tyco
Fire Protection Products

iFLOW 200/300 bar total flood fire extinguishing systems design and installation manual

LPG

IG-541
with iFlow technology

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	3-8	Matl. spec changed
	3-9	Swiss Market added
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	3-17	Part number changed
	3-19	Adapter info added
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	3-22	CE cert no. changed
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	3-29	Container numbers changed
	3-32	Container row numbers changed
	3-34	Bleed valve changed
	3-37	Information updated
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	3-39	Part no. change revised as noted
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	3-42	Manifold drop section added
	3-43	Union Connectors added
	3-44	Galvanised option removed
	3-45	Manifold part no.s added
	3-46	Manifold burst disc addded
	3-48	Component part no. revised
	3-49	Dowty seal info added
	4-5	Hose quantity revised
	4-10	Text revised
	4-15	Zero pressure note added
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	5-3	Text revised
	6-1	Document ref. revised, note added

Date	Page	Revision

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This manual is intended for use with the iFLOW IG-541 Clean Agent Total Flood Fire Suppression System. These systems are specifically engineered for total flooding application in either unoccupied or occupied areas. Planning, installation, recharge, and maintenance of the system must conform to the limitations detailed in this manual. Installation and maintenance shall be performed by an individual holding current IG-541 Certification from an iFLOW IG-541 System Training Program with training to plan, install, recharge, and maintain the IG-541 Agent System(s).

Those who plan, install, operate, reset, program, inspect, or maintain these systems should read this entire manual. Specific sections will be of particular interest depending upon one's responsibilities.

As with all electrical, mechanical, pneumatic equipment, the system needs periodic care to provide maximum assurance that it will operate effectively and safely. Inspection frequency shall be performed consistently, depending on operating and/or environmental conditions. Maintenance shall be performed semi-annually, or more frequently, depending on operating and/or environmental conditions.

The application and use of the IG-541 System is limited to the applications and uses described in this manual. For other applications, contact your Authorized iFLOW IG-541 Distributor, Territory Manager, or Tyco Fire Protection Products – Technical Services Department, Manchester, M40 2WL, UK.

Note: Metric and English conversions are rounded as appropriate to stay within maximum and minimum approved values.

Part No. 14A-23L

Date: 2017-JAN-04

⚠ DANGER

Indicates a hazardous situation in which a person ***will*** **experience serious personal injury or death** if the situation is not avoided.

⚠ WARNING

Indicates a hazardous situation in which a person ***could*** **experience serious personal injury or death** if the situation is not avoided.

⚠ CAUTION

Indicates a hazardous situation in which a person **could experience minor or moderate personal injury** if the situation is not avoided.

CAUTION

Addresses practices not related to personal injury, such as a system part malfunctioning, property damage, or system failure.

NOTICE

Addresses general practices or observations related to system function that are *not* related to personal injury.

SECTION	PAGES
1 - INTRODUCTION	**1-1 - 1-4**
Approvals	1-1
Temperature Range	1-1
General Information	1-1
Description of iFLOW Systems	1-1
Properties of IG-541	1-2
Safety of IG-541	1-3
General	1-3
Physiological Effects	1-3
Noise	1-3
Turbulance	1-3
Visibility	1-3
Exits	1-3
Post Discharge Ventilation	1-3
Agent Physical Properties	1-4
2 - SYSTEM DESIGN	**2-1 - 2-8**
Design Standards	2-1
Determination of Agent Quantity	2-1
Achieved Agent Concentration	2-5
Discharge Time to Achieve Minimum Design Concentration	2-5
Extended Discharge	2-5
Connected Reserves	2-5
Stop Valves and Selector Valve Systems	2-5
Pipe size Estimating	2-6
Design Drawings	2-6
Room Integrity and Pressurisation	2-7
Detection and Control Systems	2-7
Electrical Earthing and Safety Clearances	2-7
Flow Calculations	2-7
Introduction/Installation	2-7
Completing the System Design	2-8
Nozzle Drilling Details	2-8
Pipework and Fittings	2-8
Nozzles	2-8
Actuation Container Requirements	2-8
3 - EQUIPMENT DESCRIPTIONS	**3-1 - 3-52**
iFLOW IG-541 Container and Valve Assemblies	3-7
▸ Container Labels	3-8
iFLOW Container Valve	3-9
300 bar iFLOW Container Valve	3-9
▸ 200 bar iFLOW Container Valve	3-10
Discharge Nozzles	3-11
Acoustic Nozzle	3-14
Pneumatic Actuator	3-16
Manual Actuator	3-17
▸ Pneumatic-Manual Actuator	3-18
Discharge Pressure Switch	3-19
Pressure Guage Assembly	3-20
Pilot Container - Standard	3-22
Gas Metron	3-24
iFLOW Check Valve	3-25
iFLOW Discharge Hose	3-27
iFlLOW Discharge Hose Connectors	3-28
iFLOW Matrix Brackets	3-29
iFLOW 140 Litre Container Brackets (Single Row)	3-30
iFLOW 140 Litre Container Brackets (Double Row)	3-31
iFLOW Actuation Hose	3-32
1/4 in. Bleed Valve	3-33
Pilot Valve Adaptor	3-33
Pilot Line Non Return Valve	3-34
Decompression Screw	3-35
Selector Valve	3-36
Selector Valve Solenoid and Brackets	3-38
Lock Off Assembly	3-39
Selector Valve Manifolds	3-40
▸ Manifold Drop Section	3-41
▸ Union Connectors	3-42
iFLOW Manifolds	3-43
▸ Manifold Burst Disc	3-45
Pressure Relief Valve	3-46
Actuation Piping	3-47
Special Tools	3-49
Manual Release Caution Plate	3-50
Door Caution Plate - Lock Off	3-51
Door Caution Plate - No Lock Off	3-52
4 - INSTALLATION	**4-1 - 4-17**
Delivery and handling of equipment	4-1
Container Fixing	4-1
Check Valve Installation	4-4
Discharge Hose Installation	4-5
Actuation Installation	4-6
Pilot container	4-6
Manual Actuator Lever	4-7
Pressure Switch with Interlock	4-8
Selector Valve	4-8
Selector Valve Soleniods and Manual Release	4-9
Release System for Selector Valves	4-10
Solenoid Valve	4-12
Pneumatic Actuator	4-12
Actuation Hose	4-13
Electrical Installation	4-14
Pressure Switch	4-14
Solenoid Valve	4-14
Pressure Gauge (Contacted Type)	4-15
Pipe Distribution System	4-16
Discharge Nozzle Installation	4-17

SECTION	PAGES
5 - COMMISSIONING	**5-1 - 5-10**
Pipework Integrity	5-1
Discharge Pressure Switch Test	5-1
Pneumatic Actuation Line Test for Single Risk Area Systems	5-1
Pneumatic Actuation Line Test for Multi Hazard Area Systems	5-3
Pilot Container Soleniod Test	5-3
Room Integrity Testing	5-5
Pressure/Temperature Chart	5-6
Commisioning schedule Example	5-7
6 - SERVICE AND MAINTENANCE	**6-1 - 6-5**
Service and Maintenance Schedule Example	6-2
7 - APPENDIX	**7-1 - 7-5**
Typical Installations	7-1
Safety Data Sheet	7-3

INTRODUCTION

This manual has been prepared primarily for the use of Designers/Installers of IG-541 (iFLOW) Constant Flow Fire Extinguishing Equipment. Its purpose is to provide general information on iFLOW and its use in Fire Extinguishing Systems and to give more detailed information covering the design, installation, testing and servicing of these systems.

Note: The manual covers the minimum requirements for the design of Total Flooding Systems. Local application and explosion extinguishing systems are not covered by the manual. Whilst marine and inerting systems are not specifically excluded, these applications require additional considerations. If in doubt refer to the Product Manager. If a total flooding system is not designed and installed to the parameters set out in this manual Tyco Fire Protection Products cannot guarantee the correct operation of the system.

This manual has been prepared in the light of the best information available at the time of publication. It has been assumed that users of this manual have sufficient experience of Fixed Fire Extinguishing Systems to enable the correct interpretation to be made of the contents.

It must be recognised that correct system design, installation and maintenance are fundamental to the safe and effective use of any gaseous Fire Extinguishing System.

APPROVALS

The iFLOW system is based on a number of components which have been approved or listed by VdS in Germany.

TEMPERATURE RANGE

The components are designed and tested to operate in the temperature range -20 °C to 50 °C or as stated in separate component listings.

GENERAL INFORMATION

IG-541 has been introduced as an alternative to Halon 1301, production of which ceased at the end of 1993, under the agreed adjustments made to the Montreal Protocol in November 1992.

IG-541 is a mixture of three naturally occurring gases that do not support combustion, nor have an impact on the ozone layer, and has no global warming potential.

The three gases, Nitrogen, Argon and Carbon Dioxide are mixed in the following proportions:

Nitrogen	**52%**
Argon	**40%**
Carbon Dioxide	**8%**

(See Table 1-1 for filling tolerances)

Storage containers are designed to hold agent in gaseous form at a nominal pressure of 200 bar or 300 bar at 15 °C.

Handling and Installation of iFLOW equipment should only be carried out by persons experienced in dealing with this type of equipment.

DESCRIPTION OF iFLOW SYSTEMS

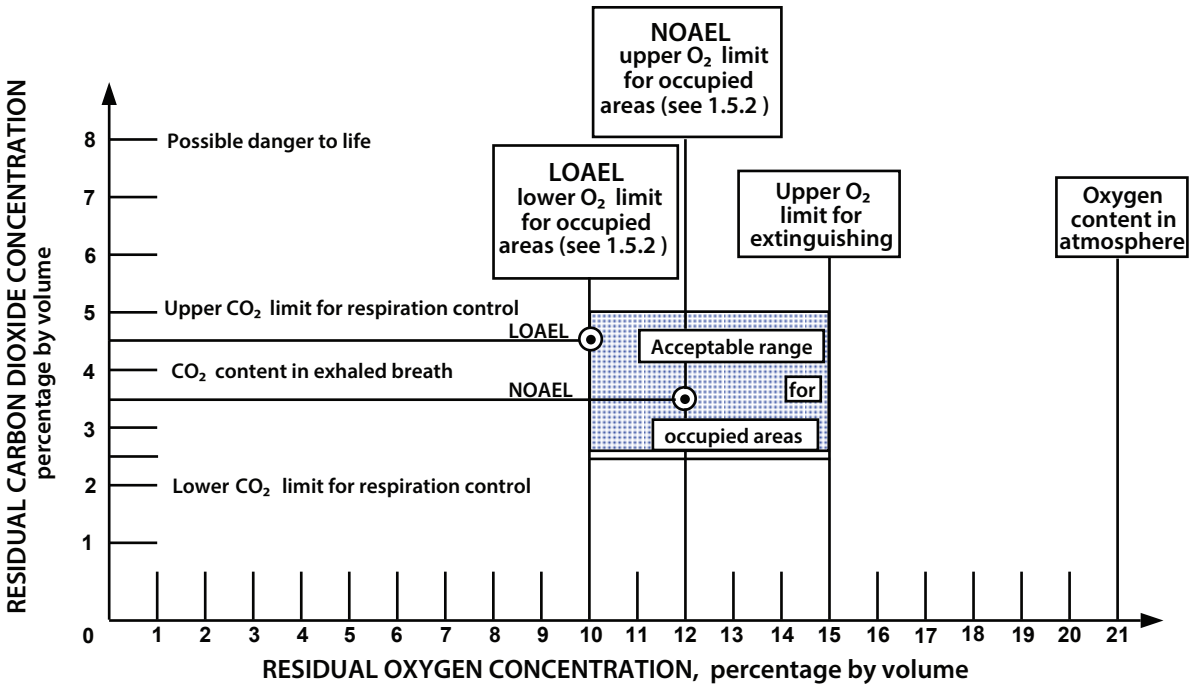
iFLOW systems are designed to suppress fires involving class A, B and C hazards.

The systems are designed to be total flooding and consist of a fixed supply of agent connected to a piping system with nozzles to direct the agent into an enclosed hazard. Inert gas extinguishes fires by lowering the oxygen content below the level that supports combustion. In simple terms if the oxygen content of the atmosphere is reduced to a level below 15%, most ordinary combustibles will not burn.

As an example an IG-541 system will reduce the oxygen content from 20.9% to approximately 12.5% whilst increasing the carbon dioxide content from 0.03% to around 3.0%. The increase in carbon dioxide content increases an individual's respiration rate and the body's ability to absorb oxygen thus allowing the body to compensate for the lower oxygen content.

Since IG-541 is stored as a gas, it discharges as an invisible gas, allowing people to safely exit a protected space without obscured vision.

Inert gas systems are particularly valuable in extinguishing fires in enclosures containing hazards or equipment where a clean, electrically non-conductive medium is essential or where the cleaning up of foam, water or powder would be problematic.



*** Predicted oxygen and carbon dioxide residual concentration for NOAEL and LOAEL**

Chart 1-1 Guide to Oxygen Levels

PROPERTIES OF IG-541

Under normal conditions IG-541 is an odourless colourless gas with a density similar to that of air.

IG-541 does not decompose when subjected to heat from a fire thus avoiding hazardous breakdown products, but it must be recognised that in a fire condition, decomposition products from the fire itself especially carbon monoxide, smoke and heat will create a hazard in the protected enclosure and the reduced oxygen level occurring in a fire situation may lower the resultant level below that calculated from the agent discharge alone.

The following specification applies to IG-541.

Pressure (300 bar System)	295 bar - 300 bar at 15 °C
Pressure (200 bar System)	195 bar - 200 bar at 15 °C
Moisture	max 12 ppm

Table 1-1: Gas Fill Tolerance

	ISO14520-15 EN15004-10	NFPA 2001	TYCO IG-541 FILL MANUAL
ARGON	37.2% - 42.8%	36.0% - 44.0%	38.0% - 42.0%
CARBON DIOXIDE	7.6% - 8.4%	8.0% - 9.0%	8.0% - 8.4%
NITROGEN	48.8% - 55.2%	48.0% - 56.0%	50.0% - 54.0%

SAFETY OF IG-541

GENERAL

IG-541 simultaneously reduces the oxygen concentration in an enclosure and increases the carbon dioxide concentration.

Proper and safe system design requires that agent design concentration falls within a design window that limits the upper and lower concentrations of oxygen and carbon dioxide.

