency conditions independent of electrical power.

The weight loaded provides the energy required for a single closing or opening operating of the valve.

Mirab compact type weight loaded Hydraulic Actuator is used for operating valves with a drive shaft rotating by max. 90° ,maybe incorporated in ball valves, Butterfly valves or needle valves range of size and standard interfaces combined with a perfect modular concept enable to supply the best solution for valves of all sizes and pressure ratings.

Since this valve as an emergency valve should be ready to operate any time all components must be made high quality. Hence an smart control system check the all parts and provide the report of failed mechanism or components if need this report can be showed on control desk or monitored by in-charge people. This valve can operate by signals from control room.



Description of performance

Hydraulic pumps produce a pressure on the piston side of the cylinder which raises the weight-loaded lever. Falling weight can be done in the following sequences:

- By energizing or de energizing hydraulic solenoid valve from remote or local control system
- By hydraulic or electrical command signal from speed sensor (or other sensors).
- By means of manual hydraulic valve on control block.

To prevent creating water Hammer and impact to Hydraulic system, weight falling at the beginning, is rapid and in the near end of its travel course fairy slowly. Each falling step times of weight movement is adjustable

Applications

Applications of weight loaded - Hydraulic actuator valves can be classified as follows:
Please note that mentioned applications are most important use of valve and this valve can be used for other applications according to designer opinion.

1- Combined pump discharge control & non return valve

Combined function in one valve starting pumps in a controlled manner and non-return function the actuator helps towards a smooth start of the pump. Closing slams of the disk are prevented by means of 2 phase closing characteristics. Also the valve can be used as an emergency shut off valve for preventing returning water to pump station when pipe burst has occurred.

2- Over flow control valve

In this case of application, this valve can be installed at inlet of reservoir and can close inlet water pipe for controlling water level, also it can prevent water returning in case of inlet pipe burst occurs.

3- Turbine inlet safety valve

Safety valve directly installed at the turbine inlet. It is used as a safety valve for quick closing in case of sudden load rejection, avoiding inadmissibly high speed (runaway speed) of the turbine and water hammer phenomena which might be created there. In a lot of plants, weight loaded hydraulic actuators are also used in the bypass acting quick- opening devise in order to open synchronously to the closing of the inlet valve in a neutral manner as far as flow rate in concerned

