Gas Delivery Systems

When gases are used in significant volumes, a centralized gas delivery system is a practical necessity. A well-conceived delivery system will reduce operating costs, increase productivity and enhance safety.

A centralized system will allow the consolidation of all cylinders into one storage location. With all the cylinders in one place, inventory control will be streamlined and cylinder handling will be simplified and improved. Gases can be separated by type to enhance safety.

With gas delivery systems the frequency of cylinder changeouts are reduced. This reduction is achieved by connecting multiple cylinders to supply panels in banks in such a way that one bank can be safely vented, replenished and purged while a second bank provides continuous gas service. This type of system can supply gas to multiple applications and even entire facilities, eliminating the need for separate cylinders and regulators for each point of use.

Since cylinder switchover can be accomplished automatically by the supply panel, cylinders in a bank will be uniformly exhausted, resulting in improved gas utilization and lower costs. The integrity of the delivery system will be better protected since cylinder change-outs will be done in an isolated, controlled environment.

Purity

The level of gas purity required at each point of use is extremely important in designing a gas delivery system. Maintaining the gas purity is simplified with a centralized system as described above. Selection of materials for construction should be consistent throughout. For example, if a research grade gas is being utilized, all stainless steel construction and diaphragm packless shut-off valves should be used to eliminate contamination of the gas stream.

In general, three levels of purity are sufficient to describe nearly any application. The first level, usually described as a multi-purpose applications, has the least stringent purity requirement. Typical applications may include welding, cutting, laser assist, atomic absorption or ICP mass spectrometry. Gas supply panels for multipurpose applications are economically designed for safety and convenience. Acceptable materials for construction include brass, copper, Teflon®, Tefzel® and Viton®. Packed valves, such as needle valves and ball valves, are often used for flow shut-off. Gas distribution systems manufactured to this level should not be used with high purity or ultra-high purity gases.

The second level, called high-purity applications, requires a higher level of protection against contamination. Applications include laser resonator gases or chromatography where capillary columns are used and system integrity is important. Materials of construction are similar to multi-purpose manifolds, except flow shut-off valves are diaphragm packless to prevent diffusion of contaminants into the gas stream.

The third level is referred to as ultra-high purity applications. This level requires the highest level of purity for components in a gas delivery system. Trace measurement in gas chromatography is an example of an ultra-high purity application. Wetted materials for manifolds at this level must be selected to minimize trace components adsorption. These materials include 316L stainless steel, Teflon®, Tefzel® and Viton®*. All tubing should be 316SS cleaned and passivated. Flow shut-off valves must be diaphragm packless. It is particularly important to recognize that components that are suitable for multi-purpose applications may adversely affect results in high or ultra-high purity applications. For example, out-gassing from neoprene diaphragms in regulators can cause excessive baseline drift and unresolved peaks.

**Teflon®, Viton® and Tefzel® are registered trademarks of The Chemours Company*

Types of Gas Delivery Systems

SINGLE STATION SYSTEMS

In some applications, a gas is used only to calibrate instrumentation. For example, a continuous emissions monitoring system (CEMS) may only require calibration gases to flow for a few minutes each day. Such an application clearly does not require a large-scale automatic changeover manifold. However, the delivery system should be designed to protect against contamination of the calibration gas and to minimize costs associated with cylinder change-outs.

A single station supply panel with bracket is an ideal solution for this type of application. It provides a safe and cost-effective means of connecting and changing out cylinders by eliminating the need to struggle with the regulator. When the gas includes corrosive components such as HCl or NO, a purge assembly should be incorporated into the manifold to allow the regulator to be purged with an inert gas (usually nitrogen) to protect it from corrosion. The single station panel can also be equipped with a second pigtail. This arrangement allows an additional cylinder to be connected and held in reserve. Switchover is accomplished manually using the cylinder shut-off valves. This configuration is usually desirable with calibration gases since the precise mix of components generally varies somewhat from cylinder to cylinder. A cylinder change may require resetting the instrument.

SEMI-AUTOMATIC SWITCHOVER SYSTEMS

Many applications require continuous use and/or larger volumes of gases beyond what is practical for a single station manifold. Any pause in the gas supply results in lost or ruined experiments, a loss of productivity and even downtime for an entire facility. Semi-automatic switchover systems provide the capability to switch from a primary to a reserve cylinder or bank without interrupting the gas supply, thus minimizing costly downtime. Once the primary cylinder or bank is depleted, the system automatically switches to the reserve cylinder or bank for continuous gas flow. The user then changes the empty cylinders for new cylinders, while the gas is still flowing from the reserve side. A bi-directional valve is used to indicate the primary or reserve side during cylinder change-out.

FULLY AUTOMATIC PROGRAMABLE SWITCHOVER SYSTEMS

In some critical manufacturing and laboratory processes, an uninterrupted gas supply is an absolute necessity. Failure of the gas supply in these facilities can result in loss of an entire laboratory's in-process experiments or even shutdown of manufacturing production line or process. The potential cost of either of these events is so high that the installation of a gas delivery system, designed to provide an uninterrupted gas supply, is clearly justified. A fully automatic programmable switchover system is generally selected for these applications.