IG-541 has been accepted for use in occupied spaces when the design concentration falls within this window.

PHYSIOLOGICAL EFFECTS

The following table details the physiological data on IG-541.

Table 1-2: Physiological Data

	IG-541 Concentration	Oxygen Concentration
Cardiac Sensitisation No Observed Adverse Effect Level* (NOAEL)	43% (0.56**)	12%
Cardiac Sensitisation Lowest Observed Adverse Effect Level* (LOAEL)	52% (0.74**)	10%

* Based on physiological effects in humans in hypoxic atmospheres.

** Flooding Factor. (Approximate value based on 20 °C) m^3/m^3.

NOISE

Discharge of an inert gas system can cause noise loud enough to be startling but ordinarily insufficient to cause traumatic injury.

TURBULENCE

High velocity discharge from nozzles may be sufficient to dislodge substantial objects directly in the path of the discharge. General turbulence in the enclosure may be sufficient to move light objects, unsecured paper etc. Ceiling tiles in the vicinity of the nozzles should be clipped in place to prevent them being dislodged during the discharge.

VISIBILITY

Under normal conditions an inert gas agent will not reduce visibility in the protected enclosure. However in a fire situation especially where large amounts of smoke are produced it is likely that the agent discharge will produce some displacement of that smoke around the enclosure and this could reduce visibility in some circumstances

EXITS

Adequate means of escape from the protected area should be provided. Doors should open outwards and be self closing. They should be arranged to open easily from inside and any that need to be secured must be fitted with escape overrides.

POST DISCHARGE VENTILATION

In order to allow for the ventilation of agent and/or the post fire atmosphere, a normally closed means of ventilation with extract arrangements will be required as with any gaseous extinguishing system. Any mechanical ventilation provided should not form part of the normal ventilation system. Controls for the ventilation system should be outside the protected enclosure and should be key operated. In some circumstances the normally closed means of ventilation may be provided by doors and windows.

AGENT PHYSICAL PROPERTIES

TABLE 1-3: IG-541 PHYSICAL PROPERTIES

AGENT PHYSICAL PROPERTIES	
Chemical structure	N_2 , Ar , CO_2
Chemical name	Nitrogen Argon Carbon Dioxide
Molecular weight	34.0
Boiling point	-196
Freezing point	-78.5
Critical temperature	N/A
Critical pressure	N/A
Critical volume	N/A
Critical density	N/A
Saturated vapor density at 20 °C (68 °F)	N/A

(Reference: NFPA 2001)

TABLE 1-4: NITROGEN PHYSICAL PROPERTIES

AGENT PHYSICAL PROPERTIES	
Chemical structure	N_2
Chemical name	Nitrogen
Molecular weight	28
Boiling point	-195.80 °C (-320.4 °F)
Freezing point	-210.00 °C (-346 °F)
Critical temperature	-146.90 °C (-232.4 °F)
Critical pressure	34.0 bar (492.9 psi)

TABLE 1-5: IG-541 ENVIRONMENTAL TOXICOLOGY

ENVIRONMENTAL	
Ozone Depletion Potential (ODP)	0
Atmospheric Lifetime (years)	Nil
TOXICOLOGY	
Cardiac Sensitization No Observed Adverse Effect Level (NOAEL)	43%
Lowest Observed Adverse Effect Level (LOAEL)	52%

(Reference: NFPA 2001)

SYSTEM DESIGN

DESIGN STANDARDS

Information contained in this manual has been based generally on the EN15004 Fixed firefighting systems - Gas extinguishing systems and ISO 14520 Gaseous fire-extinguishing systems - Physical properties and system design (For VDS approved systems see the appropriate manual).

The manual has been prepared to give an understanding in the application of iFLOW systems. Systems are suitable only for the total flooding of hazard enclosures.

DETERMINATION OF AGENT QUANTITY

Prior to commencing with the design of any iFLOW system the designer should have, as a minimum the following details:

1. Enclosure dimensions.
2. Specific details of the hazard, such as fuel types, chemicals, excessive fire load, etc.
3. The minimum and maximum temperatures of the hazard enclosure.
4. Height of the enclosure above (or below) sea level.
5. Confirmation of the integrity of the protected space.
6. Details of the ventilation system.
7. Intended occupancy of the enclosure.
8. Storage container location, (this should preferably be outside the protected enclosure), but must not be exposed to weather or other potential hazards. Floor loading should also be taken into account.

Details of National laws or requirements that need to be taken into account, for example TRG 280, which is applicable in Germany.

The following notes provide additional information to assist the designer in providing the correct system for the hazard.

iFLOW systems are suitable for the protection of hazards involving Class A, B and C materials. Providing a Class A fire is detected quickly and the inert gas discharged promptly and the concentration is maintained for an adequate period of time to allow embers to cool, surface fire and embers associated with the burning of solid materials are quickly extinguished. iFLOW systems are suitable for use on fires involving live electrical equipment but is not effective on, and should not be used to fight fires involving:

1. Chemicals containing their own supply of oxygen, such as cellulose nitrate.
2. Mixtures containing oxidising agents such as sodium chlorate or sodium nitrate.
3. Chemicals capable of undergoing auto thermal decomposition such as some organic peroxides.
4. Reactive metals.
5. Solid materials in which fires quickly become deep seated.

Class B and C fires are quickly extinguished by inert gas at the appropriate concentrations, but in the case of Class C fires the risk of explosion should be carefully considered and where possible the flammable gas flow should be isolated before or as soon as possible after extinguishment.

Determine the gross room volume. The net volume can only be considered if there are permanent impermeable building structures within the area.

1. Establish the minimum anticipated temperature of the protected enclosure. The iFLOW equipment may not be stored in temperatures below -20 °C. The system must be designed using the minimum design temperature.
2. Determine the minimum design concentration required for the hazard involved. As IG-541 is released into an enclosure it displaces both air and IG-541. The proportion of air that has been replaced by IG-541 when the discharge is complete is called the **design concentration**.

The ratio of volume of IG-541 injected into the volume of an enclosure is called the **flooding factor**.

The relationship between the design concentration and the flooding factor may be summarised by the following equations.

$$Q = V * FF * C_{Alt}$$

Q	required agent quantity (m^3)
V	hazard volume (m^3)
FF	flooding factor (from table 2-3)
C_{alt}	altitude correction factor (from table 2-4)

The minimum design concentration as specified by EN15004 Fixed firefighting systems- Gas extinguishing systems- and ISO 14520 Gaseous fire- extinguishing systems- Physical properties and system design- for Surface class A, is 39.9%. Class B and C risks should be given special consideration. Table 2-2 contains a list of various materials and the appropriate minimum design concentration. The values are taken from ISO 14520 Gaseous fire- extinguishing systems - Physical properties and system design - (no table exists in EN15004 Fixed firefighting systems - Gas extinguishing systems-) and are based on the ‘extinguishing value’ plus 30.0% and then rounded up to the next nearest full number. EN15004 Fixed firefighting systems - Gas extinguishing systems-specifies the minimum design concentration of 45.7% for higher hazard class A and 48.1% for class B. In case of doubt please refer to Technical Services.

3. Multiply the gross volume by the appropriate flooding factor from Table 2-3 or determine the agent quantity required by using the formula:

$$Q = V * \frac{S_R}{s} * \ln(\frac{100}{100 - c}) * C_{Alt}$$

Q	required agent quantity (m³)
V	hazard volume (m³)
S_R	specific reference volume at filling reference temperature (m³/kg)
s	specific vapour volume of the agent at sea level (m³/kg)
	$s = K1 + K2 \times T_{Design}$
T_{Design}	design temperature (°C)
c	design concentration (%)
C_{alt}	altitude correction factor

K1 = 0.65799

K2 = 0.002390

S_R = 0.69384 (15 °C)

Note:

Adjust the agent quantity in accordance with Table 2-4 if the system is to be installed at altitudes that vary from sea level by more than 11%.

4. Determine the number of iFLOW containers required by dividing the agent quantity required by the capacity of each agent container according to Table 2-1.(rounded up to to a full container)

Pressure	Container Sizes	Capacity (Volume)	Capacity (Mass)
300 bar	80 litre	23.0 m^3	33.1 kg
300 bar	140 litre	40.2 m^3	57.9 kg
200 bar	80 litre	16.5 m^3	23.8 kg
200 bar	140 litre	28.9 m^3	41.6 kg

TABLE 2-1 CAPACITIES OF IG-541

Note:

For VdS installations, VdS rules document 2380 must be complied with. The designer must refer to this document for the VdS approved system.

Material	ISO 14520	NFPA 2001	VdS
Acetone	35.3%	41.9%	49.5%
AV 100	35.4%	39.6%	-
Butane	-	-	55 . 2%
1-Butanol	48.4%	-	57. 3%
Diesel Oil #2	46.5%	40.0%	-
Diethylether	45.4%	-	55.7%
Ethanol (Ethyl Alcohol)	45.5%	48.4%	55. 4%
Formic acid (89-91%)	-	-	-
Fuel Oil #1	-	34.2%	-
Hydraulic Oil	-	40.1%	-
Isopropyl Alcohol (IPA)	-	37.7%	48.1%
Jet A	-	42.5%	-
Kerosene	-	40.%	-
Methane	20.0%	-	46.3%
Methanol (Methyl Alcohol)	57.5%	64.7%	68.3%
Methyl-Ethyl-Ketone (MEK)	46.5%	45.8%	-
Methyl Iso Butyl Ketone	-	39.4%	-
n-Butyraldehyde	-	-	-
Heptane	41.2%	40.7%	48.1%
Hexane	37.5%	39.6%	54.3%
Pentane	48.4%	46.2%	51.3%
Propane	42.0%	42.4%	44.6%
PSX 700 cure	-	-	-
Quench Oil	-	37.9%	-
Gasoline	46.5%	39.2%	-
Toluene	30.0%	34.5%	43.8%
Transformer Oil	-	-	59.0%
White Spirit / Test Gasoline	-	-	51.0%

TABLE 2-2 MINIMUM IG-541 DESIGN CONCENTRATION

Notes:

ISO 14520 Concentration:

The ISO 14520 design concentrations shown are based on cup burner values, from VdS where available, plus a safety factor of 1.3

NFPA Concentration:

The NFPA design concentrations shown are based on cup burner values, from Tyco Fire Protection Products where available, with a safety factor of 1.3

VdS Concentration:

The VdS design concentration shown for n-heptan (Heptane) is based upon a large full scale value and has safety factor of 1.3.

All other VdS design concentrations shown are based on cup burner values. They have a safety factor of 1.3 and a scaling factor of 1.2 applied to them.

Design Temperature (t) of Hazard Area (°C) [2]	Specific Vapour Volume of IG-541 at Design Temperature (s) (m^3/kg) [3]	Concentration (c) [4]											
		34%	36%	38%	40%	42%	44%	46%	48%	50%	52%	54%	56%
		Agent weight requirements of hazard volume [1]											
-40	0.5624	0.5232	0.5620	0.6020	0.6432	0.6859	0.7301	0.7759	0.8234	0.8728	0.9242	0.9778	1.0338
-35	0.5743	0.5123	0.5503	0.5894	0.6299	0.6717	0.7149	0.7598	0.8063	0.8547	0.9050	0.9575	1.0123
-30	0.5863	0.5019	0.5391	0.5774	0.6170	0.6580	0.7004	0.7443	0.7899	0.8373	0.8866	0.9380	0.9917
-25	0.5982	0.4919	0.5283	0.5659	0.6047	0.6448	0.6864	0.7294	0.7741	0.8205	0.8689	0.9192	0.9719
-20	0.6102	0.4822	0.5180	0.5548	0.5929	0.6322	0.6729	0.7151	0.7589	0.8045	0.8518	0.9012	0.9528
-15	0.6221	0.4730	0.5080	0.5441	0.5815	0.6201	0.6600	0.7014	0.7444	0.7890	0.8355	0.8839	0.9345
-10	0.6341	0.4641	0.4984	0.5339	0.5705	0.6084	0.6476	0.6882	0.7303	0.7741	0.8197	0.8673	0.9169
-5	0.6460	0.4555	0.4892	0.5240	0.5600	0.5971	0.6356	0.6755	0.7168	0.7598	0.8046	0.8512	0.8999
0	0.6580	0.4472	0.4803	0.5145	0.5498	0.5863	0.6240	0.6632	0.7038	0.7460	0.7900	0.8358	0.8836
5	0.6699	0.4392	0.4718	0.5053	0.5400	0.5758	0.6129	0.6514	0.6913	0.7327	0.7759	0.8209	0.8678
10	0.6819	0.4315	0.4635	0.4965	0.5305	0.5657	0.6022	0.6399	0.6791	0.7199	0.7623	0.8065	0.8526
15	0.6938	0.4241	0.4555	0.4879	0.5214	0.5560	0.5918	0.6289	0.6674	0.7075	0.7491	0.7926	0.8379
20	0.7058	0.4169	0.4478	0.4797	0.5126	0.5466	0.5818	0.6183	0.6561	0.6955	0.7365	0.7792	0.8238
25	0.7177	0.4100	0.4403	0.4717	0.5040	0.5375	0.5721	0.6080	0.6452	0.6839	0.7242	0.7662	0.8100
30	0.7297	0.4033	0.4331	0.4639	0.4958	0.5287	0.5627	0.5980	0.6347	0.6727	0.7123	0.7536	0.7968
35	0.7416	0.3968	0.4262	0.4565	0.4878	0.5202	0.5537	0.5884	0.6244	0.6619	0.7009	0.7415	0.7839
40	0.7536	0.3905	0.4194	0.4492	0.4800	0.5119	0.5449	0.5791	0.6145	0.6514	0.6897	0.7297	0.7715
45	0.7655	0.3844	0.4128	0.4422	0.4726	0.5039	0.5364	0.5700	0.6049	0.6412	0.6790	0.7183	0.7595
50	0.7775	0.3785	0.4065	0.4354	0.4653	0.4962	0.5281	0.5613	0.5956	0.6314	0.6685	0.7073	0.7478
55	0.7894	0.3727	0.4004	0.4288	0.4582	0.4887	0.5201	0.5528	0.5866	0.6218	0.6584	0.6966	0.7365
60	0.8014	0.3672	0.3944	0.4224	0.4514	0.4814	0.5124	0.5445	0.5779	0.6125	0.6486	0.6862	0.7255
65	0.8133	0.3618	0.3886	0.4162	0.4448	0.4743	0.5049	0.5365	0.5694	0.6035	0.6391	0.6761	0.7148
70	0.8253	0.3566	0.3830	0.4102	0.4383	0.4674	0.4975	0.5287	0.5611	0.5948	0.6298	0.6663	0.7045
75	0.8372	0.3515	0.3775	0.4043	0.4321	0.4608	0.4904	0.5212	0.5531	0.5863	0.6208	0.6568	0.6944
80	0.8492	0.3465	0.3722	0.3987	0.4260	0.4543	0.4835	0.5139	0.5453	0.5780	0.6121	0.6476	0.6847
85	0.8611	0.3417	0.3670	0.3931	0.4201	0.4480	0.4768	0.5067	0.5378	0.5700	0.6036	0.6386	0.6752
90	0.8731	0.3370	0.3620	0.3877	0.4143	0.4418	0.4703	0.4998	0.5304	0.5622	0.5953	0.6299	0.6659

(1) Agent volume requirements (m^3/m^3) - cubic metres of IG-541 required per cubic metre of protected volume.
(2) Temperature (t) - the design temperature of the hazard area.
(3) Specific vapour volume (s) (m^3/kg) - specific volume of IG-541 vapour.
(4) Concentration (c) - volumetric concentration of IG-541 in air at the temperature indicated.