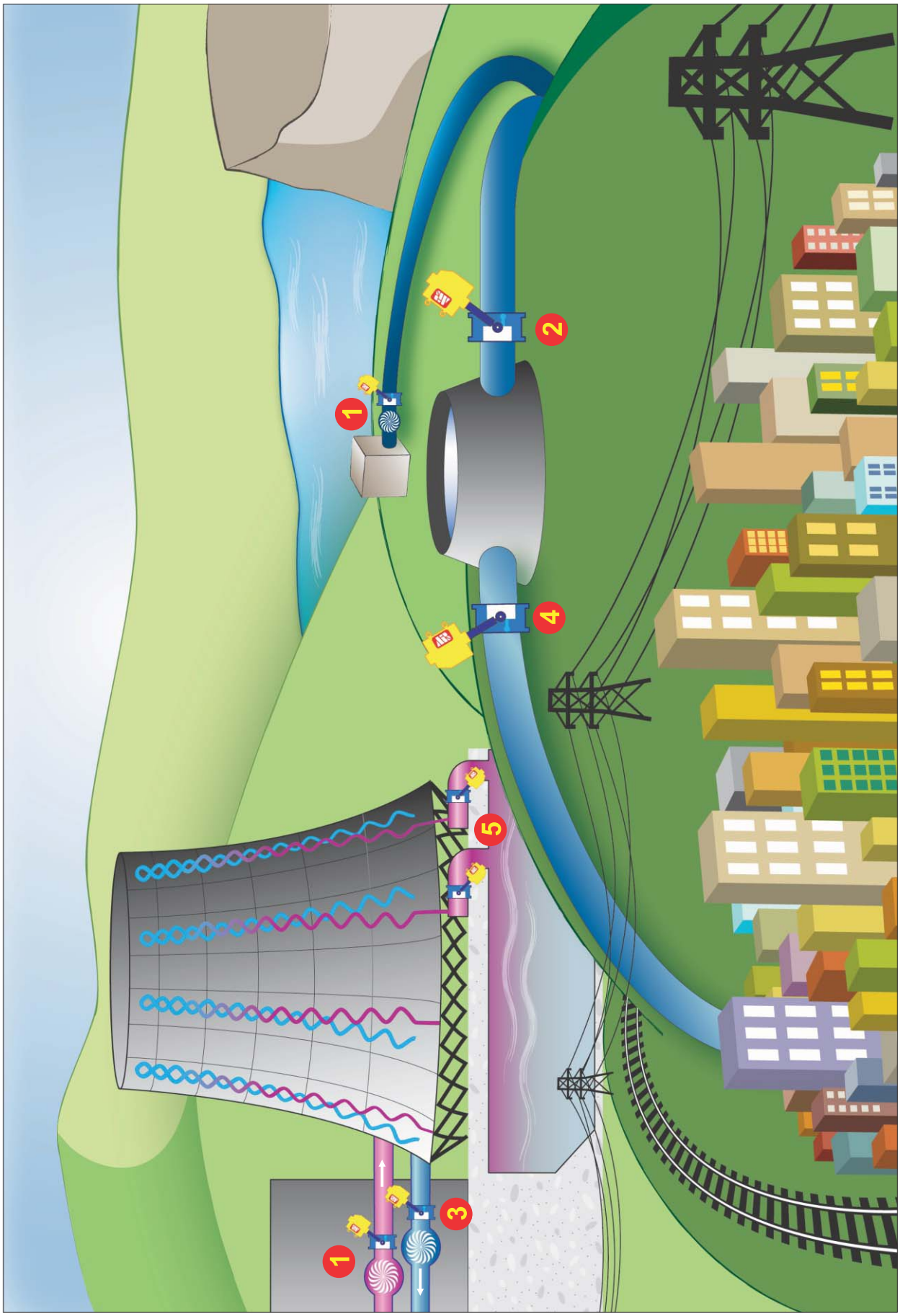
4- Burst control valve

In water piping systems, pipe burst can happen due to natural disasters or other reasons like fire, explosion etc. emergency hydraulic valve can be used in system for closing water flow and to protect buildings, traffic routes, pumping stations etc.

5- Emergency drain valve (Quick opening valve)

Sometime water drainage is necessary for protection of systems for instance in a power plant for any reason cooling tower should be drained (to avoid freezing in winter time) in this situation emergency valve will open and would allow drain of the water.

For applications item 1, 2, 3 & 4 the valve is normally open (when the Weight is up valve is in open situation). In application item 5 (emergency opening) the valve is normally closed (when the Weight is up, valve is closed)
For more data, contact technical office of Mirab Valves.


1
2
4
5
3
1

Technical specification

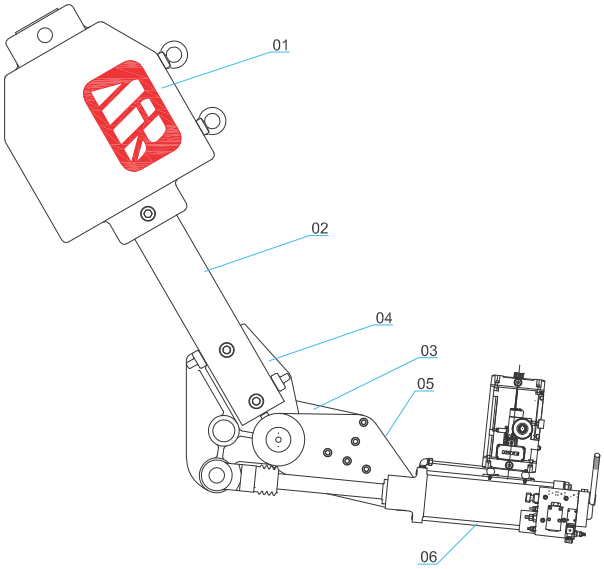
Hydraulic system

Hydraulic system in Mirab Valves weight loaded with hydraulic actuator has the duty of raising the weight and also damping speed of weight falling process to prevent system shock. Hydraulic system consists of:

- Hydraulic actuator
- Power pack (consist of motor pump and reservoir and protection elements)
- Control block
- Piping and connections

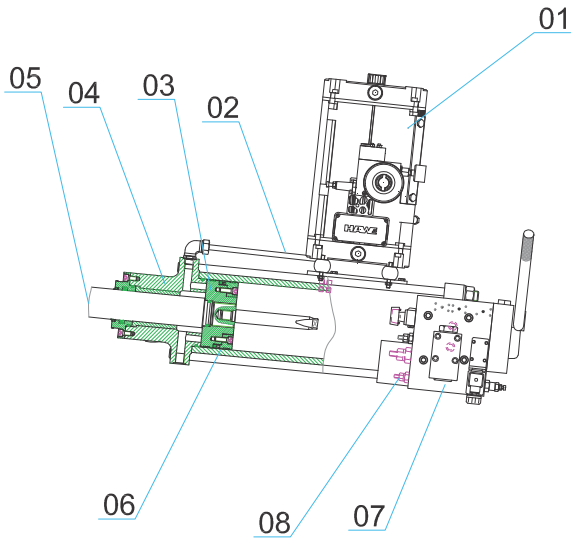
Hydraulic standard parts are provided by great well known European companies .All hydraulic system also will be tested after installation on valves.

Weight loaded hydraulic actuator parts



Part No.	Part Name
01	weight
02	Weight arm
03	Main plate
04	Joint plate
05	External plate
06	actuator

Hydraulic system



Part No.	Part Name
01	Power pack & Oil
02	Pipe
03	Piston
04	Joint
05	Shaft
06	Cylinder
07	Block
08	3 way hand valve
09	Hand pump

Control system

Mirab Valves hydraulic control system are used as receiving, analyzing & generating control signals to running the main valve. These systems allow control of the valve as following options:

- Sending the control signal from local control cabinet (installed near the valve).
- Sending the control signal by control unit center.
- Generating the control signal by electrical sensors such as velocity & flow sensors, water level detecting devices & earthquake detecting sensors.
- Generating the hydraulic and electric control signal by paddle type tripping Device.

Note:
Some of these control devices can be produced by Mirab Valves.

The electrical control system for valves equipped by weight loaded-hydraulic actuator include of:

- Local control cabinet including of PLC planning system, contactors, timers & connection terminals.
- Limit switches & pressure switches.
- Electrical motors for hydraulic pump.
- Connection cables.

The generating signal system to falling the weight (open or close valve) for emergency position is available by this table:

Electrical situation	Description	Command signal source
Electrical power is available	Valve can be operated by electrical control system.	- Cut off main electrical power. - Speed or flow meter or earthquake sensor - Flow switch fig.1 page 9
Electrical power is not available	Weight will fall when the hydraulic system gets signal from mechanical flow speed sensor.	- Mechanical paddle fig.2 page 9
	Weight will fall when the hydraulic system gets signal from pressure differential sensor (venture).	- Venture pipe fig.3 page 9

Technical Specification

Default Technical data for weight loaded with hydraulic actuator valves are listed in this section:

Standards	Butterfly Valve	DIN EN 593 (DIN 3354)
	Face to face	DIN EN 558-1 series 14 / ISO 5752-14 (DIN 3202-F4)
	Flanges	DIN EN 1092-2 (DIN 2501)
Material	Body , Disc , Clamping ring	EN-GJS-400-15 DIN EN 1563 = GGG 40 (DIN 1693)
	Solid body seat	1.4301
	Profile sealing ring	NBR or EPDM (Germany)
	Shaft , driven & free end	1.4021
	O-ring	NBR with Certificate KTW (Germany)
	Bearing bushes	Al- Bz DIN 1714
	Screws	A2 DIN 931
Disc swing	Eccentric or double eccentric	
Coating		Body and disc are coated with blue electrostatic powder epoxy coating
Flange Drilling		DIN EN 1092-2 (DIN 2501)

