

A NEW PIPING SYSTEM
FOR TIRE VULCANIZING MACHINES

ROCKY PANEL UNIT



■ HISTORY OF ROCKY VALVES

Valves specially used for tire curing press comprise one of the leading product lines of ICHIMARU-GIKEN. They were initially developed as valves for tire vulcanizing machines in 1978 at the time of the founding of the company (Figure 1). Instead of diaphragm type valves employing metal seal that comprised the main type of valve in use at the time, they were an epochal development, a piston seal type employing a soft seal; and they are now in widespread use not only in Japan but in tire manufacturing plants around the world as long-life, maintenance-friendly valves.

The product lineup of ROCKY valves starts out with standard 2-way, 3-way, and 4-way valves and includes control valves, steam regulators, knuckle joints, ejectors, and check valves, and so every possible type of valve needed for tire vulcanizing is available; while on the one hand conforming to various flange and thread specifications to meet standards both within Japan and around the world, these products also meet various types of special specifications in terms of materials, paintings, surface treatment, and face-to-face dimensions of flanges and so on. Thus, these valves not only constitute world standards in themselves but also unflinchingly meet the requirements of the customers.



Figure 1. The First Piston Valve
(Dec. 10, 1978)

■ TIRE VULCANIZING MACHINES AND VALVES

Valves for tire vulcanizing machines will be used for the ON/OFF, regulation of flow rates or flow paths of wide range of fluids such as high pressure steam, high pressure nitrogen gas, hot water, cold water, exhausts, and vacuums. Accordingly, they are subjected to large fluctuations in temperatures and pressures, while the frequency of the execution of their functions is also high, so that extremely rugged valves are called for. In addition, the gas vulcanizing process that is being employed in recent days requires that there be no leakage from the valve seats or stem seals. Based on their track record in extensive usage over the years in different plants, ROCKY valves have won a high reputation in these respects based on their track record over the years in plants.



Figure 2. ROCKY Valve Series
(Conventional valves)

■ DEVELOPMENT OF ROCKY PANEL UNIT

In tire vulcanizing machines, several types of flowing substances including steam, hot water, and nitrogen gas, are used while their exhaust systems have to provide a variety of functions including the recovery of gases and steam, vacuum, and drainage. Since in the vulcanizing of tires, a variety of different types of valves are put to work, scores of valves are used in each vulcanizing machine, so that there is a wild confusion of piping in the area surrounding the vulcanizing machine proper and in the piping pit. In some cases, this results in work areas where difficulties are encountered even in replacing valves. Also, since heated gaseous and fluid substances such as steam and water are used, the area around the piping is inevitably a harsh environment with high temperatures and high humidity prevailing.

As a result, the environment in which maintenance work on the valves has to be carried out inevitably is a hazardous, dirty, and harsh environment. Yet it is also extremely important in the vulcanizing of tires that the valves function accurately without any leaks, while since the equipment has to operate 24 hours a day, around the clock, it is essential that any maintenance work to take care of any problems involving valves that might crop up can be carried out swiftly. Also, as indicated earlier, piping for a large number of valves has to be installed in the limited space around the machines, and so up to now, there has been a great deal of work involved in the assembling and installing of the press proper, in making advance preparations, programming of the steps involved, carrying out the piping work, and conducting of tests to check for any possible leaks. Completing the piping work in an infallible manner as quickly as possible is essential if the period required to complete the system is to be reduced, but given the piping procedures followed in the past, it is a sad fact that there were inevitably limits to what could be done.

ICHIMARU-GIKEN has integrated valve and casting technologies available heretofore into a piping system that makes possible swift installation of vulcanizing machine valves and that enables maintenance work to be carried out readily, to develop a new piping system for tire vulcanizing machines, the "ROCKY PANEL UNIT." The ROCKY Panel Unit will contribute to reducing costs in every aspect for its customers, starting from the installation of tire vulcanizing machines and including post-installation maintenance work.

■ WHAT IS ROCKY PANEL UNIT?