TABLE 2-3 IG-541TOTAL FLOODING QUANTITY

Equivalent Altitude (Metres)	Correction Factor
-1000	1.130
0	1.000
1000	0.885
1500	0.830
2000	0.785
2500	0.735
3000	0.690
3500	0.650
4000	0.610
4500	0.565

TABLE 2-4 ALTITUDE CORRECTION FACTORS

ACHIEVED AGENT CONCENTRATION

The 'Halon Alternatives Group' report, 'A review of the toxic and asphyxiating hazards of clean agent replacements for Halon 1301', advises that Inert gas systems may be used in the fully automatic mode in occupied areas where the oxygen level does not reduce below 12%.

In the event that the oxygen level is between 10% and 12% the system may be on automatic providing the enclosure can be evacuated in less than 2 minutes.

If the oxygen level falls below 10%, the system must not be used in the automatic mode whilst the enclosure is occupied.

In order to determine or confirm which of the above conditions apply, the following steps should be taken.

i) Calculate the exact volume of agent to be discharged into the protected enclosure by multiplying the number of containers to be provided by the volume of agent contained in each (refer to Table 2-1).

ii) Divide the actual volume of agent being provided by the nett hazard volume to determine the actual flooding factor.

$$FF_{Actual} = \frac{\text{Agent Supplied}}{\text{Altitude Corr. Factor} * \text{Hazard Volume}}$$

FF_{Actual} = actual flooding factor (m^3/m^3)

Agent supplied = number of containers * agent quantity per container (m^3)

iii) This relates the actual flooding factor to the oxygen concentration for NOAEL (min 10%) Use this equation to determine the actual oxygen level.

$$= \frac{20.8}{2.71828^{FF}}$$

Euler's number = 2.71828
FF = Actual Flooding Factor (m^3/m^3)
20.8 = Nominal O_2 concentration

DISCHARGE TIME TO ACHIEVE MINIMUM DESIGN CONCENTRATION

The 'minimum' design concentration is defined as the quantity of agent required to achieve a concentration not less than the extinguishing value, plus a 30% safety factor, even if the actual design concentration for the hazard enclosure is greater than the 'minimum' value. For example, if the hazard consists of combustible materials that are extinguished at 28.1% to give a 'minimum' design concentration of 36.5% (28.1 x 1.3), then the requirement is for 95% of the 'minimum' value (0.95 x 36.5%) i.e. 34.7% concentration to be discharged within 1 minute.

Expressed as an oxygen level the following calculation will apply:
100% - 34.7% = 65.3% of start level.

Therefore (assuming initial oxygen level of 21%) - 65.3% of 21% = residual oxygen level of 13.7%.

EXTENDED DISCHARGE

Should the nature of the hazard determine that an extended discharge of agent is required the system must be so configured that the requirement for 95% of the 'minimum' design concentration for the hazard enclosure is achieved within 1 minute.

Any extended discharge should be designed to add agent at such a rate as to compensate for losses. The duration of the extended discharge may be determined according to the nature of the hazard and the required hold time.

All extended discharge systems should be referred to Technical Services.

CONNECTED RESERVES

Connected reserves can be accommodated in the system. The means to achieve this will normally be by means of a duplicate bank of agent containers connected into a common manifold. All parts of the storage system will be duplicated but the pipework system from the container storage area and the discharge nozzles will normally be common.

STOP VALVES AND SELECTOR VALVE SYSTEMS

Stop valves and selector valves can be accommodated in the system. Both types of arrangement will create 'closed' sections of pipework and will require pressure relieving devices (pressure relief valves). The methodology by which to achieve the many configurations possible will require the use of non-return valves and pilot line bleed valves strategically positioned in the pneumatic control system. An example of a typical layout is shown in Fig. 2-1.

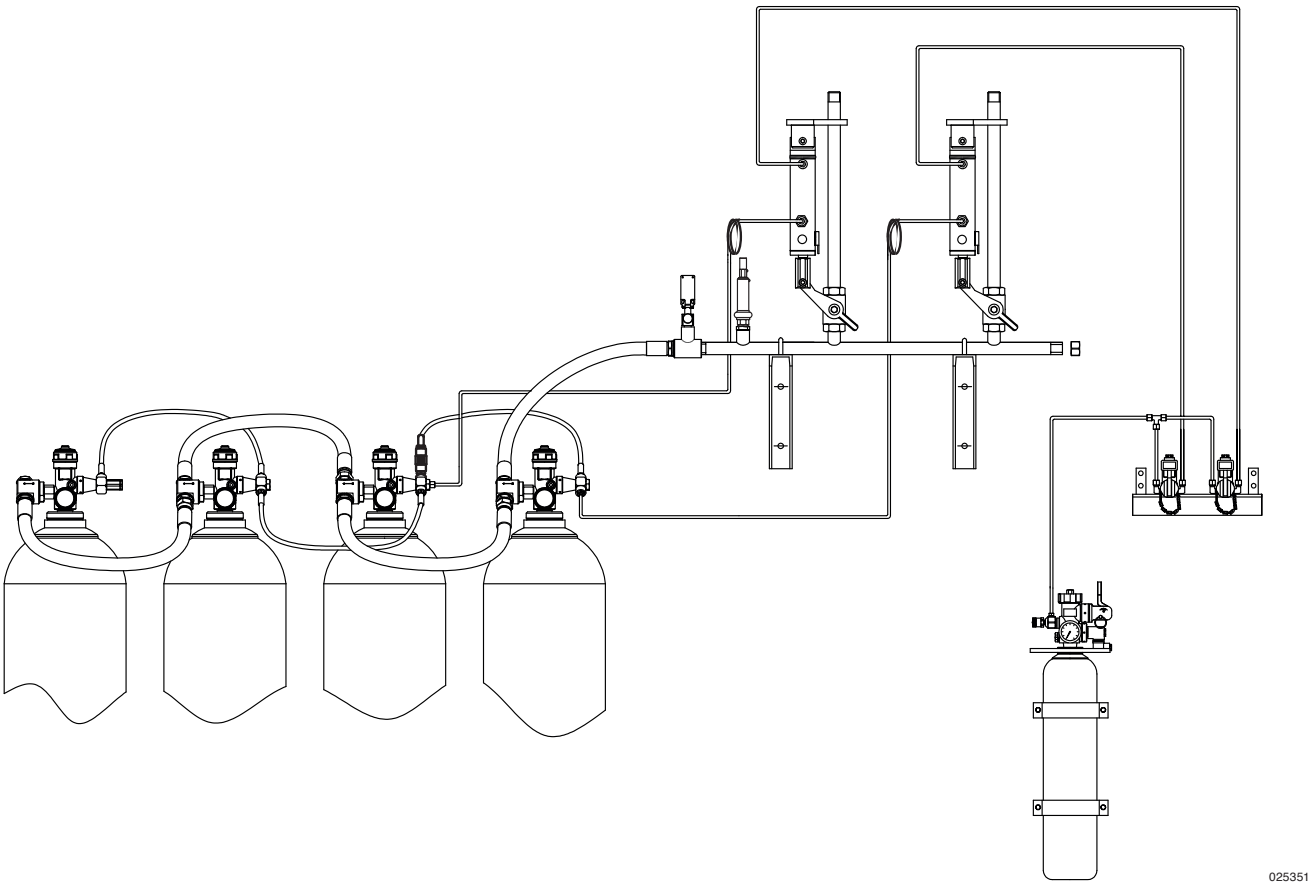


FIG. 2-1 SELECTOR VALVE ACTUATION ARRANGEMENTS

PIPE SIZE ESTIMATING

In order to assist in the determination of the required pipe sizing the following table may assist the designer for the majority of systems. In the case of systems with extensive pipework runs, it may be necessary to allow for larger pipework than that shown in Table 2-5.

Pipe Size (NB)	Nominal Flow Rate (m^3/min)	Kg/min
15mm (1/2 in.)	24	34.54
20mm (3/4 in.)	48	69
25mm (1 in.)	72	103.5
32mm (1 1/4 in.)	120	172.5
40mm (1 1/2 in.)	192	276
50mm (2 in.)	360	517.5
65mm (2 1/2 in.)	578	831
80mm (3 in.)	916	1317
100mm (4 in.)	1199	1725

TABLE 2-5 PIPE FLOW RATES FOR ESTIMATING

DESIGN DRAWINGS

Following receipt of instructions from the client to proceed with an installation, system layout drawings must be prepared which contain the following information as a minimum:

i) Extent of the protected enclosure.

ii) Details of the hazards.

iii) Location of the agent containers and associated equipment.

iv) Layout, type and size of pipework.

v) Position of nozzles and orifice size.

vi) Calculations to show how the quantity of agent and number of containers were determined.

vii) Over pressurisation vent calculations.

Drawings are to be submitted to the client for approval

and installation must only proceed against approved drawings.

ROOM INTEGRITY AND PRESSURISATION

The successful performance of a Gaseous Total Flooding system is largely dependent on the integrity of the protected enclosure. It is a requirement that a room integrity test is performed on any protected enclosure to establish the total equivalent leakage area and enable a prediction to be made of the enclosure's ability to retain fire extinguishing agent. The required retention time will vary depending on the particulars of the hazard but will not normally be less than 10 minutes. Longer retention times for example may be necessary if enclosures contain hazards that may readily become deep seated.

In considering room integrity the designer should be aware that the discharge of any gaseous extinguishing agent into an enclosure will give rise to a change in the pressure within that enclosure, which under some conditions could affect the structural integrity of the enclosure.

In some cases the protected enclosure will require a pressure relief device and in all cases the client must be made aware of the pressurisation level expected (from calculation) within the enclosure.

The basis for these calculations will be the natural leakiness of the enclosure, which can only be assessed with any degree of accuracy by using the room integrity test equipment. When conducting this test don't forget that we are looking for the minimum amount of leakage not the maximum amount of leakage as would be required with a standard room integrity test. The difference between the two tests will be that doors surrounding the protected room will be left closed as opposed to being held open during a standard room integrity test.

In order to calculate the venting area, if the vent path cannot go direct to atmosphere then we may 'Cascade' the pressure through one or more rooms before exiting to atmosphere. It needs to be clear that we will be passing gas/smoke through these rooms so the client needs to be aware in case of any problems that might arise from this action.

The formula provided above will not provide an accurate indication of vent sizes for this operation. Please either refer to the Fire Industry Association 'Guidance on the pressure relief and post discharge venting of enclosures protected by gaseous firefighting systems issue 2 or refer to the Tyco Fire Protection Products Technical Department in your area.

NOTE: It is the clients' responsibility to determine the enclosure strength and not the fire protection system supplier. The client must advise the allowable pressure differential that the enclosure can withstand without sustaining damage.

As a guide it is expected that (in the UK) normal blockwork construction can withstand 500 Pascals whilst lightweight structures such as stud portioning can withstand only 250 Pascals. Certain structures, particularly suspended ceilings may have even lower limits and the figure may be as low as 100 Pascals.

In the event that the client does not make clear what the allowable pressure the enclosure can withstand it will be necessary to obtain his acceptance of the figures used.

$$A = \frac{Q}{\sqrt{\Delta P \times 0.77}}$$

Where

A	=	Opening (m^2)
Q	=	Agent flow rate (m^3/s)
ΔP	=	Maximum Allowable Pressure Increase (Pa)

DETECTION AND CONTROL SYSTEMS

Detection and control systems associated with fixed firefighting systems are outside the scope of this manual. Reference should be made to the applicable equipment manufacturers' manuals and relevant standards.

ELECTRICAL EARTHING AND SAFETY CLEARANCES

For guidance on the requirements for earthing and safety clearances refer to the appropriate section of the design standards listed in Page 2-1.

FLOW CALCULATIONS

INTRODUCTION/INSTALLATION

iFLOW 200 bar and 300 bar engineered systems use a flow calculation program developed by VdS.

The program contains flow calculation routines developed to accurately predict the flow of agent through a system of pipework and to determine the piping and nozzle orifice sizing.

As part of our licensing agreement the program is copy protected. For additional licences, contact the Product Manager.

COMPLETING THE SYSTEM DESIGN

Once the program has completed its calculations and the Design Engineer has taken account of any Warning Flags, the appropriate discharge nozzles are to be ordered.

The calculated nozzle and pressure reducing unit orifice areas are used to provide drilling information.

NOZZLE DRILLING DETAILS

Nozzles are available in 3/8 in., 1/2 in., 3/4 in., 1 in., 1 ¼ in., 1 ½ in. and 2 in. sizes and in 180 degree and 360 degree options. The orifice sizes are specified in the flow calculation programs print out. When ordering it is necessary to quote the nozzle part number and orifice size.

PIPEWORK AND FITTINGS

It is essential that the correct grade and size of pipework and fittings are employed in the system.

Distribution piping downstream from the iFLOW valve must be constructed to withstand the maximum downstream pressure as determined by the flow calculation.