HPI 100TP
High purity wall mounted point of use

Model HPI 100TP is a wall mounted point of use regulator available in chrome-plated brass (HPI 100TPC) or stainless steel (HPI 100TPS) barstock.

Model shown with additional accessories to be ordered separately

APPLICATIONS:

- High purity gas applications
- Research sample systems gases
- Gas chromatography
- Calibration gas
- Process analyzer gases

FEATURES:

- **Recommended gases purity levels up to grade 6.0 (99.9999)**
- Stainless steel version applicable also for corrosive gases after prior confirmation of the material's compatibility
- Wall mounting panel and brackets included
- Ready to install wall mounting panel
- Based on HPI 100L regulator
- 3 inlet port available configuration – top as a standard
- 316L stainless steel diaphragm eliminates contamination from diffusion or outgassing
- Diaphragm inlet shut-off valves
- Modular design
- HPI 100TPC - chrome-plated body, bonnet and fittings
- HPI 100TPS - 316L stainless steel body, bonnet and fittings
- $1x10^{-9}$ mbar l/s He inboard helium leak rate to maintain gas purity levels
- Inlet / outlet - 1/4" FNPT
- Maximum inlet pressure 40 bar (580 psig)
- **Cleaned for oxygen service**

TECHNICAL DATA:

Regulator type	Single-stage
Purity	Up to 6.0
Inlet pressure	Max. 40 bar (580 psi)
Outlet pressure	2/4/10 bar (29/58/145 psi) 20 bar (290 psig) on request
Flow capacity	Kv = 0,0602 (Cv = 0,07)
Oxygen use	Suitable

MATERIALS:

Body, bonnet	316L stainless steel barstock or chrome-plated brass barstock
Diaphragm (regulator)	Hastelloy®*C276
Diaphragm (valve)	Hastelloy®*C276
Nozzle	316L stainless steel
Seat	PEEK
Seals O-ring	Viton®** (FKM)
Filter	SS 316L
Adjusting Knob	ABS plastic

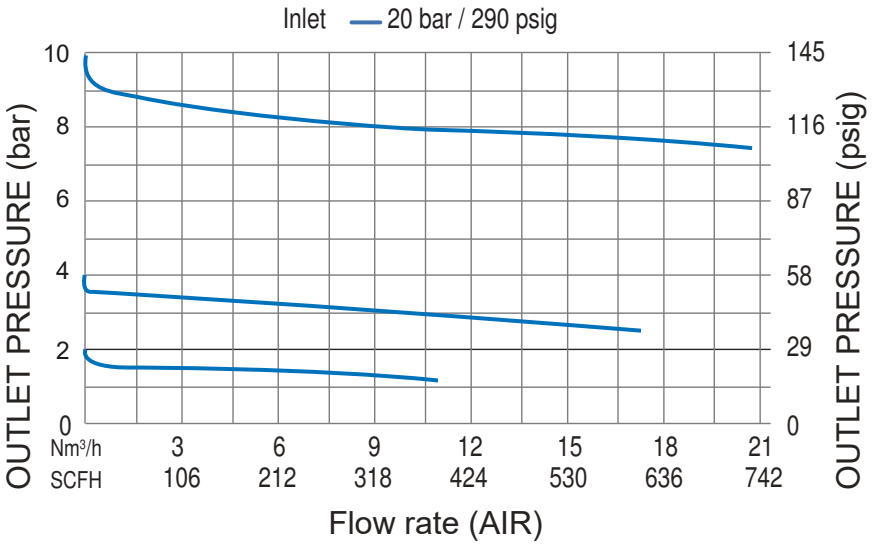
** Hastelloy® is a registered trademark name of Haynes International, Inc*
*** Viton® is a registered trademark of The Chemours Company*

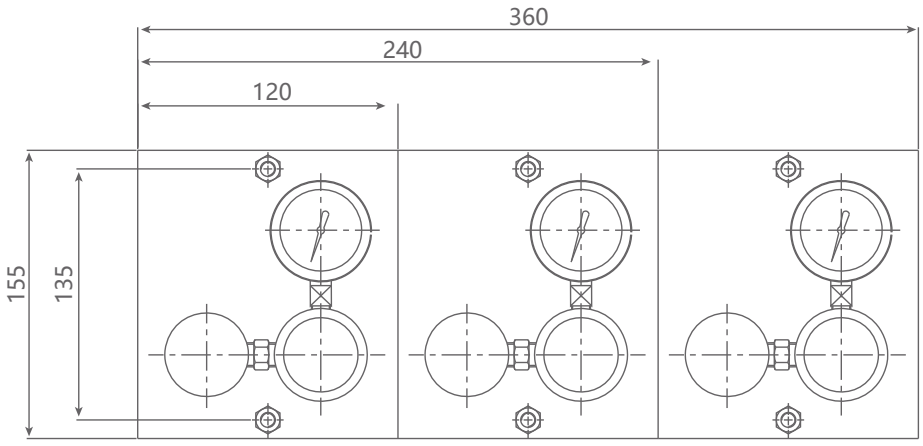
SPECIFICATIONS:

Inlet / outlet ports	1/4" FNPT
Weight	2,5 kg

FLOW CHART:

HPI 100TP





ORDERING INFORMATION:

MODEL	MATERIAL	OUTLET PRESSURE		INLET CONNECTION		OUTLET CONFIGURATION		INLET OPTIONS		GAS TYPE
HPI 100TPC	Chrome-plated brass	0 - 2 bar 0 - 29 psig	029	1/4" FNPT	000	1/4" FNPT	A	Top (standard)	A	Please specify
HPI 100TPS	Stainless steel	0 - 4 bar 0 - 58 psig	058	1/4" tube fitting	002	1/4" tube fitting	D	Bottom	B	
		0 - 10 bar 0 - 145 psig	145	6 mm tube fitting	003	1/8" tube fitting	E	Left side	C	
						6 mm tube fitting	F			

Other options upon request, please contact us

For example:

HPI 100TPC	145	000	E	A	N_2

HPI 101TP

High purity wall mounted point of use slim version

Model HPI 101TP is a wall mounted point of use regulator available in chrome-plated brass (HPI 101TPC) or stainless steel (HPI 101TPS) barstock.

APPLICATIONS:

- High purity gas applications
- Research sample systems gases
- Gas chromatography
- Calibration gas
- Process analyzer gases

FEATURES:

- **Recommended gases purity levels up to grade 6.0 (99.9999)**
- Wall mounting panel and brackets included
- Ready to install wall mounting panel, modular design
- Ergonomic, slim design
- 1 inlet port available configuration – top as a standard
- 3 outlet port possible configuration – on request
- 316L stainless steel diaphragm eliminates contamination from diffusion or outgassing
- Diaphragm inlet and outlet shut-off valves
- HPI 101TPC - chrome-plated body, bonnet and fittings
- HPI 101TPS - 316L stainless steel body, bonnet and fittings
- $1x10^{-9}$ mbar l/s He inboard helium leak rate to maintain gas purity levels
- Inlet / outlet - 1/4" FNPT
- Maximum inlet pressure 40 bar (580 psig)
- **Cleaned for oxygen service**

TECHNICAL DATA:

Regulator type	Single-stage
Purity	Up to 6.0
Inlet pressure	Max. 40 bar (580 psi)
Outlet pressure	2/4/10 bar (29/58/145 psi) 20 bar (290 psig) upon request
Flow capacity	Kv = 0,0602 (Cv = 0,07)
Oxygen use	Suitable

MATERIALS:

Body, bonnet	316L stainless steel barstock or chrome-plated brass barstock
Diaphragm (regulator)	Hastelloy®*C276
Diaphragm (valve)	Hastelloy®*C276
Nozzle	316L stainless steel
Seat	PEEK
Seals O-ring	Viton®** (FKM)
Filter	SS 316L
Adjusting Knob	ABS plastic

A

B

C

Models shown with additional accessories to be ordered separately

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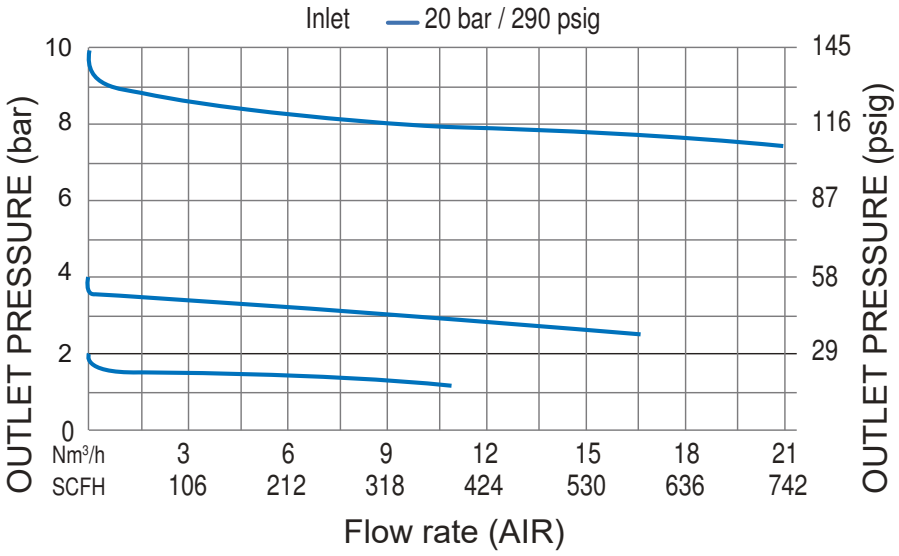
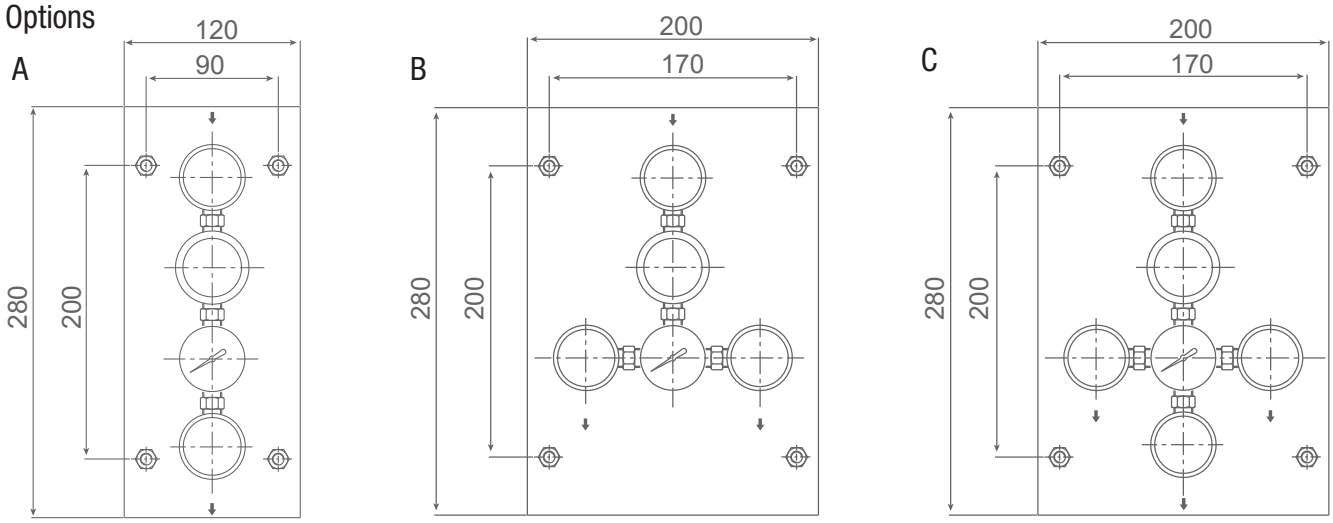
SPECIFICATIONS:

Inlet / outlet ports	1/4" FNPT
Weight	4,1 – 5,7 kg

FLOW CHART: HPI 101TP



Options



ORDERING INFORMATION:

MODEL	MATERIAL	OUTLET PRESSURE		INLET CONNECTION		OUTLET CONFIGURATION		OPTIONS		GAS TYPE
HPI 101TPC	Chrome-plated brass	0 - 2 bar 0 - 29 psig	029	1/4" FNPT	000	1/4" FNPT	A	Single	A	Please specify
HPI 101TPS	Stainless steel	0 - 4 bar 0 - 58 psig	058	1/4" tube fitting	002	1/4" tube fitting	D	Dual	B	
		0 - 10 bar 0 - 145 psig	145	6 mm tube fitting	003	1/8" tube fitting	E	Tripple	C	
						6 mm tube fitting	F			

Other options upon request, please contact us

For example:

HPI 101TPC	145	000	E	A	N_2

HPI 300TP
High purity bench mounted point of use

Model HPI 300TP is a bench mounted point of use regulator available in chrome-plated brass (HPI 300TPC) or stainless steel (HPI 300TPS) barstock.

Model shown with additional accessories to be ordered separately

APPLICATIONS:

- High purity gas applications
- Research sample systems gases
- Gas chromatography
- Calibration gas
- Process analyzer gases

FEATURES:

- **Recommended gases purity levels up to grade 6.0 (99.9999)**
- Stainless steel version applicable also for corrosive gases after prior confirmation of the material's compatibility
- Ready to install bench mounting panel, modular design
- 1 inlet port configuration - bottom
- 1 outlet port configuration - bottom
- 316L stainless steel diaphragm eliminates contamination from diffusion or outgassing
- Diaphragm inlet shut-off valves
- HPI 300TPC - chrome-plated body, bonnet and fittings
- HPI 300TPS - 316L stainless steel body, bonnet and fittings
- $1x10^{-9}$ mbar l/s He inboard helium leak rate to maintain gas purity levels
- Inlet / outlet - 1/4" FNPT
- Maximum inlet pressure 60 bar (870 psig)
- **Cleaned for oxygen service**

TECHNICAL DATA:

Regulator type	Single-stage
Purity	Up to 6.0
Inlet pressure	Max. 60 bar (780 psi)
Outlet pressure	2/4/10 bar (29/58/145 psi) 20 bar (290 psig)
Flow capacity	Kv = 1,032 (Cv = 0,12)
Oxygen use	Suitable

MATERIALS:

Body, bonnet	316L stainless steel barstock or chrome-plated brass barstock
Diaphragm (regulator)	Hastelloy®*C276
Diaphragm (valve)	Hastelloy®*C276
Nozzle	316L stainless steel
Seat	PEEK
Seals O-ring	Viton®** (FKM)
Filter	SS 316L
Adjusting Knob	ABS plastic