Weight loaded - Hydraulic actuator

Material	Actuator bracket	Steel
	Weight lever	Steel
	Weight	Cast iron
	Piston rod	Steel with hard-chrome plating
	Hydraulic cylinder	Steel with inner roller burnishing
	Cylinder Front & end	Ductile cast iron
	Sealing	High quality NBR packing.
	Pipe fittings	Zinc-coated steel
	Bearing	AL-BZ
Operation	Valve opening	By means of electric pump & manual pump
	Valve closing	By means of :Solenoid valve , Remote command from flow sensor or central control room or by manual hand valve
	Valve blocking	By means of Solenoid valve or Hand valve
	Weight raising time	Min. opening time is about 60 Sec. and would be increase by mean of the flow control.
	2-step adjustable weight falling	1st step (%70) is adjustable with flow control on the main block.
		2nd step(%30) is adjustable with flow control on the main block.
	Total closing time	~20 Sec. and more
Electrical system	Solenoid valve	Zero leakage (Seated cone type) ED %100
	Voltage of Solenoid	24 VDC (other on request).
	Limit switches	3 high corrosion resistant limit switches for open, close & %90 open (signal for compensation of unexpected internal oil leakage). or proximity switch.
	Control panel	The Control Panel is installed on the valve or wall and all electric devices connected to it and operates by means of the PLC.
Protection Class IEC 529	Control Panel	IP 54
	Junction Box	IP 54 (if necessary)
	Limit switches	IP 67
	power pack	IP 54
	Solenoid valve	IP 65
Power pack unit	Type:	Compact power pack unit
	Electrical motor	400 VAC–3 phases 50 Hz or 230V-1phase 50Hz
	Hydraulic pump	Gear type
Safety guards	Effective protective guards have to be installed around moving parts, by customer.	
Coating	Body and disc are coated with blue electrostatic powder epoxy coating (250µ).	

Schematic sketch for bursting pipe valve

Fig1) installation with flow switch

This equipment use for water speed $0.3\frac{m}{s} \leqslant V < 1\frac{m}{s}$

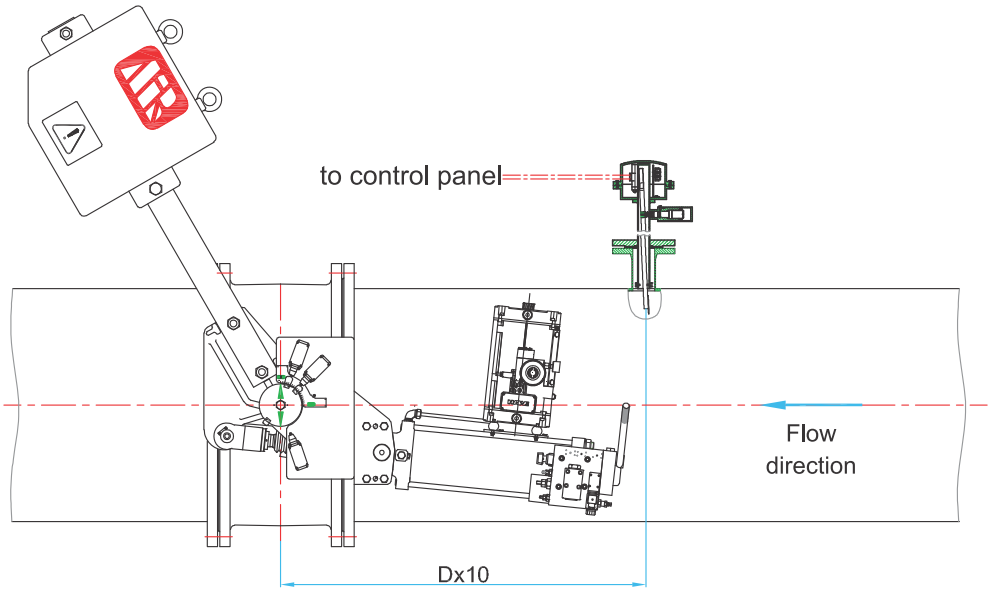
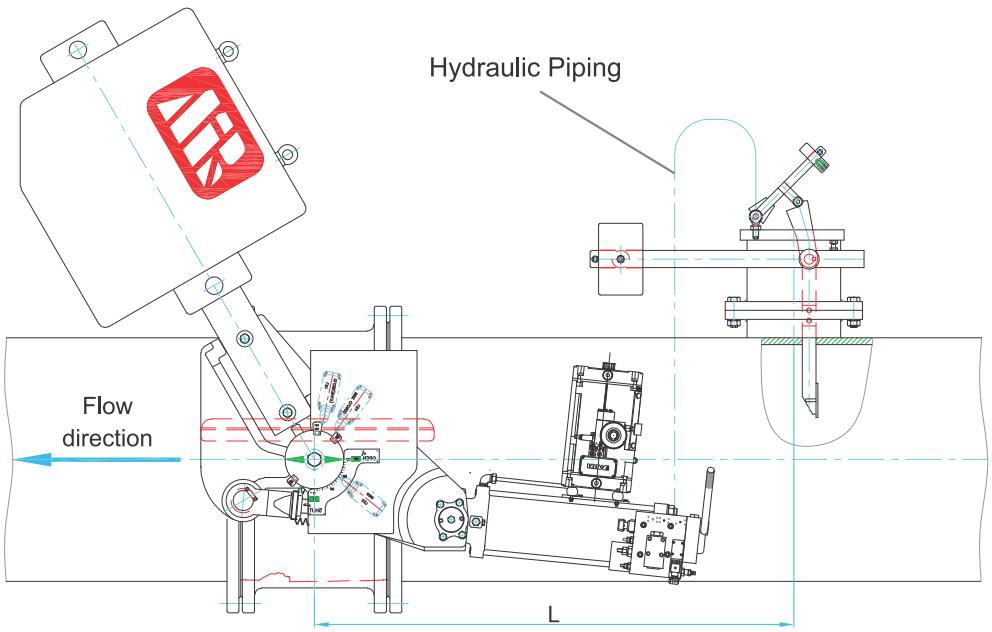