It is therefore recommended that either ISO 14520 Gaseous fire- extinguishing systems - Physical properties and system design, or EN15004 Fixed firefighting systems - Gas extinguishing systems, is consulted in order to determine the grade of pipework and fittings to be used in the system.

NOZZLES

The type of nozzle, 180 degree or 360 degree, used in any system design will depend on the location of the nozzle in the system.

ACTUATION CONTAINER REQUIREMENTS

After all flow calculation has been completed.

Pilot line limitations:

The pilot actuation system is limited by the volume of gas in the pilot container used. The volume of gas determines the number of actuation components and the length of tubing allowed when designing a system.

Note: When utilizing selector valves determine your maximum equivalent length of actuation line for each hazard. Remember the pressure will travel through all tubing until a check valve stops the flow of gas. The maximum equivalent length shall be used to determine pilot container size.
The following calculation is used to determine which size container is required for proper actuation.
1.18 m(3.88 ft) x (number of containers) + 14 m (46 ft) if 1”-3” selector valve or 32 m (105 ft) for 4” selector valve) + total ft of tubing used in actuation = Total

EXAMPLE

A system contains 22 containers utilizing one 3 in. selector valve and 18.3 m (60 ft) of actuation tubing from the pilot container to the first system container.

Number of Containers x 3.88	25.96 m (85.36 ft)
Selector Valve 1” to 3” (use 14 m (46 ft)) 4” (use 32 m (105 ft))	14 m (46 ft)
Length of tubing	18.3 m (60 ft)
Total	58.26 m (191.36 ft)

Based on the example and the table below a 3 Litre pilot container or larger could be used.

Total equivalent length of actuation line required	Container volume required
Less than 67.1 m (220.2 ft)	3 L
Greater than 67.1 m (220.2 ft) and less than 111.5 m (366 ft)	13 L
Greater than 111.5 m (366 ft) and less than 148.7 m (488 ft)	50 L
Greater than 148.7 m (488 ft)	No available containers for this design. Please contact customer support.

EQUIPMENT DESCRIPTIONS

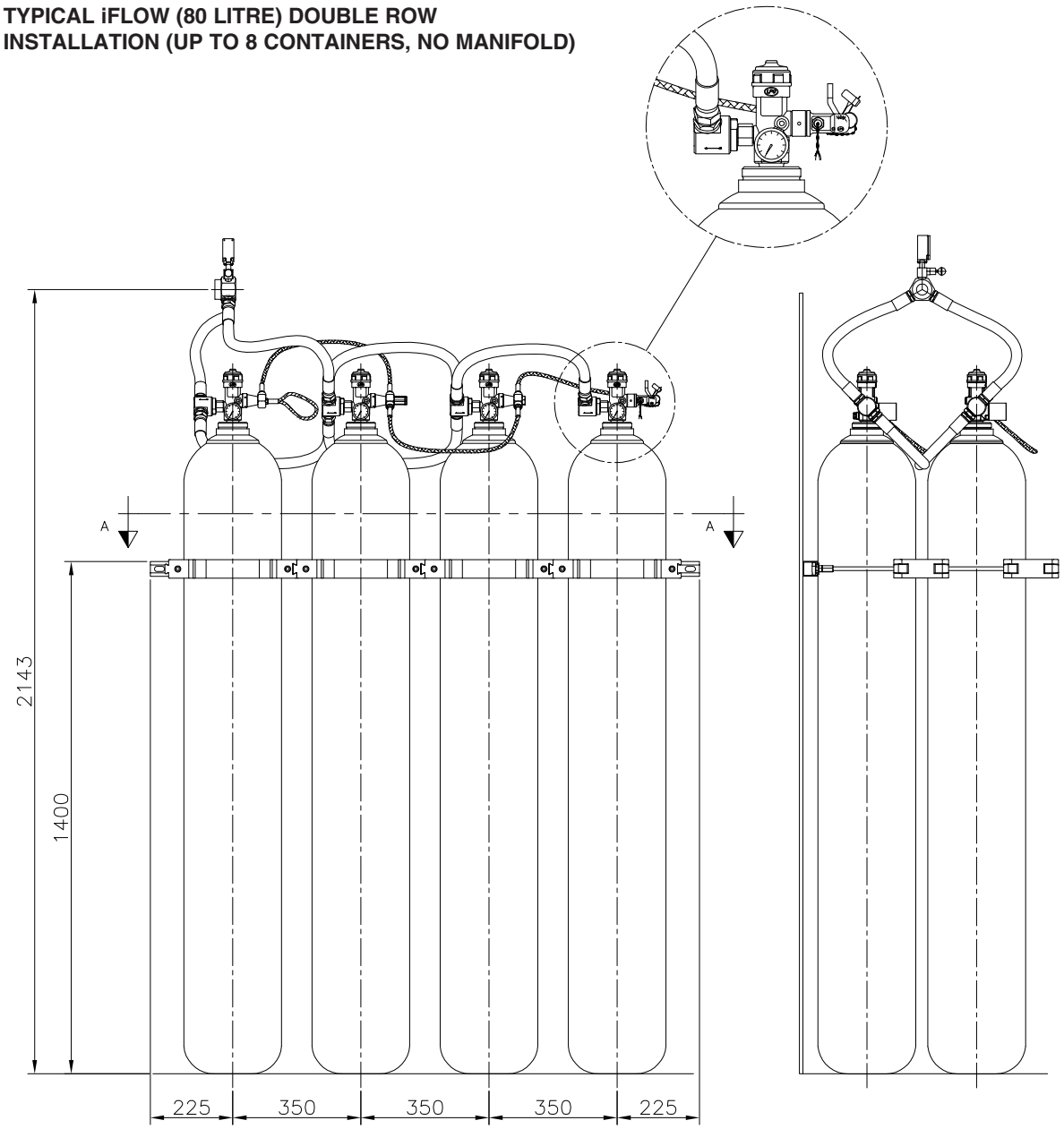
	EQUIPMENT DESCRIPTION	PART NO.
	80 litre container assembly - 300 bar (with contacted pressure gauge)	73130006
	80 litre container assembly - 300 bar (with standard pressure gauge)	73130007
	140 litre container assembly - 300 bar (with contacted pressure gauge)	74106020
	140 litre container assembly - 300 bar (with standard pressure gauge)	74106021
	80 litre container assembly - 200 bar (with contacted pressure gauge)	73131025
	80 litre container assembly - 200 bar (with standard pressure gauge)	73131026
	140 litre container assembly - 200 bar (with contacted pressure gauge)	74106018
	140 litre container assembly - 200 bar (with standard pressure gauge)	74106019
	80 litre container assembly - 300 bar (Australian work cover approved with contacted pressure gauge)	73130032
	80 litre container assembly - 300 bar PESO (India) approved (with contacted pressure gauge)	73130029
	140 litre container assembly - 300 bar PESO (India) approved (with contacted pressure gauge)	74106044
	Container label (IG-541)	35116314
	Pilot container label	35116401
	300 bar iFLOW container valve (with standard pressure gauge)	21114042
	300 bar iFLOW container valve (with contacted pressure switch)	21114043
	200 bar iFLOW container valve (with standard pressure gauge)	21114040
	200 bar iFLOW container valve (with contacted pressure switch)	21114041
	3/8 in. 180° discharge nozzle	30400007
	1/2 in. 180° discharge nozzle	30400008
	3/4 in. 180° discharge nozzle	30400009
	1 in. 180° discharge nozzle	30400010
	1-1/4 in. 180° discharge nozzle	30400011
	1-1/2 in. 180° discharge nozzle	30400012
	2 in. 180° discharge nozzle	30400013
	3/8 in. 360° discharge nozzle	30400000
	1/2 in. 360° discharge nozzle	30400001
	3/4 in. 360° discharge nozzle	30400002
	1 in. 360° discharge nozzle	30400003
	1-1/4 in. 360° discharge nozzle	30400004
	1-1/2 in. 360° discharge nozzle	30400005
	2 in. 360° discharge nozzle	30400006
	Nozzle orifice plate 3/8 in.	30440032
	Nozzle orifice plate 1/2 in.	30440042
	Nozzle orifice plate 3/4 in.	30440052
	Nozzle orifice plate 1 in.	30440062
	Nozzle orifice plate 1-1/4 in.	30440072
	Nozzle orifice plate 1-1/2 in.	30440082
	Nozzle orifice plate 2 in.	30440092
	Nozzle/pipe ceiling plate 3/8 in.	30410320
	Nozzle/pipe ceiling plate 1/2 in.	30410420
	Nozzle/pipe ceiling plate 3/4 in.	30410520
	Nozzle/pipe ceiling plate 1 in.	30410620
	Nozzle/pipe ceiling plate 1-1/4 in.	30410720
	Nozzle/pipe ceiling plate 1-1/2 in.	30410820
	Nozzle/pipe ceiling plate 2 in.	30410920
▸	Acoustic Nozzle	445710
▸	Acoustic Nozzle Orifice Pipe Assembly, NPT	445715
▸	Acoustic Nozzle Orifice Pipe Assembly, BSPT	27511
▸	Pneumatic actuator	30118APB
	Manual actuator	30180APB
	Pneumatic -manual actuator	3018NAPB

EQUIPMENT DESCRIPTION	PART NO.
Discharge pressure switch	30330010
Pressure gauge assembly - standard (300 bar)	42116056
Pressure gauge assembly- contacted (300 bar)	42116057
Pressure gauge assembly- standard (200 bar)	42116054
Pressure gauge assembly- contacted (200 bar)	42116055
3 litre pilot container - standard	70100075
13 litre pilot container - standard	70100082
50 litre pilot container - standard	70121011
3 litre pilot container - (Australian work cover approved)	70100084
13 litre pilot container - (PESO (India) approved)	70100083
50 litre pilot container - (PESO (India) approved)	70121012
Gas metron	30110604
iFLOW check valve	21114011
Blind cap ¾ in.	30390160
Dowty seal ¾ in.	95108010
▸ iFLOW discharge hose - 350 mm long 1/2 in. (80 litre and 140 litre)	30521041
iFLOW discharge hose - 350 mm long 3/4 in. (80 litre)	91116026
iFLOW discharge hose - 450 mm long 3/4 in. (140 litre)	91116045
iFLOW discharge hose - 590 mm long 3/4 in. (80 litre)	91116030
iFLOW discharge hose - 690 mm long 3/4 in. (140 litre)	91116046
iFLOW discharge hose 'Y' connector	35116261
iFLOW discharge hose connector	35116260
Wall mount bracket (3 containers)	36116200
Wall mount bracket (2 containers)	36116274
▸ Wall mount bracket (1 containers)	14267
Support screw	36116291
Set of bolts	36116292
iFLOW bracket	36116293
Single row manifold bracket (80 litre container)	30680006
Manifold support single/double row (140 litre container)	30640006
iFLOW 140 litre container bracket single row bracket (2 containers)	30602100
iFLOW 140 litre container bracket single row bracket (3 containers)	30603100
iFLOW modular bracket	30621010
iFLOW 140 litre container bracket double row bracket (4 containers)	3060410D
iFLOW 140 litre container bracket double row bracket (6 containers)	3060610D
Manifold U bolt (¾ in.)	3060050
Manifold U bolt (1 in.)	3060060
Manifold U bolt (1¼ in.)	3060070
Manifold U bolt (1½ in.)	3060080
Manifold U bolt (2 in.)	3060090
Manifold U bolt (2½ in.)	30600100
Manifold U bolt (3 in.)	30600110
Manifold U bolt (4 in.)	30600120
iFLOW 1/4 in. actuation hose - 580 mm long (pilot actuated)	30506014
iFLOW 1/4 in. actuation hose - 580 mm long (metron actuated)	30506015
▸ iFLOW 1/4 in. actuation hose - 580 mm long (metron actuated) - secondary supply	30506016
iFLOW 1/4 in. actuation hose - 700 mm long (pilot actuated)	30522001
iFLOW 1/4 in. actuation hose - 700 mm long (metron actuated)	30522003
▸ iFLOW 1/4 in. actuation hose - 700 mm long (metron actuated) - secondary supply	30522004
▸ 1/4 in. bleed valve	302.200.075
Pilot valve adaptor	35116381
Pilot line non-return valve	20006020
Decompression screw	30027301
Selector valve 20mm (¾ in.) with solenoid actuator and manual release	445043
Selector valve 25mm (1 in.) with solenoid actuator and manual release	445044
Selector valve 32mm (1¼ in.) with solenoid actuator and manual release	445045
Selector valve 40mm (1½ in.) with solenoid actuator and manual release	445046
Selector valve 50mm (2 in.) with solenoid actuator and manual release	445047
Selector valve 65mm (2½ in.) with solenoid actuator and manual release	445048
Selector valve 80mm (3 in.) with solenoid actuator and manual release	445049
Selector valve 100mm (4 in.) with solenoid actuator and manual release	445050