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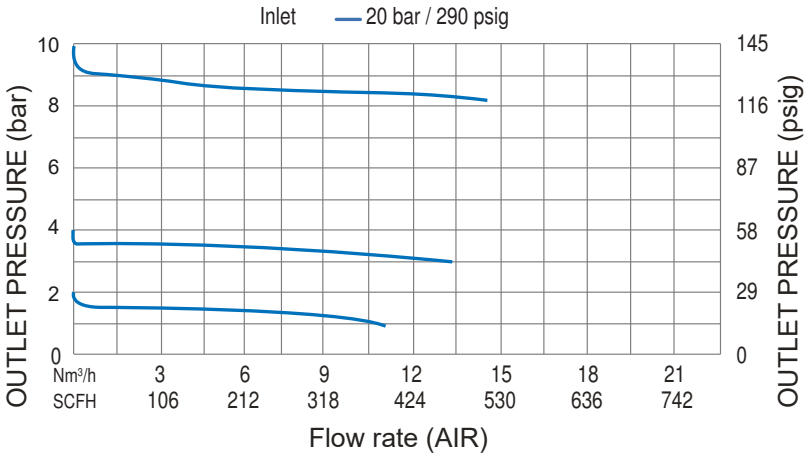
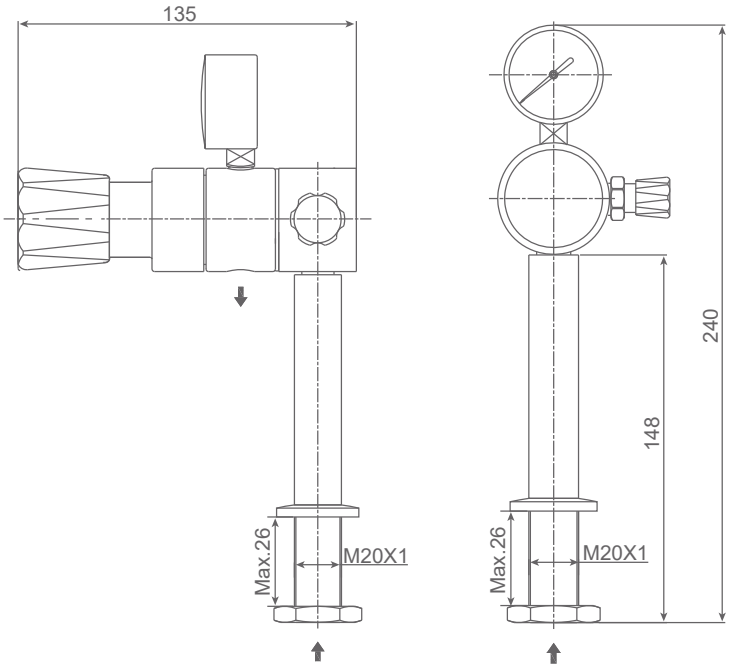
SPECIFICATIONS:

Inlet / outlet ports	1/4" FNPT
Weight	1,6 kg

FLOW CHART: HPI 300TP





ORDERING INFORMATION:

MODEL	MATERIAL	OUTLET PRESSURE		INLET CONNECTION		OUTLET CONFIGURATION		GAS TYPE
HPI 300TPC	Chrome-plated brass	0 - 2 bar 0 - 29 psig	029	1/4" FNPT	000	1/4" FNPT	A	Please specify
HPI 300TPS	Stainless steel	0 - 4 bar 0 - 58 psig	058	1/4" tube fitting	002	1/4" tube fitting	D	
		0 - 10 bar 0 - 145 psig	145	6 mm tube fitting	003	1/8" tube fitting	E	
						6 mm tube fitting	F	

Other options upon request, please contact us

For example:

HPI 300TPC	145	000	E	N_2

HPI 301TP
High purity wall mounted point of use

Model HPI 301TP is a wall mounted point of use regulator available in chrome-plated brass (HPI 301TPC) or stainless steel (HPI 301TPS) barstock.

Model shown with additional accessories to be ordered separately

APPLICATIONS:

- High purity gas applications
- Research sample systems gases
- Gas chromatography
- Calibration gas
- Process analyzer gases

FEATURES:

- **Recommended gases purity levels up to grade 6.0 (99.9999)**
- Stainless steel version applicable also for corrosive gases after prior confirmation of the material's compatibility
- Ready to install wall mounting panel, modular design
- 1 inlet port configuration - top
- 1 outlet port configuration - bottom
- 316L stainless steel diaphragm eliminates contamination from diffusion or outgassing
- Diaphragm inlet shut-off valves
- HPI 301TPC - chrome-plated body, bonnet and fittings
- HPI 301TPS - 316L stainless steel body, bonnet and fittings
- $1x10^{-9}$ mbar l/s He inboard helium leak rate to maintain gas purity levels
- Inlet / outlet - 1/4" FNPT
- Maximum inlet pressure 60 bar (870 psig)
- **Cleaned for oxygen service**

TECHNICAL DATA:

Regulator type	Single-stage
Purity	Up to 6.0
Inlet pressure	Max. 60 bar (870 psi)
Outlet pressure	2/4/10 bar (29/58/145 psi) 20 bar (290 psig)
Flow capacity	Kv = 1,032 (Cv = 0,12)
Oxygen use	Suitable