A ROCKY Panel Unit is made up of ROCKY Panel Valves that have been developed recently and a ROCKY Panel Block (Figure 3). In assembling the unit, seals (gaskets or O-rings) are first fitted to the ROCKY Panel Valves, after which they are secured to the ROCKY Panel Block with Hexagon socket bolts or stud bolts screwed in and secured in place in advance.



Figure 3. ICHIMARU-GIKEN Panel Unit, Panel Valves, and Panel Block

The valves have grooves that are provided for fitting seals (Figure 4), that enable the seals to be fitted securely. There are two types of seals, and the appropriate type is selected according to the application: for hydraulic systems O-rings are used, while for steam, gas, and hot water systems, special gaskets (Figure 5) that provide a high level of sealing are used for such high-temperature, high pressure application environments.



Figure 4. Grooves in Panel Valve for gaskets



Figure 5. Gasket for Panel Valve

Basically, ROCKY Panel Units are shipped out after the ROCKY Valves have been fitted in the Panel Block and the assembly has been tested for air tightness using nitrogen gas. Accordingly, all the customer has to do is the subsequent piping, and this means a dramatic reduction of the piping work.



Figure 6. Inspection scene of ROCKY Panel Unit

■ ROCKY PANEL VALVES

Basically, insofar as major components such as the sealing and cylinder sections are concerned, ROCKY Panel Valves continue to use the conventional ROCKY Valve configuration that has a proven track record and has taken firm root during the many years that they have been in use. Nevertheless, they have been improved and evolved even further in many respects both major and minor (see pages that follow). Also, while a wide-ranging product lineup that is on a par with that of conventional valves is available (Table 1), they continue to be improved and perfected in response to customer requirements.



Panel Valve
(PPM1214-25)



Conventional Valve-Flange
(TPC2312-25)



Conventional valve – Thread
(TPC2311-25)

Figure 7. External Views of ROCKY Panel Valves and conventional valves

Item	Series Type	Function		Applicable fluid				Sizes						Notes
		NC	NO	Steam	Gases	Hot water	Cold water	10	15	20	25	32	40	
2-way valve	PPM	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	3-way valves with threaded 3-port also available
3-way valve	PMM	—	—	✓	✓	✓	✓			✓	✓	✓	✓	
Lift check valve	PVL	✓	×	✓	✓	✓	✓			✓	✓			
Control valve	PDC	✓	×	✓	×	×	×		✓					CV=1, 3, 6
Steam regulating valve	PSR	✓	×	✓	×	×	×			✓				
2-way valve	PPW	✓	×	×	×	×	✓			✓		✓		Spool type (balanced)
3-way valve	PPW	—	—	×	×	×	✓			✓		✓		Spool type (balanced)
4-way valve	PFW	—	—	×	×	×	✓	✓	✓					Single action and double action types available
Relief valve	PRW	✓	×	×	×	✓	✓		✓	✓		✓		Can handle relief pressures for different applications

Table 1. Product lineup

■ FEATURES OF ROCKY PANEL VALVES

Compared to conventional valves used heretofore, ROCKY Panel Valves have the following features.

1. Adoption of panel mount system conforming to ICHIMARU-GIKEN's unique specifications
2. Adoption of different valve configurations depending upon applicable fluid and applications
3. Change in diameter of piston for 4-way valves
4. Modification of normally open piston valve design
5. Modification of indicator for verification of movement of stem

1. Adoption of Panel mount system employing ICHIMARU-GIKEN's unique specifications

This constitutes the biggest change that has just been implemented. With conventional thread or flange connections, much effort was required in installing or replacing valves, or retightening them, however, in the case of Panel Valves, they are fitted with a minimum of two nuts, and so it is very easy to fit or remove valves, or retighten the fittings. In addition, Panel Valves are designed in conformation with the ICHIMARU-GIKEN's unique standardized world specifications, and so the same valves (*1) can be used both within and without Japan without having to worry about differences in various flange or thread standards as has been the case heretofore.