Fig2) installation with mechanical speed sensor

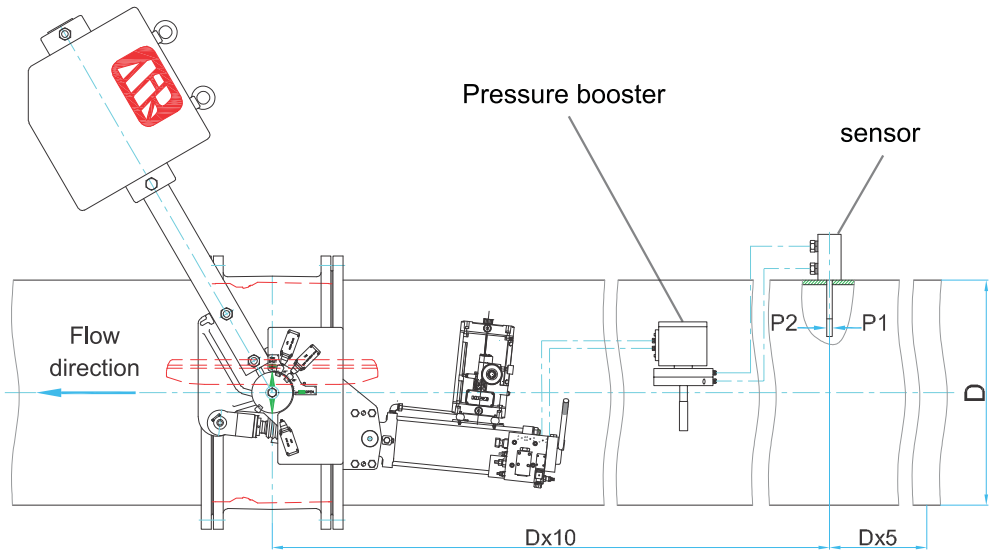
This equipment use for water speed more than $1\frac{m}{s}$
(no need to electricity power)



DN	L
300	1300
400	1300
500	1350
600	1400
700	1450
800	1450
900	1500
1000	1550
1200	1550
1400	1600
1600	1700
1800	1800
2000	2000
2200	2200

Fig3) with Differential pressure sensor

This equipment without depending on electricity power.