MATERIALS:

Body, bonnet	316L stainless steel barstock or chrome-plated brass barstock
Diaphragm (regulator)	Hastelloy®*C276
Diaphragm (valve)	Hastelloy®*C276
Nozzle	316L stainless steel
Seat	PEEK
Seals O-ring	Viton®** (FKM)
Filter	SS 316L
Adjusting Knob	ABS plastic

RELATED OPTIONS:

Wall mounting Bracket: HPI-L-BPB

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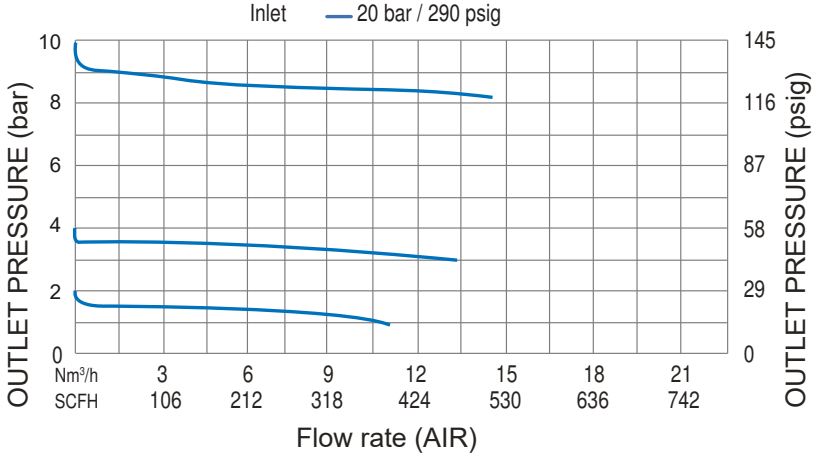
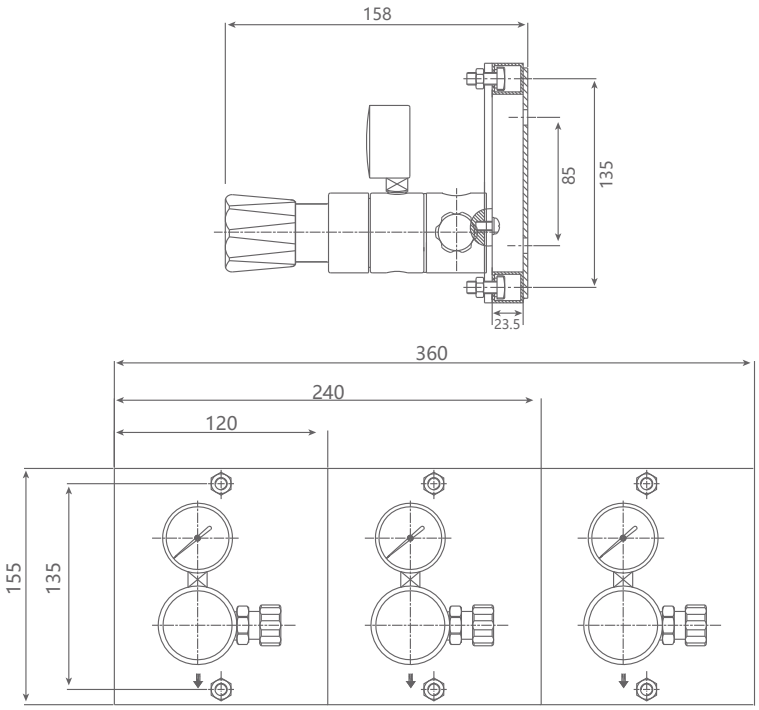
SPECIFICATIONS:

Inlet / outlet ports	1/4" FNPT
Weight	1,16 kg

FLOW CHART: HPI 301TP





ORDERING INFORMATION:

MODEL	MATERIAL	OUTLET PRESSURE		INLET CONNECTION		OUTLET CONFIGURATION		GAS TYPE
HPI 301TPC	Chrome-plated brass	0 - 2 bar 0 - 29 psig	029	1/4" FNPT	000	1/4" FNPT	A	Please specify
HPI 301TPS	Stainless steel	0 - 4 bar 0 - 58 psig	058	1/4" tube fitting	002	1/4" tube fitting	D	
		0 - 10 bar 0 - 145 psig	145	6 mm tube fitting	003	1/8" tube fitting	E	
						6 mm tube fitting	F	
						Wall mounting Bracket	P	

Other options upon request, please contact us

For example:

HPI 301TPC	145	000	E	N_2

HPI 400TP

High purity plate mounted point of use

Model HPI 400TP is a plate mounted point of use regulator available in chrome-plated brass (HPI 400TPC) or stainless steel (HPI 400TPS) barstock.