*1: There is, however, a difference in the thread specifications of the air pilot port (Rc(PT), NPT, BSP)

2. Adoption of different valve configurations depending upon applicable fluid and applications

ROCKY Panel Valves are designed based on a concept of making available valves with optimum designs and construction at optimum prices. For this reason, insofar as sealing between the Panel Valves and the Panel Block is concerned, if the fluid involved is water, low-priced O-rings are used, however, for high temperature applications or high pressure internal and external circuits, special gaskets that feature outstanding sealing properties are used. As for 3-way valves used for driving segmental mold hydraulic cylinders, in order to eliminate the water hammer phenomenon that tends to occur when switching ports and that has been a problem heretofore, a special stem design (spool type balanced type) is used.



Panel Valve: 3-way valve for water line
(PPW1314-32)



Panel Valve: 3-way valve for steam or gas
(PMM1314-25)

Figure 8. Various types of 3-way valves

3. Change in diameter of piston for 4-way valves

Scale or other forms of foreign matter have tended to accumulate on the stems of 4-way valves used heretofore after the valves have been in use over long periods, and this tends to destabilize ON-OFF functions. However, in the case of ROCKY Panel 4-way valves, the diameters of the pistons have been increased for reliable operation over long periods.

4. Modification of normally open piston valve design

Normally open type piston valves used heretofore consist simply of having the functions of the pistons reversed, however, those of the Panel Valves have the same piston configuration as normally closed valves: this is made possible by the use of a bonnet (a component fitted between the yoke stand and body). This has the effect of standardizing the construction which in turn increases the number of common components, thereby making maintenance work easier. Also, thanks to a function that provides protection of the V-gasket of the stem in the state of normal opening, which is a feature that is attributable to the inherent internal design, longevity of the valves is increased insofar as leakage from the gland section is concerned.

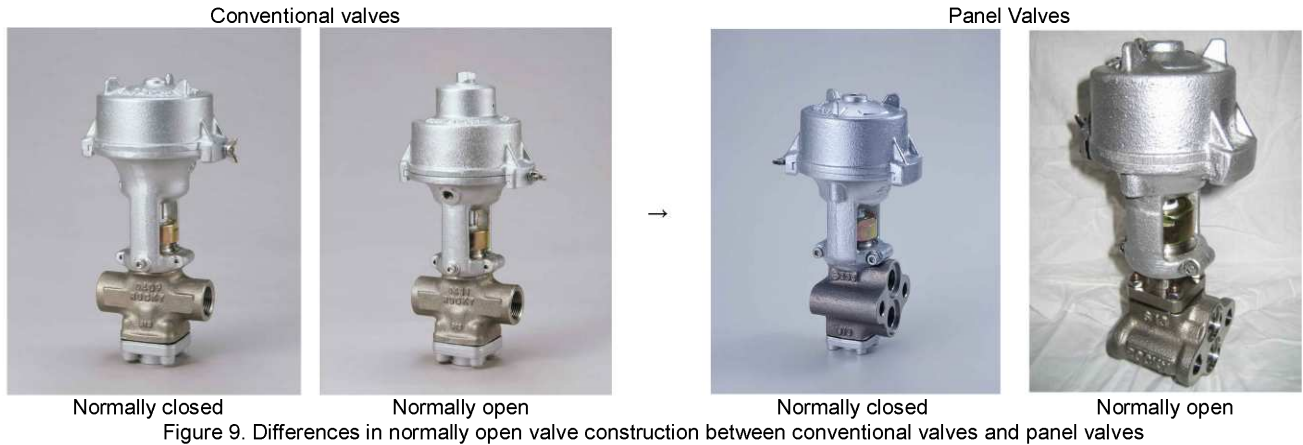


Figure 9. Differences in normally open valve construction between conventional valves and panel valves

5. Modification of indicator for verification of movement of stem

With conventional piston valves, the procedure for verifying the state of their ON-OFF functions has been to visually check the position of the lift ring gauge fitted on the stem proper. However, there are drawbacks to this procedure, namely, difficulties in conducting visual checks depending upon the attitude or positioning of the valve, while limitations are imposed upon the design of the yoke stand and upon efforts to reduce the size thereof if visibility of the stem is to be improved. However, in the case of Panel Valves, with the fitting of a separately mounted indicator on the yoke stand, it is now possible to positively conduct visual checks of ON-OFF functions. Thanks to this design, the yoke stand is short and compact in size.