EQUIPMENT DESCRIPTION	PART NO.
Selector valve 20mm (¾ in.) with solenoid actuator and blind cap (no manual release)	442795
Selector valve 25mm (1 in.) with solenoid actuator and blind cap (no manual release)	442796
Selector valve 32mm (1¼ in.) with solenoid actuator and blind cap (no manual release)	442797
Selector valve 40mm (1½ in.) with solenoid actuator and blind cap (no manual release)	442798
Selector valve 50mm (2 in.) with solenoid actuator and blind cap (no manual release)	442799
Selector valve 65mm (2½ in.) with solenoid actuator and blind cap (no manual release)	442800
Selector valve 80mm (3 in.) with solenoid actuator and blind cap (no manual release)	442801
Selector valve 100mm (4 in.) with solenoid actuator and blind cap (no manual release)	442802
▸ Selector valve solenoid with manual release	30130253V
▸ Selector valve solenoid only with blind cap	30130255V
Selector valve solenoid mounting bracket (3 solenoids)	30650013
Selector valve solenoid mounting bracket (4 solenoids)	30650014
Selector valve solenoid mounting bracket (2 solenoids)	30650022
Lock off assembly	302.200.072
Lock off assembly limit switch	KO 246 2526
Lock off assembly limit switch and fixing kit	KO 246 2876
Selector valve manifold - 20mm (¾ in.) diameter	36211000 to 36611111
Selector valve manifold - 25mm (1 in.) diameter	36222000 to 36622222
Selector valve manifold - 32mm (1¼ in.) diameter	36233000 to 36633333
Selector valve manifold - 40mm (1½ in.) diameter	36244000 to 36644444
Selector valve manifold - 50mm (2 in.) diameter	36255000 to 36655555
Selector valve manifold - 65mm (2½ in.) diameter	36266000 to 36666666
Selector valve manifold - 80mm (3 in.) diameter	36277000 to 36677777
Selector valve manifold - 100mm (4 in.) diameter	36288000 to 36688888
▸ Selector valve manifold outlet nipple - 20mm (¾ in.) diameter	94116021
Selector valve manifold outlet nipple - 25mm (1 in.) diameter	94116022
Selector valve manifold outlet nipple - 32mm (1¼ in.) diameter	94116023
Selector valve manifold outlet nipple - 40mm (1½ in.) diameter	94116024
Selector valve manifold outlet nipple - 50mm (2 in.) diameter	94116025
Selector valve manifold outlet nipple - 65mm (2½ in.) diameter	94116026
Selector valve manifold outlet nipple - 80mm (3 in.) diameter	94116027
Selector valve manifold outlet nipple - 100mm (4 in.) diameter	94116028
Manifold drop section - 20mm (¾ in.) diameter - 900mm pipe centres	19263001
Manifold drop section - 25mm (1 in.) diameter - 900mm pipe centres	19263002
Manifold drop section - 32mm (1¼ in.) diameter - 900mm pipe centres	19263003
Manifold drop section - 40mm (1½ in.) diameter - 900mm pipe centres	19263004
Manifold drop section - 50mm (2 in.) diameter - 900mm pipe centres	19263005
Manifold drop section - 65mm (2½ in.) diameter - 900mm pipe centres	19263006
Manifold drop section - 80mm (3 in.) diameter - 900mm pipe centres	19263007
Manifold drop section - 100mm (4 in.) diameter - 900mm pipe centres	19263008
Manifold drop section - 20mm (¾ in.) diameter - 1500mm pipe centres	19263009
Manifold drop section - 25mm (1 in.) diameter - 1500mm pipe centres	19263010
Manifold drop section - 32mm (1¼ in.) diameter - 1500mm pipe centres	19263011
Manifold drop section - 40mm (1½ in.) diameter - 1500mm pipe centres	19263012
Manifold drop section - 50mm (2 in.) diameter - 1500mm pipe centres	19263013
Manifold drop section - 65mm (2½ in.) diameter - 1500mm pipe centres	19263014
Manifold drop section - 80mm (3 in.) diameter - 1500mm pipe centres	19263015
Manifold drop section - 100mm (4 in.) diameter - 1500mm pipe centres	19263016
Union connector - 20mm (¾ in.) diameter - NPT to NPT	30888001
Union connector - 25mm (1 in.) diameter - NPT to NPT	30888002
Union connector - 32mm (1¼ in.) diameter - NPT to NPT	30888003
Union connector - 40mm (1½ in.) diameter - NPT to NPT	30888004
Union connector - 50mm (2 in.) diameter - NPT to NPT	30888005
Union connector - 65mm (2½ in.) diameter - NPT to NPT	30888006
Union connector - 80mm (3 in.) diameter - NPT to NPT	30888007
▸ Union connector - 100mm (4 in.) diameter - NPT to NPT	30888008

	EQUIPMENT DESCRIPTION	PART NO.
	Union connector - 20mm (¾ in.) diameter - NSPT to BSPT	30888027
	Union connector - 25mm (1 in.) diameter - NPT to BSPT	30888028
	Union connector - 32mm (1¼ in.) diameter - NPT to BSPT	30888029
	Union connector - 40mm (1½ in.) diameter - NPT to BSPT	30888030
	Union connector - 50mm (2 in.) diameter - NPT to BSPT	30888031
	Union connector - 65mm (2½ in.) diameter - NPT to BSPT	30888032
	Union connector - 80mm (3 in.) diameter - NPT to BSPT	30888033
	Union connector - 100mm (4 in.) diameter - NPT to BSPT	30888034
►	iFLOW manifold - 20mm (¾ in.) diameter (80 litre container)	19263021 to 19263031
	iFLOW manifold - 25mm (1 in.) diameter (80 litre container)	19263022 to 19263042
►	iFLOW manifold - 32mm (1¼ in.) diameter (80 litre container)	19263033 to 19263073
►	iFLOW manifold - 40mm (1½ in.) diameter (80 litre container)	19263034 to 19263084
	iFLOW manifold - 50mm (2 in.) diameter (80 litre container)	19263035 to 19263095
►	iFLOW manifold - 65mm (2½ in.) diameter (80 litre container)	19263046 to 19263096
	iFLOW manifold - 80mm (3 in.) diameter (80 litre container)	19263057 to 19263107
	iFLOW manifold - 100mm (4 in.) diameter (80 litre container)	19263078 to 19263128
	iFLOW manifold - 25mm (1 in.) diameter (140 litre container)	19266022
►	iFLOW manifold - 32mm (1¼ in.) diameter (140 litre container)	19266033 to 19266063
►	iFLOW manifold - 40mm (1½ in.) diameter (140 litre container)	19266034 to 19266064
	iFLOW manifold - 50mm (2 in.) diameter (140 litre container)	19266035 to 19266065
►	iFLOW manifold - 65mm (2½ in.) diameter (140 litre container)	19266046 to 19266096
	iFLOW manifold - 80mm (3 in.) diameter (140 litre container)	19266047 to 19266127
	iFLOW manifold - 100mm (4 in.) diameter (140 litre container)	19266078 to 19266138
►	Manifold burst disc	200CD120
	Pressure relief valve	62104002
	Half hard 6mm copper pipe - 3 metres	308.002.002
	Copper pipe (6 x 4mm)	30804068
	Copper pipe coupling (1/4 in. BSPT x 6 mm)	30880007
	Equal tee (6 mm)	30880015
	Hose connector (1/4 in. hose - female/female)	30880008
	Bonded seal (1/4 in. dowty)	31199816
	'C' Spanner dia 35 mm-60 mm, pin dia 4 mm	35017401
	'C' Spanner dia 60 mm-90 mm, pin dia 5 mm	35017402
	'C' Spanner dia 90 mm-155 mm, pin dia 6 mm	35017403
	'C' Spanner dia 165 mm-230 mm, pin dia 10 mm	35017404
►	Pneumatic actuator test tool	441564
►	Pneumatic actuator test tool, package of five	441565
►	Pneumatic actuator reset tool	441566
	Manual release caution plate	63013038
	Door caution plate - lock-off	63013042
	Door caution plate - no lock-off	63013047

TYPICAL iFLOW (80 LITRE) DOUBLE ROW INSTALLATION (UP TO 8 CONTAINERS, NO MANIFOLD)



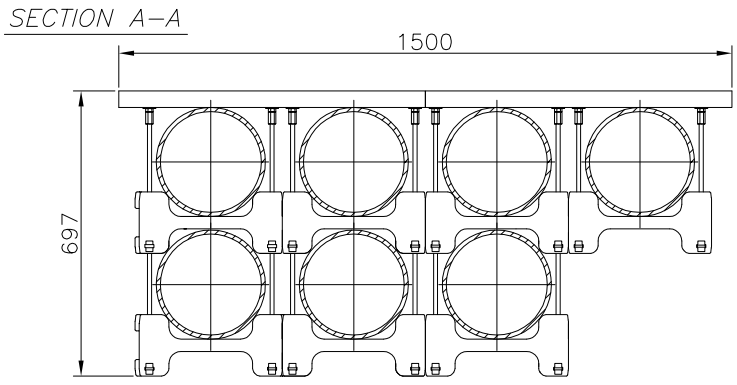


FIG. 3-1 iFLOW TWO ROW STANDARD CONTAINER BANK ARRANGEMENT 80 LITRE (NO MANIFOLD)

TYPICAL iFLOW (140 LITRE) DOUBLE ROW INSTALLATION (UP TO 4 CONTAINERS, NO MANIFOLD)

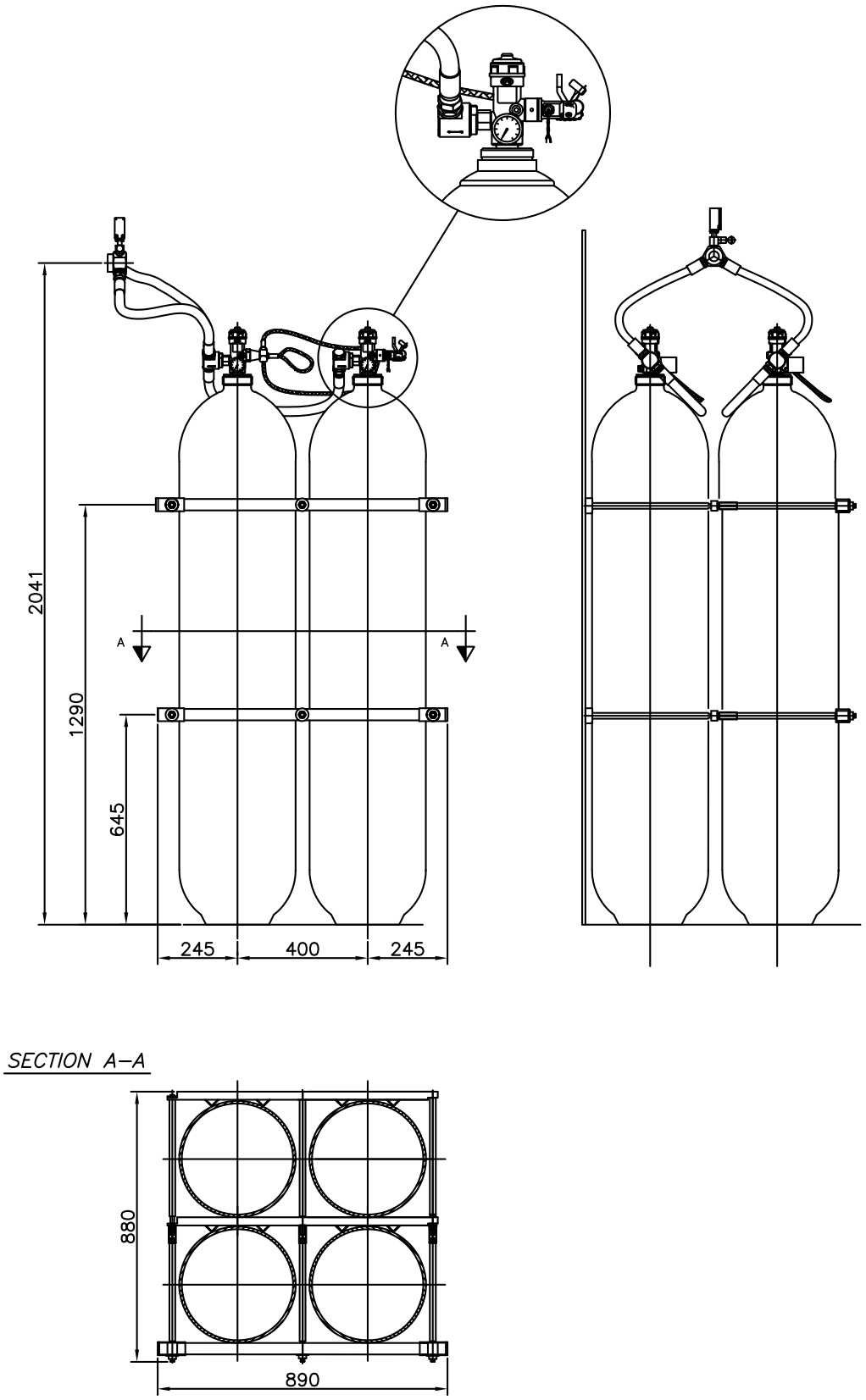


FIG. 3-2 iFLOW TWO ROW STANDARD CONTAINER BANK ARRANGEMENT 140 LITRE (NO MANIFOLD)

▸ iFLOW IG-541 CONTAINER AND VALVE ASSEMBLIES

iFLOW systems are configured around a range of eight container and valve assemblies.

Each basic assembly consists of:

1) Container complete with transport cap

2) Valve assembly

3) Container labels

Each container size can be supplied with either a standard pressure gauge or a contacted pressure gauge fitted.

Each assembly is provided with a specific charge of IG-541 to a maximum pressure of 200 bar or 300 bar (+0 / -5 bar) at 15°C.

Filling details for each type and size of container are shown in Tables 3-1.

Part Number	Pressure (bar)	Container Size (Litres)	Standard Pressure Gauge Fitted	Contacted Pressure Gauge Fitted	IG-541 Quantity (m^3)	IG-541 Quantity (kg)
73130006	300	80	No	Yes	23.0	33.1
73130007	300	80	Yes	No	23.0	33.1
74106020	300	140	No	Yes	40.2	57.9
74106021	300	140	Yes	No	40.2	57.9
73131025	200	80	No	Yes	16.5	23.8
73131026	200	80	Yes	No	16.5	23.8
74106018	200	140	No	Yes	28.9	41.6
74106019	200	140	Yes	No	28.9	41.6
73130032*	300	80	No	Yes	23.0	33.1
73130029**	300	80	No	Yes	23.0	33.1
74106044**	300	140	No	Yes	40.2	57.9

TABLE 3-1 FILLING DETAILS FOR iFLOW IG-541 CONTAINER AND VALVE ASSEMBLIES

Dimensions and weights for each assembly are shown in Table 3-2.

* Container for Australian Work Cover Approved Market Only.

** PESO (India) Approved Market.

Containers are designed, manufactured and marked in accordance with 2010/35/EC and are pressure tested to 300 or 450 bar.

Labels providing safety, maintenance and pressure temperature information are fitted to all containers.

Containers are coloured red to BS4800 : 04 E53 with a green top dome to RAL 7031.

Containers must not be subject to direct sunlight or adverse weather conditions and must not be positioned where water can accumulate around the base.