Model shown with additional accessories to be ordered separately

APPLICATIONS:

- High purity gas applications
- Research sample systems gases
- Gas chromatography
- Calibration gas
- Process analyzer gases

FEATURES:

- **Recommended gases purity levels up to Grade 6.0 (99.9999)**
- Stainless steel version applicable also for corrosive gases after prior confirmation of the material's compatibility
- Ready to install plate mounting panel, modular design
- 1 inlet port configuration - back inlet
- 1 outlet port configuration - bottom
- 316L stainless steel diaphragm eliminates contamination from diffusion or outgassing
- Diaphragm inlet shut-off valves
- HPI 400TPC - chrome-plated body, bonnet and fittings
- HPI 400TPS - 316L stainless steel body, bonnet and fittings
- $1x10^{-9}$ mbar l/s He inboard helium leak rate to maintain gas purity levels
- Inlet / outlet - 1/4" FNPT
- Maximum inlet pressure 60 bar (870 psig)
- **Cleaned for oxygen service**

TECHNICAL DATA:

Regulator type	Single-stage
Purity	Up to 6.0
Inlet pressure	Max. 60 bar (870 psig)
Outlet pressure	2/4/10 bar (29/58/145 psi) 20 bar (290 psig)
Flow capacity	Kv = 1,032 (Cv = 0,12)
Oxygen use	Suitable

MATERIALS:

Body, bonnet	316L stainless steel barstock or chrome-plated brass barstock
Diaphragm (regulator)	Hastelloy®*C276
Diaphragm (valve)	Hastelloy®*C276
Nozzle	316L stainless steel
Seat	PEEK
Seals O-ring	Viton®** (FKM)
Filter	SS 316L
Adjusting Knob	ABS plastic

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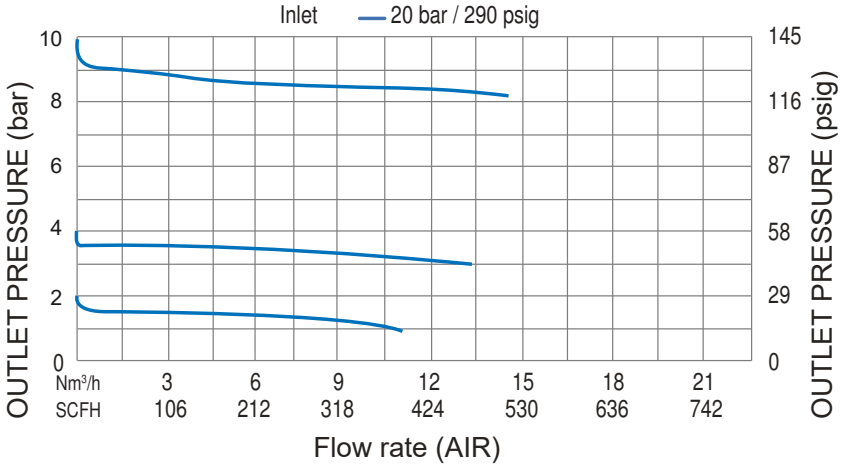
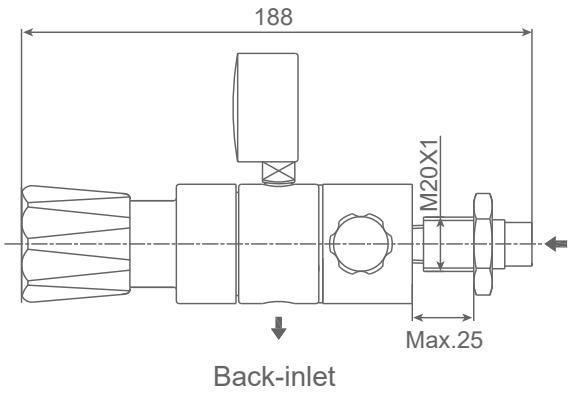
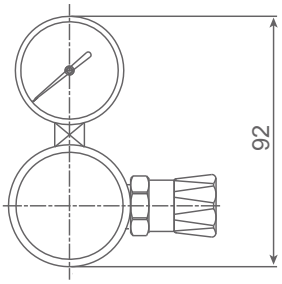
SPECIFICATIONS:

Inlet / outlet ports	1/4" FNPT
Weight	0,8 kg

FLOW CHART: HPI 400TP







ORDERING INFORMATION:

MODEL	MATERIAL	OUTLET PRESSURE		INLET CONNECTION		OUTLET CONFIGURATION		GAS TYPE
HPI 400TPC	Chrome-plated brass	0 - 2 bar 0 - 29 psig	029	1/4" FNPT	000	1/4" FNPT	A	Please specify
HPI 400TPS	Stainless steel	0 - 4 bar 0 - 58 psig	058			1/4" tube fitting	D	
		0 - 10 bar 0 - 145 psig	145			1/8" tube fitting	E	
						6 mm tube fitting	F	

Other options upon request, please contact us

For example:

HPI 400TPC	145	000	E	N_2

HPI 500TP

High purity compact point of use

Model HPI 500TP is a compact aluminium point of use regulator for pressure control.