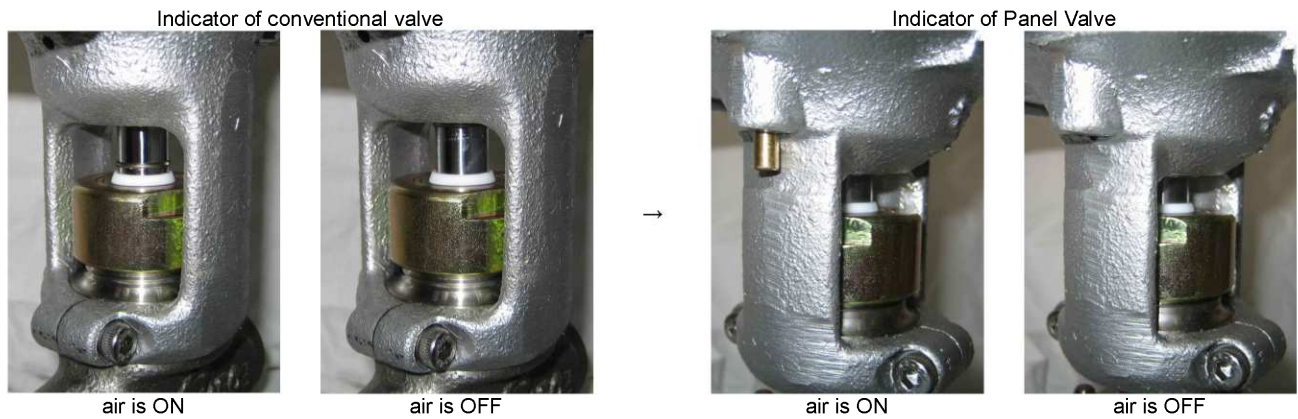


Figure 10. Differences in indicators of conventional valves and Panel Valves

■ ROCKY PANEL BLOCK

ROCKY Panel Blocks are designed and manufactured so that the ROCKY Panel Valves can be positioned in an optimum manner while giving full play to the functions of each valve, based upon the piping schematics of the customers. Insofar as the materials are concerned, if the quantity involved is large enough, we recommend stainless steel castings which would be low in price, light in weight, and provide flexibility for the valve layout. However, if the number is limited, stainless steel blocks can be used.

Stainless steel castings are manufactured in the same manner as castings for the valves, and so they feature the same degree of reliability as the valves, while they are products that also feature reliability from the outset of their development in terms of their designing, production, and track record in use. We stand ready to propose optimum procedures with respect to these points depending upon the quantity and type of systems involved, and delivery times. As for the piping method of Panel Block with main piping, here again, we stand ready to propose optimum method in accordance with the customer's intended uses such as screwing into the Panel Block, socket welding, or socket welded stainless steel piping plus stainless steel flanges of various standards.



Figure 11. ROCKY Panel Block

■ Flow of processes involved in manufacturing of ROCKY Panel Units

Panel Units are highly integrated piping systems. In order to enable them to display their effectiveness to the maximum, careful studies must be conducted when they are being adopted and installed. However, once the decision to adopt Panel Units has been made, then when the next opportunity arises, tremendous effects in terms of reducing delivery periods and costs will be achieved if earlier experiences are put to use.