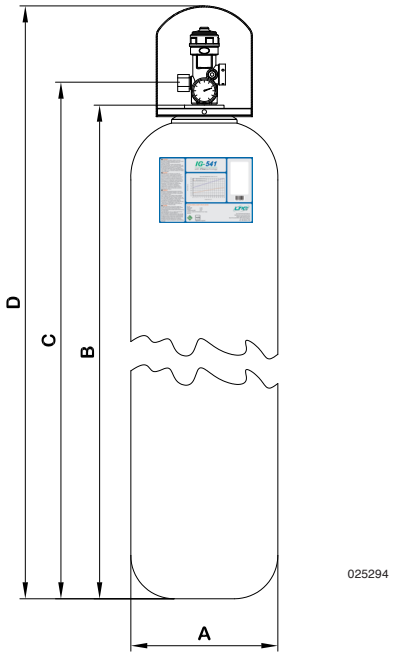


Fig 3-3 Container and Valve Assembly (Showing Dimensions - See Table 3-2)

Technical Specification

Minimum Test Pressure:	450 bar (300 bar system) 300 bar (200 bar system)
Nominal Working Pressure:	300 bar and 200 bar (at 15 °C)
Maximum Working Pressure:	358 bar and 235 bar (at 50 °C)

Container Size (Litres)	Pressure (bar)	Dimension A (mm)	Dimension B (mm)	Dimension C (mm)	Dimension D (mm)	Tare Weight (kg)	Gross Weight (kg)
80	300	267	1780	1825	1980	120.2	152.9
140	300	360	1745	1790	1945	207.2	264.8
80	200	267	1710	1755	1910	96.2	120.0
140	200	360	1690	1735	1890	161.2	202.2

▸ **TABLE 3-2 DIMENSIONS AND WEIGHTS FOR iFLOW IG-541 CONTAINER AND VALVE ASSEMBLIES**

IFLOW IG-541 CONTAINER LABEL

(Part No. 35116314)

The container label details the container number, pressure contained, and charge date. Once the label is applied to the container surface, and to avoid possible tampering it can not be removed intact.

Technical Information

▸ Material:	PVC with adhesive backing
Certification:	LPCB, VdS
Overall Size:	289 mm x 202 mm (11.38 in. x 7.95 in.) (Part No.35116317)
Weight:	0.0558 kg (0.122 lbs)
▸ Language Translations	English (GB), Spanish (SP), French (FR) and German (DE)

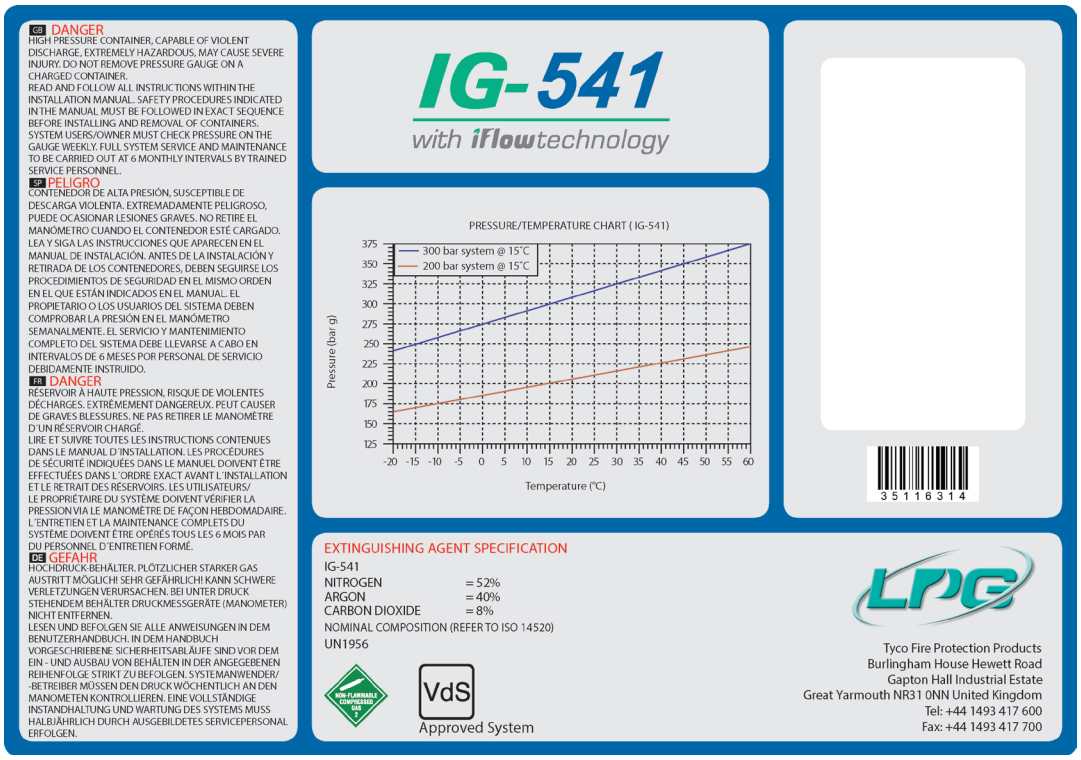


FIG. 3-4 PART NO. 35116314

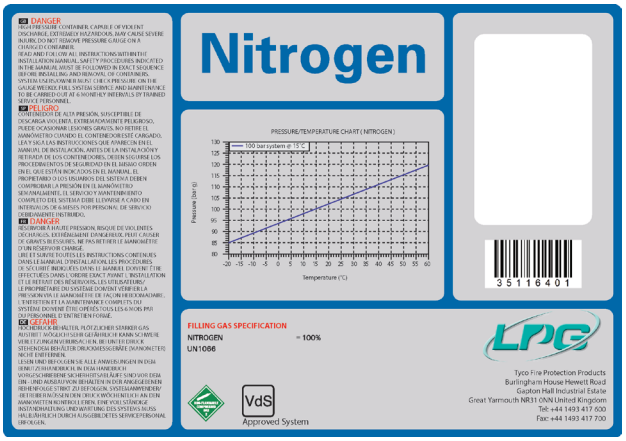


FIG. 3-5 PART NO. 35116401

PILOT CONTAINER LABEL

(Part No. 35116401)

Technical Information

▸ Material:	PVC with adhesive backing
Certification:	LPCB,VdS
Overall Size:	193 mm x 135 mm (7.6 in. x 5.3 in.) (Part No. 35116391)
▸ Weight	0.037 kg (0.081 lbs)
▸ Language Translations	English (GB), Spanish (SP), French (FR) and German (DE)

iFLOW CONTAINER VALVES

300 BAR iFLOW CONTAINER VALVE

(Assembly Part No. 21114042, 21114043)

The iFLOW 300 bar container valve is a quick action valve designed to be operated by means of a gas metron, local manual actuator or pneumatic actuator.

All valves are provided with a recoil cap which is screwed onto the agent discharge outlet. This is removed only when the container is to be connected into the pipework system and must be refitted immediately when the container is disconnected from the pipework. (Regardless of whether the container is full or empty).

When installed in a system the valve will be factory fitted with a pressure gauge (Part No. 42116056 to provide visual indication of container pressure. As an optional item a gauge fitted with electrical contacts (Part No. 42116057) may be provided to enable an electrical indication to be given in the event of a loss in container pressure exceeding 10%.

A safety burst disc is incorporated in the valve and is
▸ designed to rupture at between 392 bar (55 °C) and 427 bar (20 °C).

In the event that the safety burst disc ruptures, agent will be discharged through the burst disc outlet adaptor. As a safety precaution a recoil cap (supplied with all charged containers) must be fitted to this outlet.

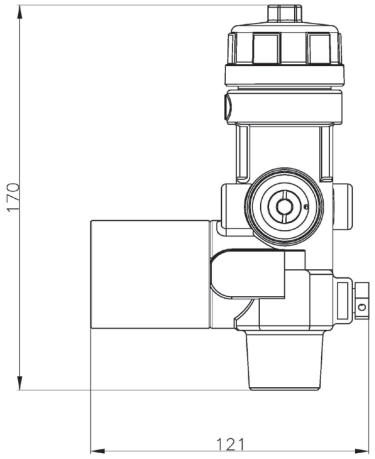


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FIG. 3-6
PART NO. 21114042 (WITH STANDARD PRESSURE GAUGE)
PART NO .21114043 (WITH CONTACTED PRESSURE GAUGE)
300 BAR iFLOW VALVE

Technical Specification

Body Material:	Brass CZ 120
Thread Type:	1 in. NPT
Outlet Connection:	DIN 477
Outlet Safety Cap Material:	Brass
Maximum Working Pressure:	370 bar
Free Flow Cross Sectional Area:	34.8 mm²
Equivalent Length:	N/A
▸ Burst Disc Rating:	392 bar (55 °C) - 427 bar (20 °C)
Working Temperature Range:	-20 °C to 50 °C
Weight:	2.10 kg
Approvals:	VdS, CNPP
Certification:	EN 12094-4
CE Certification Number:	0786-CPD-30139
Year of CE Marking:	2011
CE Marking Requirements:	Manufacturer, Part Number, Serial No, CE_{0786}
▸ Valve Marking Part Number:	21114010 (Base Valve Without Pressure Gauge)
Method of Marking:	Engraving
Valve Type:	Type 2
Overall Size:	170 mm x 77 mm

Location on System

Connected to the container.

Installation Instructions

The discharge valve is supplied factory fitted to the container. Before connection to pipe work or discharge hose, ensure the container is secured with the appropriate container brackets.

Operating Instructions

The discharge valve is operated via manual, pneumatic or gas metron actuation. The discharge valve will actuate automatically upon actuation and discharge agent through the piping system into the protected area. After discharge, the valve will require refurbishment before refilling.

Maintenance Instructions

Refurbish valve after each discharge or when container is hydrostatically pressure tested. (Refer to iFLOW refill manual, 14A-39, for full details)

200 BAR iFLOW CONTAINER VALVE

(Assembly Part No. 21114040, 21114041)

The iFLOW 200 bar container valve is a quick action valve designed to be operated by means of a gas metron, local manual actuator or pneumatic actuator.

All valves are provided with a recoil cap which is screwed onto the agent discharge outlet. This is removed only when the container is to be connected into the pipework system and must be refitted immediately when the container is disconnected from the pipework. (Regardless of whether the container is full or empty).

When installed in a system the valve will be factory fitted with a pressure gauge (Part No. 42116054) to provide visual indication of container pressure. As an optional item a gauge fitted with electrical contacts (Part No. 42116055) may be provided to enable an electrical indication to be given in the event of a loss in container pressure exceeding 10%.

A safety burst disc is incorporated in the valve and is designed to rupture at a pressure of 270 bar.

In the event that the safety burst disc ruptures agent will be discharged through the burst disc outlet adaptor. As a safety precaution a recoil cap (supplied with all charged containers) must be fitted to this outlet.

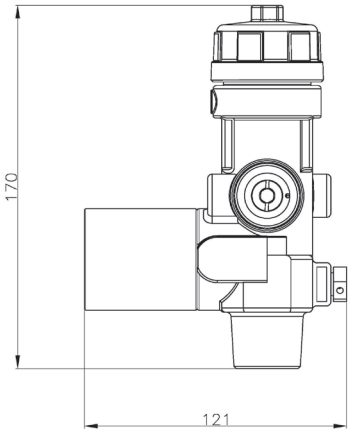

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FIG.3-7
PART NO. 21114040 (WITH STANDARD PRESSURE GAUGE)
PART NO. 21114041 (WITH CONTACTED PRESSURE GAUGE)
200 BAR iFLOW VALVE

Technical Specification

Body Material:	Brass CZ 120
Thread Type:	1 in. NPT
Outlet Connection:	DIN 477
Outlet Safety Cap Material:	Brass
Maximum Working Pressure:	240 bar
Free Flow Cross Sectional Area:	34.8 mm²
Equivalent Length:	N/A
Burst Disc Rating:	270 bar ± 10 bar (20 °C)
Working Temperature Range:	-20 °C to 50 °C
Weight:	2.10 kg
Approvals:	VdS, CNPP
Certification:	EN 12094-4
CE Certification Number:	0786-CPD-30139
Year of CE Marking:	2011
CE Marking Requirements:	Manufacturer, Part Number, Serial No, CE_{0786}
▸ Valve Marking Part Number:	21114014 (Base Valve Without Pressure Gauge)
Method of Marking:	Engraving
Valve Type:	Type 2
Overall Size:	170 mm x 77 mm

Location on System

Connected to the container.

Installation Instructions

The discharge valve is supplied factory fitted to the container. Before connection to pipe work or discharge hose, ensure the container is secured with the appropriate container brackets.

Operating Instructions

The discharge valve is operated via manual, pneumatic or gas metron actuation. The discharge valve will actuate automatically upon actuation and discharge agent through the piping system into the protected area. After discharge, the valve will require refurbishment before refilling.

Maintenance Instructions

Refurbish valve after each discharge or when container is hydrostatically pressure tested. (Refer to iFLOW refill manual, 14A-39, for full details)

DISCHARGE NOZZLES

These discharge nozzles are available in a 180º and 360º patterns and are designed to uniformly distribute agent throughout the hazard area. All nozzles are specifically drilled to suit the individual design requirements.

Where the size of any hazard enclosure determines that one nozzle does not provide coverage within the above parameters the hazard should be theoretically sub divided into appropriately sized modules.

The discharge nozzle consists of a steel discharge head containing an orifice plate. The orifice is specifically drilled according to the flow calculation determined for each hazard area.

- A nozzle/pipe ceiling plate (rosette/cover plate) is available (part numbers 30410320-30410920) (see page 3-1 for sizes)
- 180° or 360° nozzles must be ordered with the corresponding orifice plate and the drill size specified on the order.