Important operation instructions

1-Butterfly valves are designed for full opening or full closing operation so they should not be used for controlling flow rate, it will cause cavitation and valve will be damaged.

2-For better sealing function and easy maintenance and adjustment works , it is recommended to select and install valve position as pressure side locate at disc shaft side in closed situation.

3-Opening the valve under unbalanced pressure conditions – when both sides of the valve don't have the same pressure will impose extra stress to the shafts and other parts, so it is strongly recommended to balance pressure on both sides of the disc before opening the valve.

4-If the valve is kept in the warehouse for long time before installation, it is recommended to open disk 5 degree for preventing any possible seal damage. Valve should be covered properly to prevent direct sun ligh or dust.

5-Avoid any impact to valve especially hydraulic system and electrical control panel and take care while transportation and installation process.

6-It is necessary to clean pipe line carefully before installation and operation of valve , any external particle like metals, welding electrodes, wooden parts, eta ,can damage the sealing parts.

7-Be sure of compatibility of fluid physical and chemical properties and valve parts specially sealing rubber.

8-Valve installation site should be designed in such way that valve installation and maintenance process can be performed easily.

9-Service and maintenance of the valve and hydraulic system should be carried out regularly based on related instructions.

Installation, operation and maintenance instruction manual will be sent for customer upon valve delivery.

Accessory Equipments:

1-Bypass electrical valve

For balancing fluid pressure on both sides of the butterfly valve disc before opening process it is recommended to use bypass line with an electrical valve that is connected to the main emergency valve control system.

2-Differential pressure switch

To ensure equal pressure both side of the butterfly valve before opening it, installation of differential pressure switch is recommended. After opening bypass valve, it will send equal pressure confirmation signal to the control system
of the main valve.

3-Econo plug for hydraulic solenoids

In case of using fail safe control systems, the coil of hydraulic solenoid valve will be energized for a long tim; it is an electrical component and it's life time will be over finally , when the solenoid coil fails , it may cause fault in system and sometimes it is a serious trouble for systems. Mirab valves find a solution to reduce probability of this fail and postpone this trouble as late as possible . Econo plugs are used in hydraulic solenoid electrical system and make following advantages:

- Reducing continual voltage and consuming electrical power of the coil.
- Reducing produced heat in the solenoid coil.
- Increase life time of the coil.

4-Triping reporter system

Sometimes there is not control room near the valve & it is not possible to inform the operators. This system can create the tripping report & send it to in charge people by "GSM". The reports can be about:

- Valve failure &kind of fail
- Valve position (open or close)
- Valve ready to start after solving the problem.
- Periodic valve ready to start (i-e. every week)

Row	Voltage	Voltage Range	Technical Code	ATM. Temp.
1	DC	15 to 55 Volt	15-55VDC - T75	-25 to +75
2	DC	100 to 250 Volt	100-250VDC - T75	-25 to +75
3	AC	98 to 130 Volt	98-130VAC - T40	0 to +40
4	AC	200 to 250 Volt	200-250VAC - T40	0 to +40

All these sequences can be allowed after registering the security code by in charge people.

5-Accumulator

In weight loaded hydraulic actuator systems because of unavoidable little oil leakage in course of time, weight will move down a little after starting operation and it will cause shaft and disk rotation 5-10 degree (it is beneficial for preventing shaft locking if preventive maintenance had not been performed on valve) In some cases when electrical power is not available or little disk and weight movement is not allowable according to valve function , a hydraulic accumulator can be installed on actuator for decrease effect of hydraulic leakage during time.

6-Accumulator testing and charging

For testing and charging of accumulators during operation and maintenance activities charging kit is available.

Accumulators used in hydraulic system to provide pressure in required situation, so these devices should be pre charged by N gas.
Mirab Valves are provided with a kit of test & charge of accumulator to after sale service.
The customers can test,regulate & charge the accumulator gas by these devices. The pre charged gas pressure shall be according to privative maintenance procedure of weight loaded-hydraulic actuator.

Needed information for ordering charging kit:
Producer name and code of accumulator - accumulator volume – accumulator and gas tank port size and type.