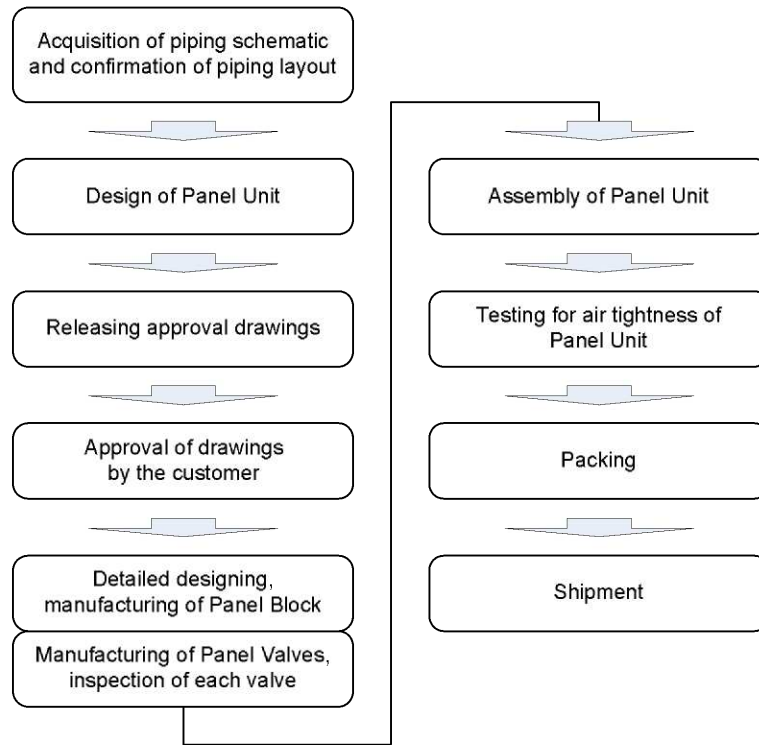


Figure 12. Flow of processes involved in manufacturing of ICHIMARU-GIKENTM Panel Units

■ Uses for ROCKY Panel Units

ROCKY Panel Units can be manufactured for all piping lines that have been used up to now in tire vulcanizing machines. The items given below are some examples of ROCKY Panel Units in different applications.

1. Internal Curing lines



W734×H518×L321

2. Platen and jacket steam lines



W439×H537×L220

3. Water lines



W615×H315.5×L173.5

4. Segmental Mold

Pneumatic lines



W562×H488.5×L300

Water lines



W433×H586×L293.5

Figure 13. Various types of ICHIMARU-GIKEN Panel Units

■ Merits of adopting ROCKY Panel Units

Following is a summary of the merits of adopting ROCKY Panel Units:

1. Reduction of piping space and elimination of piping pits.

Since a piping pit will no longer be needed, initial costs can be reduced, shortens construction period.

2. Reduction of piping work and piping materials

The piping connecting the valves are assembled in a block, thus reducing possibilities of errors or leakage, and the piping costs can be reduced.

The time required for the piping can be reduced, making it possible to shorten the construction period and enable earlier startup of the press.

3. Reduction of amount of utilities

Since the piping is highly compact, utilities such as nitrogen gas, steam, hot water, cold water, and compressed air can be reduced.

4. Easier maintenance work

The Panel Unit can be installed above floor level, and so it is easier to carry out maintenance work, while the work environment is improved.

Since Panel Valves are used, maintenance work such as replacement or retightening can be carried out readily.

5. Thermal insulation for heat retention is simplified

Compared to conventional piping systems, the piping is compact which reduces the area that requires heat insulation for heat retention and makes the thermal insulation easier.

■ Summary

During the years since the development of the Panel Unit, ICHIMARU-GIKEN has designed and manufactured a wide variety of different types of Panel Units with different specifications, starting with general systems, typical of which are water lines, and including units unique for each company, each plant, the designs of which are confidential in nature, such as internal curing lines. In changing piping systems to Panel Units in response to the needs of customers, we are able to submit proposals putting to use the know-how it now possesses after having designed and manufactured a large number of Panel Units. Please consider the adoption of our Panel Units, not only when investing in new equipment and facilities but also when moving existing tire vulcanizing machines or when conducting overhauls of piping systems.

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