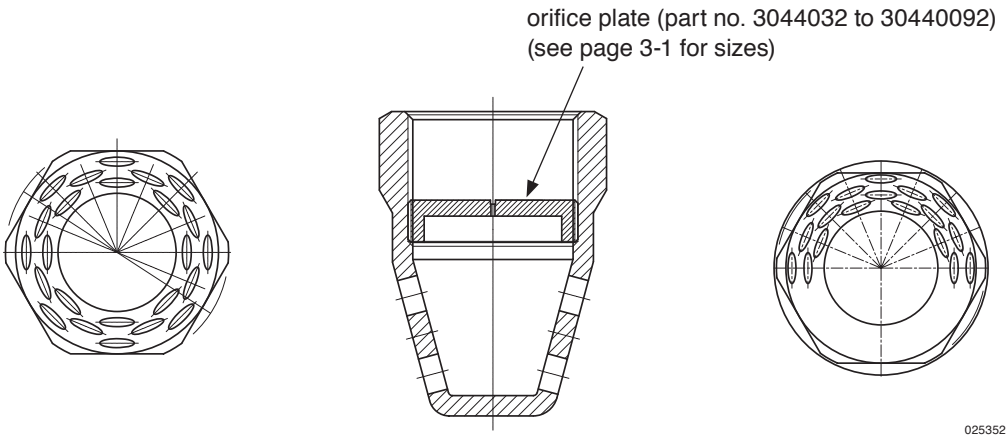


FIG. 3-10 IFLOW DISCHARGE NOZZLES

Technical Specification

Material:	Steel F-2112
Finish	Chrome Plate
Thread Type:	According to ISO 228
Nozzle Thread Sizes:	3/8 in., 1/2 in., 3/4 in., 1 in., 1¼ in., 1½ in. and 2 in.
Nozzle Types:	360° or 180°
Coverage:	7 x 7 m (360°) 7 x 7 m (180°)
Protection Height:	0.5 m - 5 m
Max Distance from Ceiling:	0.3 m
Max Coverage Area Per Nozzle:	49 m^2
Maximum Working Pressure:	142 bar
Orientation:	Pendant / Upright
Approvals:	VdS Approved Nozzle Coefficients
Drilling Increments:	0.1 mm
Minimum Drilling Diameter:	3.0 mm
▸ Maximum Drilling Diameter:	10.0 mm (3/8 in.) 12.9 mm (1/2 in.) 17.4 mm (3/4 in.) 21.8 mm (1 in.) 28.8 mm (1¼ in.) 33.5 mm (1½ in.) 42.5 mm (2 in.)

Location on System
At end of discharge pipework.

Installation Instructions
Before connection, ensure the pipework supports have been fitted at the correct intervals and are adequate for purpose. For connection to pipe work, apply suitable pipe sealant to the inlet and tighten securely.
Ensure that the nozzle is fitted in accordance with the design requirements and are aimed in the correct alignment away from obstructions or barriers that could prevent adequate distribution/mixing of the agent.

Operating Instructions
The discharge nozzles are designed to work within the pre-determined system operating conditions.

Maintenance Instructions
The nozzles should be inspected for dust and debris every six months, and cleaned out where necessary. If any doubt exists concerning the integrity of the pipework, arrange for it to be purged. Remove the nozzle(s) and the nozzle filter mesh to check that they are free of debris following the purge.
In case of faults or suspected faults contact customer services to organize replacement.

360° DISCHARGE NOZZLES

(Part Nos. as shown below)

The 360º discharge nozzle is either an 18 port or 24 port nozzle, depending upon its size.

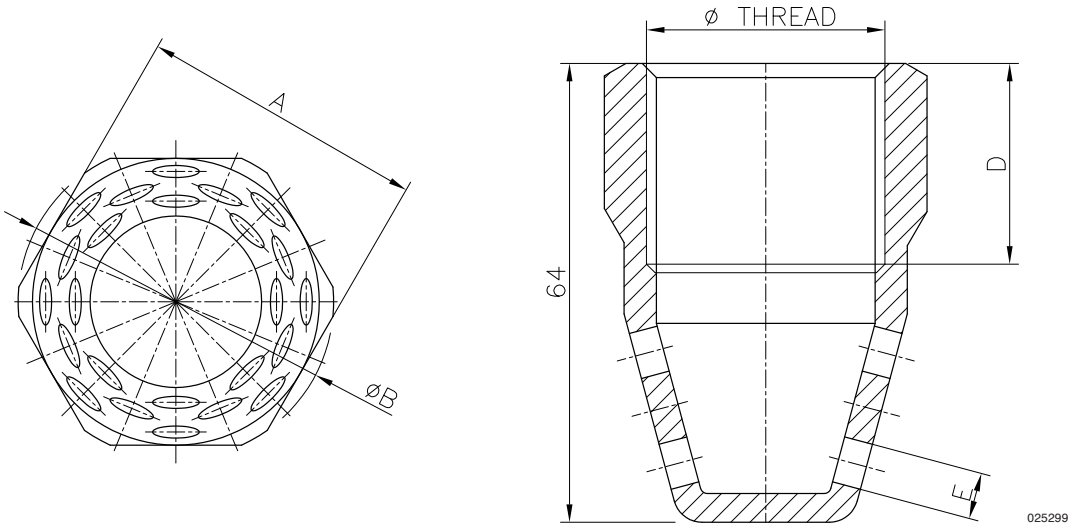


FIG. 3-9 IFLOW 360º DISCHARGE NOZZLE DETAILS

Dia Thread (BSPP)	Part Number	Dimension A (mm)	Diameter B (mm)	Dimension C (mm)	Dimension D (mm)	Number of Ports	Drill Diameter E (mm)
3/8 in.	30400000	23	25	40	20	18	3
1/2 in.	30400001	30	33	50	22	18	4
3/4 in.	30400002	35	38	55	23	24	5
1 in.	30400003	40	44	64	28	24	6.5
1-1/4 in.	30400004	50	55	75	32	24	9
1-1/2 in.	30400005	60	66	90	35	24	10
2 in.	30400006	80	88	105	38	24	13

TABLE 3-3 360º NOZZLE DETAILS

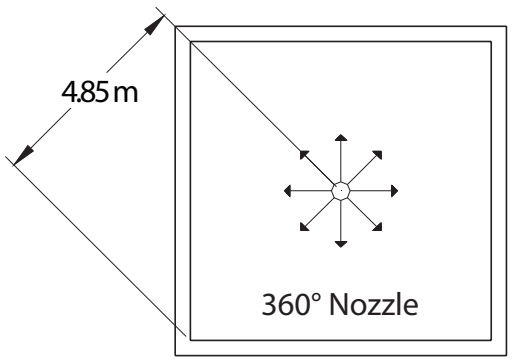


FIG. 3-10 IFLOW 360º DISCHARGE NOZZLE COVERAGE

180° DISCHARGE NOZZLES

(Part Nos. as shown below)

The 180º discharge nozzle is an 18 port nozzle.

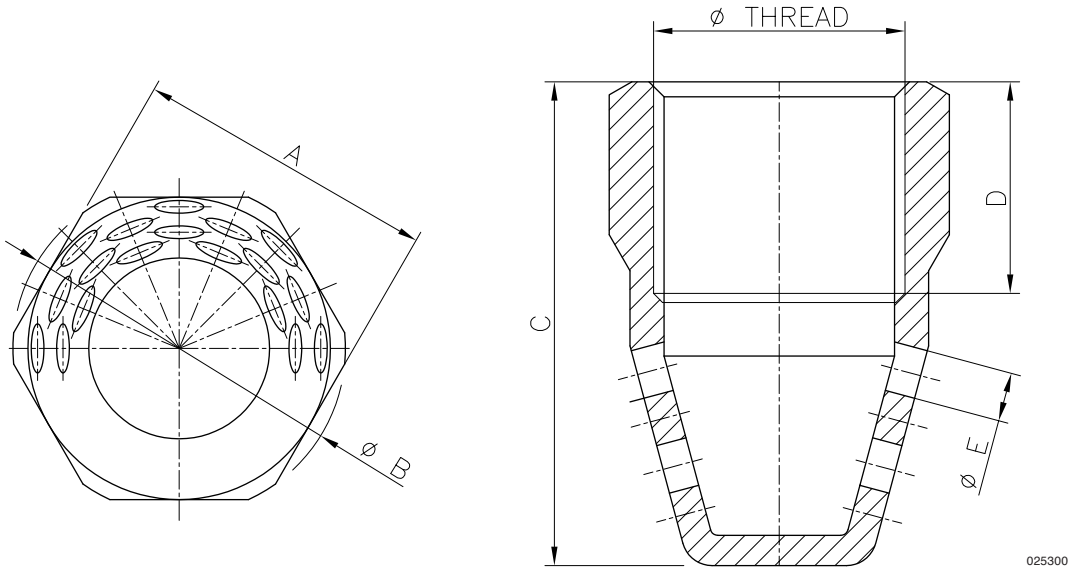


FIG. 3-11 IFLOW 180º DISCHARGE NOZZLE DETAILS

Dia Thread (BSPP)	Part Number	Dimension A (mm)	Diameter B (mm)	Dimension C (mm)	Dimension D (mm)	Drill Diameter E (mm)
3/8 in.	30400007	23	25	40	20	3
1/2 in.	30400008	30	33	50	22	4
3/4 in.	30400009	35	38	55	23	5
1 in.	30400010	40	44	64	28	6.5
1-1/4 in.	30400011	50	55	75	32	9
1-1/2 in.	30400012	60	66	90	35	10
2 in.	30400013	80	88	105	38	13

TABLE 3-4 180º NOZZLE DETAILS

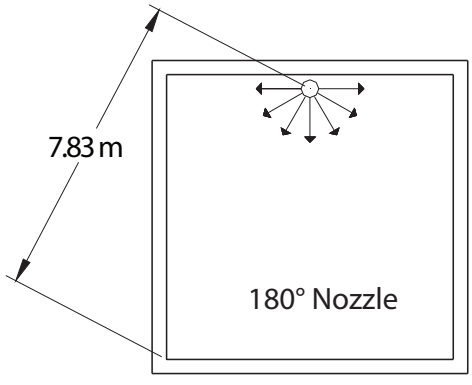


FIG. 3-12 IFLOW 180º DISCHARGE NOZZLE COVERAGE

▸ ACOUSTIC NOZZLE

(Part No. 445710 and 445715 or 27511)

Data Centres and server rooms are continuously improving their efficiencies to store and process more data. Improvements in computing hardware have led to an increase in Hard Disk Drive (HDD) sensitivity to sound. Inert gas fire suppression systems, normally used to protect this type of equipment, can produce sound levels that may have adverse effects on noise sensitive equipment. The Acoustic Nozzle, designed for inert gas fire suppression systems, decreases the acoustic footprint during a discharge.

The Acoustic Nozzle directs agent into the hazard area and reduces the sound level compared with standard nozzles. Flow calculations are used to specify the nozzle orifice size for the correct quantity and distribution of agent.

The required orifice size must be specified when ordering the nozzle.

Two orifice pipe assemblies are available depending upon the thread connection required, NPT (Part No. 445715) or BSPT (Part No. 27511), and the required type must be specified when ordering the nozzle.

Technical Specification

Body:	Aluminium
Damping Materials:	Fibreglass and Wire Wool
Orifice Pipe:	Steel
Orifice Plate:	Brass
Nozzle Type:	360°
Connection Thread:	1 1/2 in. NPT Female (Acoustic Nozzle - Part No. 445710) 1 1/2 in. NPT Male (Orifice Pipe, NPT - Part No. 445715) 1 1/2 in. BSPT Male (Orifice Pipe, BSPT - Part No. 27511)
Max. Coverage Area Per Nozzle:	9.8m x 9.8m
Max. Protection Height:	6.1 m
Max Distance from Ceiling:	0.305 m
Orientation:	Pendant / Upright
Drilling Increments:	0.1 mm
Weight:	2.3kg (Part No. 445710) 1.1 kg (Part No. 445715 and 27511)

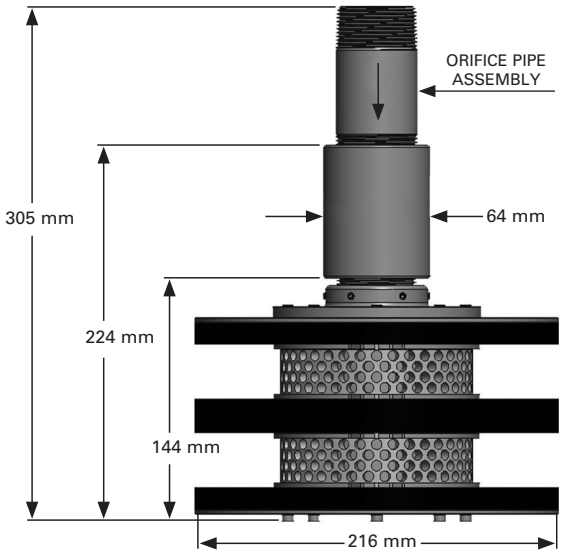


FIG. 3-13 ACOUSTIC NOZZLE ASSEMBLY
PART NO. 445710 (ACOUSTIC NOZZLE)
PART NO. 445715 (ORIFICE PIPE ASSEMBLY, NPT)
PART NO. 27511 (ORIFICE PIPE ASSEMBLY, BSPT)

⚠ CAUTION

Temporary irritation (itching) or redness may occur from handling the fibreglass material. Leather or cotton gloves should be worn to protect against irritation while handling the product.

▸ ACOUSTIC NOZZLE (CONTINUED)

Sound Performance

Sound power is the amount of sound energy produced by a noise source like a fire suppression system discharge nozzle. The Acoustic Nozzle is designed to reduce the sound power level produced during a discharge of the iFLOW Suppression System.

Sound pressure is the sound that is received at a location remote from the noise source. The remote location may include HDDs. It is sound pressure that is the critical sound energy relevant to the effects on the HDDs. The HYGOOD Acoustic Nozzle is one of the factors that assists in reducing the sound pressure to an acceptable level and therefore reduces the risk of HDD damage. The sound pressure level can be further improved by a number of other factors including the positioning of the nozzles, optimizing the room acoustics, use of sound absorbing room construction materials, and installation of sound absorption panels.

A summary of the estimated nozzle peak acoustic **sound power** across 500 Hz to 10k Hz frequencies at different flow rates is shown in Figure 3-14. These values are based on actual testing performed by Tyco.

Tyco strongly recommends that data centre operators review the room acoustics. Contact Tyco Fire Protection Products (TFPP) to help you understand the impact of these measures and estimate the sound pressure level experienced at a given location.

Location on System
At end of discharge pipework.

Installation Instructions
Before connection, ensure the pipework supports have been fitted at the correct intervals and are adequate for purpose.

The Acoustic Nozzle is provided with an attached 1 1/2 in. NPT (DN40) pipe coupling. This coupling shall be connected to the outlet side of the required orifice pipe assembly. The inlet side of the orifice pipe assembly is connected to pipework.

When the section of the pipe network to be connected to the nozzle has a diameter less than 1 1/2 in. a reducer should be used to adapt the pipe to the inlet of the 1 1/2 in. orifice pipe assembly (on the orifice plate/inlet side). Similarly, a reducer needs to be used if the pipe size is larger than 1 1/2 in. Figure 3-15 illustrates an instance where this would be necessary.