Mirab Valves Weight loaded hydraulic actuator technical Questioner form (Date:…..)

Company name: Phone No.: e-mail:
Engineer in charge: Mobile No.: e-mail:

1-Valve type : ☐ Butterfly valve ☐ Needle valve ☐ Ball valve quantity : …….. set

2- Valve Size: DN …… mm

3- Nominal pressure: PN ….. bar - Working pressure: ..... bar - Flange drilling PN ……..

4-Application:

☐ Non-return, Isolating and Pump control valve ☐ Over flow Control valve for Reservoir

☐ Safety Valve for Turbine Inlet ☐ Pipe burst control valve ☐ Quick opening vale

☐ Other Applications (please describe): ……..……..…

5-Flow rate and velocity: Normal operation condition : …….. Tripping condition: ……..……

6-Pressure conditions when valve is closed : ☐ upstream ☐ downstream

7-Valve normal situation: ☐ Normal Open (Opening with the weight rise and will be closed with weight fall)

☐ Normal Close (Closing with the weight rise and will be opened with weight fall)

8- Weight falling time: step1(70% of falling travel) ..… sec step2(30% of falling travel) …… sec

9- Weight Falling command is by :

☐ Velocity or flow switch (electrical) ☐ Paddle tripping device (mechanical) ☐ Lack of electricity

☐ Differential pressure tripping device ☐ reservoir level sensor

10- Weight rise by: ☐ Manual hydraulic pump ☐ Manual and Electrical hydraulic pump (recommended)

11-Voltage of solenoid valve: …… V ☐ AC ☐ DC (recommendation: 24VDC)

12-voltage of electrical pump: …….. V ……..phase

13-Limit switches : ☐ Open ☐ 95%Open ☐ Close ☐ Tripped ☐ Others: ……..……

14-Local control panel: ☐ Mounted on valve ☐ Wall mounted

15-solenoid electrical normal situation :

Always energized (weight will start falling with solenoid de energizing)

Always de energized (weight will start falling with solenoid energizing)

16-avalable emergency electrical supply : ……..V ☐ AC ☐ DC (from ups or generator)

17-system for checking pressure in both side of valve : ☐ DPS ☐ ordinary manometer ☐ other:….

18-valve and actuator installation position and orientation: …… (Please selectPos.1 to Pos.8)

19-installation drawing should be send for Mirab Valves for more accuracy in valve specifications.

20- Other special specifications : ……..

……..……..

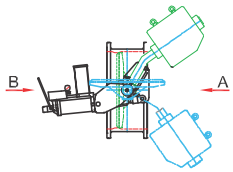
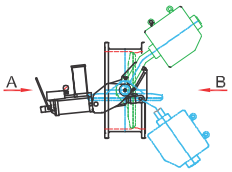
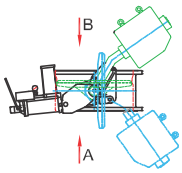
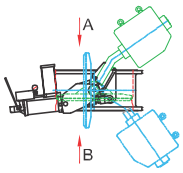
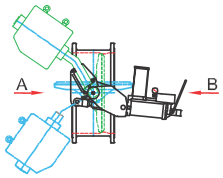
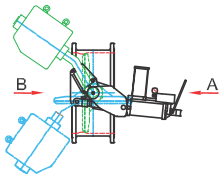
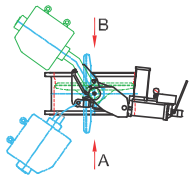
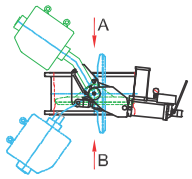
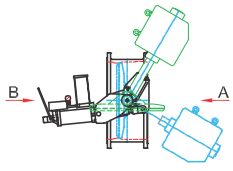
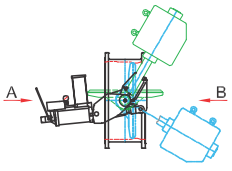
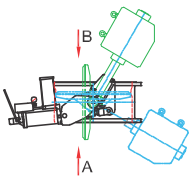
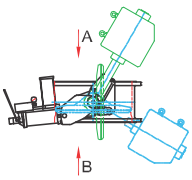
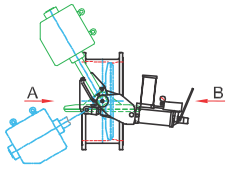
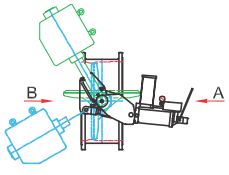
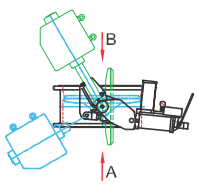
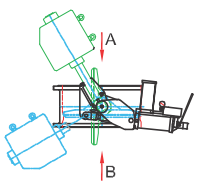
- Sending report system by "GSM"