Model shown with additional accessories to be ordered separately

APPLICATIONS:

- High purity gas applications
- Research sample systems gases
- Gas chromatography
- Calibration gas
- Process analyzer gases

FEATURES:

- **Recommended gases purity levels up to grade 6.0 (99.9999)**
- Ready to install wall mounting panel, modular design
- Two inlet and two outlet port configuration
- 316L stainless steel diaphragm eliminates contamination from diffusion or outgassing
- Diaphragm inlet shut-off valves
- $1x10^{-9}$ mbar l/s He inboard helium leak rate to maintain gas purity levels
- Inlet / outlet - 1/4" FNPT
- Maximum inlet pressure 60 bar (870 psig)

TECHNICAL DATA:

Regulator type	Single-stage
Purity	Up to 6.0
Inlet pressure	Max. 60 bar (870 psig)
Outlet pressure	2/4/10 bar (29/58/145 psi) 20 bar (290 psig)
Flow capacity	Kv = 1,032 (Cv = 0,12)
Oxygen use	Unsuitable

MATERIALS:

Body, bonnet	Aluminium barstock
Diaphragm (regulator)	Hastelloy®*C276
Diaphragm (valve)	Hastelloy®*C276
Nozzle	316L stainless steel
Seat	PEEK
Seals O-ring	Viton®** (FKM)
Filter	SS 316L
Adjusting Knob	ABS plastic

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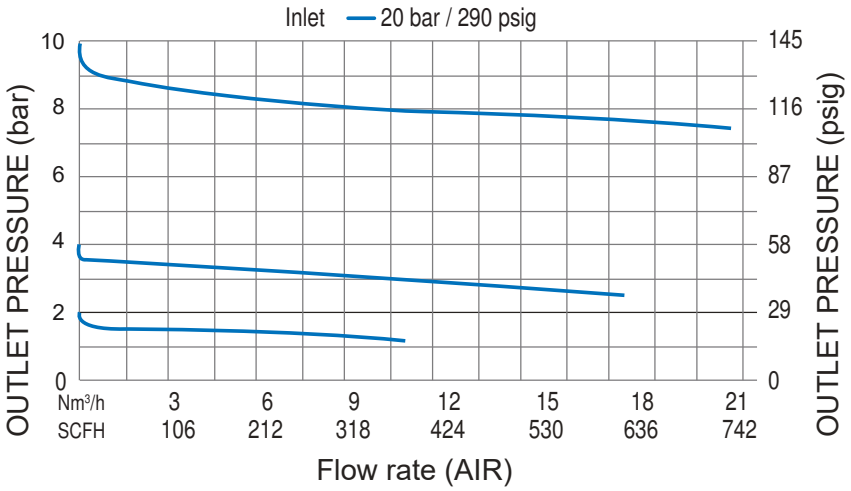
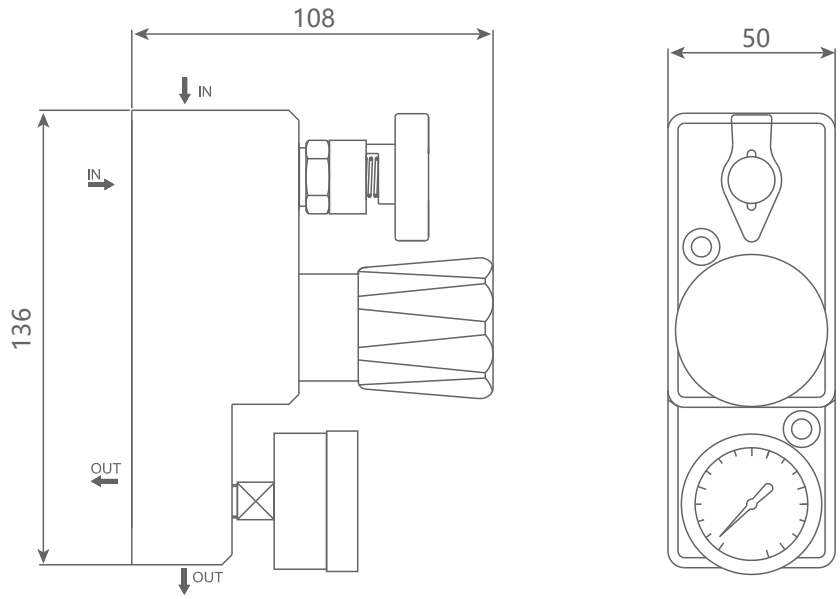
SPECIFICATIONS:

Inlet / outlet ports	1/4" FNPT
Weight	1,1 kg

FLOW CHART: HPI 500TP





ORDERING INFORMATION:

MODEL	MATERIAL	OUTLET PRESSURE		INLET CONNECTION		OUTLET CONFIGURATION		GAS TYPE
HPI 500TP	Aluminium barstock	0 - 2 bar 0 - 29 psig	029	1/4" FNPT	000	1/4" FNPT	A	Please specify
		0 - 4 bar 0 - 58 psig	058	1/4" tube fitting	002	1/4" tube fitting	D	
		0 - 10 bar 0 - 145 psig	145	6 mm tube fitting	003	1/8" tube fitting	E	
						6 mm tube fitting	F	

Other options upon request, please contact us

For example:

HPI 500TP	145	000	E	N_2