Hydraulic actuator installation positions

For selection of actuator installation position consider following notes:

- Angle of installation (horizontal or vertical situation)
- Weight direction according to pipe line and valve high pressure side
- Normal valve working situation during operation (it is normal close or normal open type)
- Valve size (for DN 800 and smaller use left column and for DN900 and upper sizes use right column)

Important note: Butterfly valve can be installed independent of pressure side or flow direction, but **Mirab Valves** strongly recommends that valve high pressure side (A) and disk shaft side be the same especially for PN16 &25 .It ensures better sealing and allow adjusting profile ring during operation time.

DN 800 and smaller sizes	DN 900 and upper sizes
NORMALLY CLOSE valves	NORMALLY CLOSE valves
 Pos.5 (NC)	 Pos.6 (NC)
 Pos.7 (NC)	 Pos.8 (NC)
 Pos.1 (NC)	 Pos.2 (NC)
 Pos.3 (NC)	 Pos.4 (NC)
NORMALLY OPEN valves	NORMALLY OPEN valves
 Pos.5 (NO)	 Pos.6 (NO)
 Pos.7 (NO)	 Pos.8 (NO)
 Pos.1 (NO)	 Pos.2 (NO)
 Pos.3 (NO)	 Pos.4 (NO)

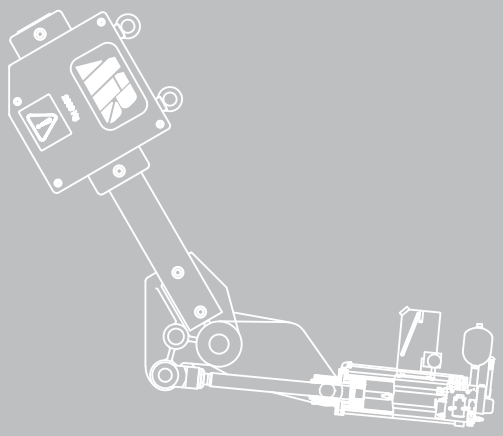
■ **Normal operation**

□ **Emergency conditions**

A : high pressure side

MIRAB Co' PRODUCTS

Butterfly Valves Family: Double Flanged Type, Butt-weld End, Wafer Type, Lug Type, Hydraulic Actuated, Pneumatic Actuated.
Gate Valves Family: Soft-Sealing Gate Valve, Metal Seat Gate Valve, Knife Gate Valve, Sluice Gate Valve.
Non Return Valves Family: Tilting Disc with Counter Weight, Tilting Disk with Counter Weight and Hydraulic Damper, Swing Check Valve, Silent Check Valve, Foot Valve, Nozzle Check Valve, Wafer Pattern Check Valve, FlapValve.
Air Vent Family: Single Chamber - Double Orifices , Double Chambers - Double Orifices, Sewage Air Valves, Large - Orifice Air Valve.
Control Valves Family: Automatic Control Valves, Needle Valve, Globe Valve, Fixed Cone Free Discharge Valve, Hollow Jet Valve, Sleeve Valve.
Hydrant Valves Family: Standing Type, Pit Type, Wet Barrel Fire Fighting Valve, Post Indicator Valve.
Strainers Family: Y Type, T Type, One Side Flanged Type.
Fittings Family: Dismantling Joint F1&F2, Pipe Coupling, Flange.
Actuators: Electrical, Hydraulic, Penumatic, Portable Electrical.



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