The nozzle shall be located so the nozzle side of the coupling is within 305mm (12 in.) of the ceiling or if installed in a sub floor within 305mm (12 in.) of the underside of the floor tile and shall be located centrally in the hazard area (or theoretical volume) it is protecting.

Operating Instructions
The discharge nozzles are designed to work within the pre-determined system operating conditions.

Maintenance Instructions
The nozzles should be inspected for dust and debris every six months, and cleaned out where necessary. If any doubt exists concerning the integrity of the pipework, arrange for it to be purged. Remove the nozzle(s) to check that they are free of debris following the purge.
In case of faults or suspected faults contact customer services to organize replacement.

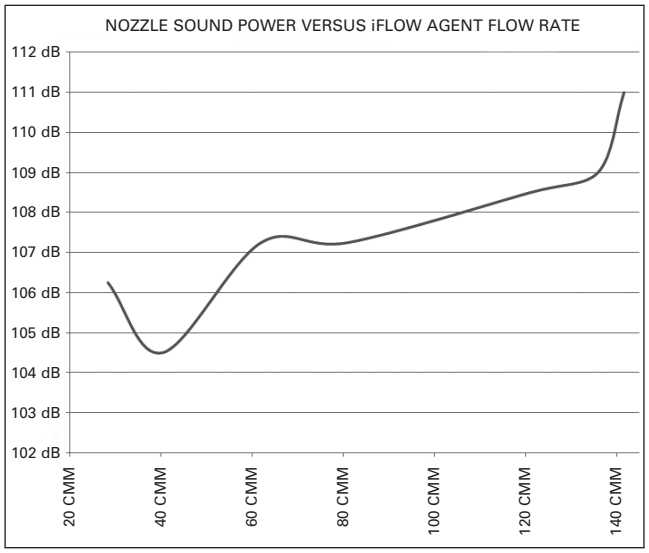


FIG. 3-14 SOUND POWER IN dB VERSUS FLOW RATE IN CUBIC METRES PER MINUTE (CMM)

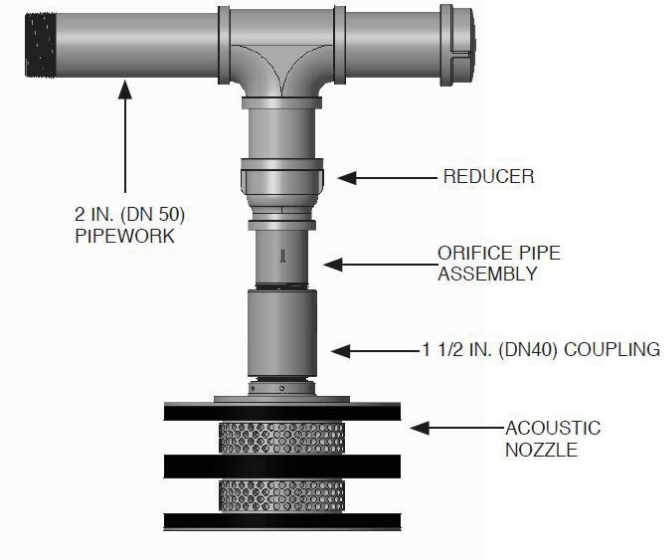


FIG. 3-15 ACOUSTIC NOZZLE PIPEWORK WITH REDUCER EXAMPLE

PNEUMATIC ACTUATOR

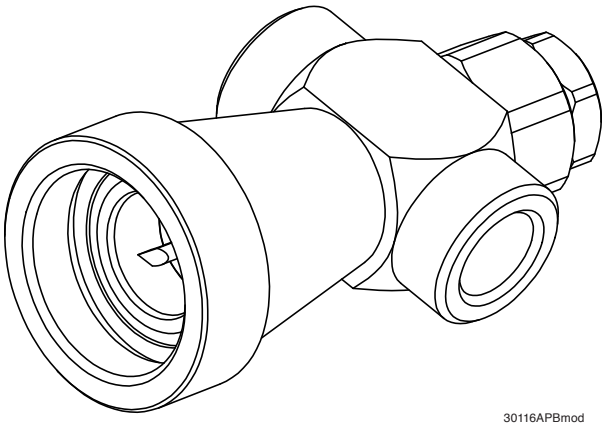
▸ (Part No. 30118APB)

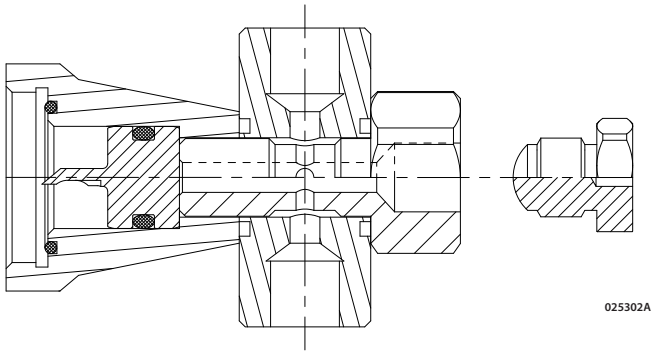
The pneumatic actuator can be installed on to the iFLOW valve. It comprises of an internal piston complete with firing pin. Following actuation by pressure the firing pin moves forward and ruptures a burst disc in the iFLOW valve causing it to operate. It can be fitted with up to three actuating hoses. It is supplied with a ¼ in. blind cap which can be fitted to the unit to blank off one of the inlets (if required by the container bank configuration).

The actuator requires a minimum pressure of 60 bar to cause operation.

⚠ WARNING

Failure to reset the actuator prior to fitting onto the container valve will result in the immediate operation of the container valve and the potentially hazardous discharge of the container.





▸ **FIG. 3-16 PART NO. 30118APB PNEUMATIC ACTUATOR**

Technical Specification

Body:	Brass
Actuator Pin:	Stainless Steel
Pipe Connection:	M30 x 1.5 Female
Inlet Connections:	1/4 in. BSPP
Maximum Working Pressure:	370 bar
Minimum Trigger Pressure:	60 bar
Nominal Trigger Pressure:	100 bar (with pilot container) 300 bar (without pilot container)
Maximum Trigger Pressure:	370 bar
Weight:	0.37 kg
Working Temperature Range:	-20 °C to 50 °C
Testing of Actuator:	Possible
Approvals:	LPCB, VdS
Certification:	EN 12094-4
CE Certification Number:	0786-CPD-30139
Year of CE Marking:	2011
CE Marking Requirements:	Manufacturer, Part Number, Serial No, Working Pressure, CE_{0786}
Method of Marking:	Engraving
Overall Size:	64 mm x 50 mm

Location on System

Connected to the port on the container discharge valve.

Installation Instructions

Refer to page 4-12.

▸ Note the 35mm-60mm ‘C’ Spanner is required (Part No. 35017401)

Operating Instructions

The pneumatic actuator is operated by pressure via a hose connection from either the master container or pilot container. Once operated the pneumatic actuator will require manual resetting before re-fitting to the iFLOW container valve.

Maintenance Instructions

Refer to Section 6.

MANUAL ACTUATOR

(Part No. 30180APB)

The manual actuator is used to mechanically operate the system at the container position.

Accidental manual release is prevented by means of a steel safety pin. The steel safety pin must be removed to allow the use of the local manual actuator. After removing the steel safety pin, manual operation is caused by pulling the lever in the direction indicated by the arrow embossed on the units body.

The unit is designed so that it may be fitted directly onto the pilot container to enable pneumatic actuation of the iFLOW container valve.

⚠ WARNING

Failure to reset the actuator prior to fitting onto the container valve will result in the immediate operation of the pilot container and the potentially hazardous discharge of the container.

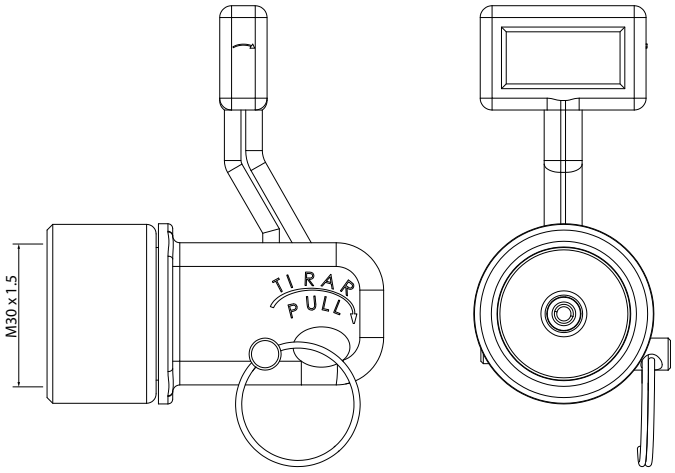


FIG. 3-17 PART NO. 30180APB MANUAL ACTUATOR

Technical Specification

Body:	Brass
Safety Pin:	Steel
Lever:	Brass
Swivel Nut:	Brass
Nominal Stroke:	6 mm
Min / Nom / Max Trigger Pressure:	N/A
Weight:	0.49 kg
Working Temperature Range:	-20 °C to 50 °C
Testing of Actuator:	Possible
Approvals:	LPCB, VdS
Certification:	EN 12094-4
CE Certification Number:	0786-CPD-30062
Year of CE Marking:	2012
CE Marking Requirements:	Manufacturer, Part Number, Serial No, CE_{0786}
Method of Marking:	Engraving
Overall Size:	82 mm x 72 mm

Location on System

Connected to the side of the container discharge valve or on side of the pilot container.

Installation Instructions

Install the local manual actuator directly to the discharge valve or pilot container hand tight only. Ensure the unit is reset in the non fire position before fitting.

Operating Instructions

Remove safety pin and apply pressure to the handle. The local manual actuator operating pin will stay in the fire position and will require manual resetting before re-fitting to the discharge valve.

Maintenance Instructions

Remove local manual actuator assembly from discharge valve. Remove safety pin and pull the lever. Verify correct function of actuator (strike knob latches, free movement of the pin and nominal fire position). Reset actuation pin and refit safety pin. Reinstall onto discharge valve. In case of faults or suspected faults contact customer services to organize replacement.

PNEUMATIC-MANUAL ACTUATOR

(Part No. 3018NAPB)

The pneumatic-manual actuator allows manual and pneumatic actuation of the iFLOW container.

It can be fitted with a gas metron to activate the master container and up to seven slave containers. If operated pneumatically apply 100 bar Nitrogen pressure to the pneumatic inlet port.

Accidental manual release is prevented by means of a steel safety pin. The steel safety pin must be removed to allow the use of the local manual actuator. After removing the steel safety pin, manual operation is caused by pulling the lever in the direction indicated by the arrow embossed on the units body.

The unit has a pneumatic outlet port with an integrated non-return system to allow pneumatic actuation of other containers if required.

- The pneumatic-manual actuator is supplied with an 1/8 in. BSPT male x 1/4 in. BSP female adaptor (part no. 30800001) to allow connection of the actuation hose, when connecting the gas metron (part no. 30110004) an 1/8 in. bonded seal (part no. 31199814) must be used.

⚠ WARNING

Failure to reset the actuator prior to fitting onto the container valve will result in the immediate operation of the container valve and the potentially hazardous discharge of the container.

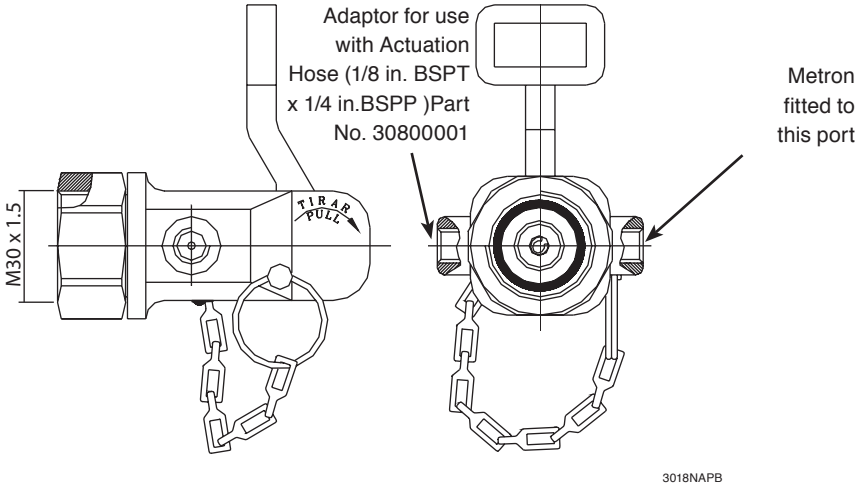


FIG. 3-18 PART NO. 3018NAPB PNEUMATIC-MANUAL ACTUATOR

Technical Specification

Body:	Brass
Safety Pin:	Steel
Lever:	Brass
Swivel Nut:	Brass
Nominal Stroke:	6 mm
Min / Nom / Max Trigger Pressure:	N/A
Weight:	0.49 kg
Working Temperature Range:	-20 °C to 50 °C
Testing of Actuator:	Possible
Approvals:	LPCB, VdS
Certification:	EN 12094-4
CE Certification Number:	0786-CPD-30062
Year of CE Marking:	2012
CE Marking Requirements:	Manufacturer, Part Number, Serial No, CE_{0786}
Method of Marking:	Engraving
Overall Size:	82 mm x 72 mm

Location on System
Connected to the side of the container discharge valve or on side of the pilot container.

Installation Instructions
Install the local manual actuator directly to the discharge valve or pilot container hand tight only. Ensure the unit is reset in the non fire position before fitting.

Operating Instructions
Remove safety pin and apply pressure to the handle. The local manual actuator will latch in the fire position and will require manual resetting before re-fitting to the discharge valve or top mounted electrical actuator.

Maintenance Instructions
Remove local manual actuator assembly from discharge valve. Remove safety pin and pull the lever. Verify correct function of actuator (free movement of the pin and nominal fire position). Reset actuation pin and refit safety pin. Reinstall onto discharge valve. In case of faults or suspected faults contact customer services to organize replacement.

DISCHARGE PRESSURE SWITCH

(Part No. 30330010)

The pressure switch is mounted in the distribution pipework and may be used to provide an electrical indication of the release of agent or to perform ventilation shut-downs or other interlock functions.

The pressure switch is required to be manually reset following operation.

A minimum pressure of 10 bar is required to ensure satisfactory operation

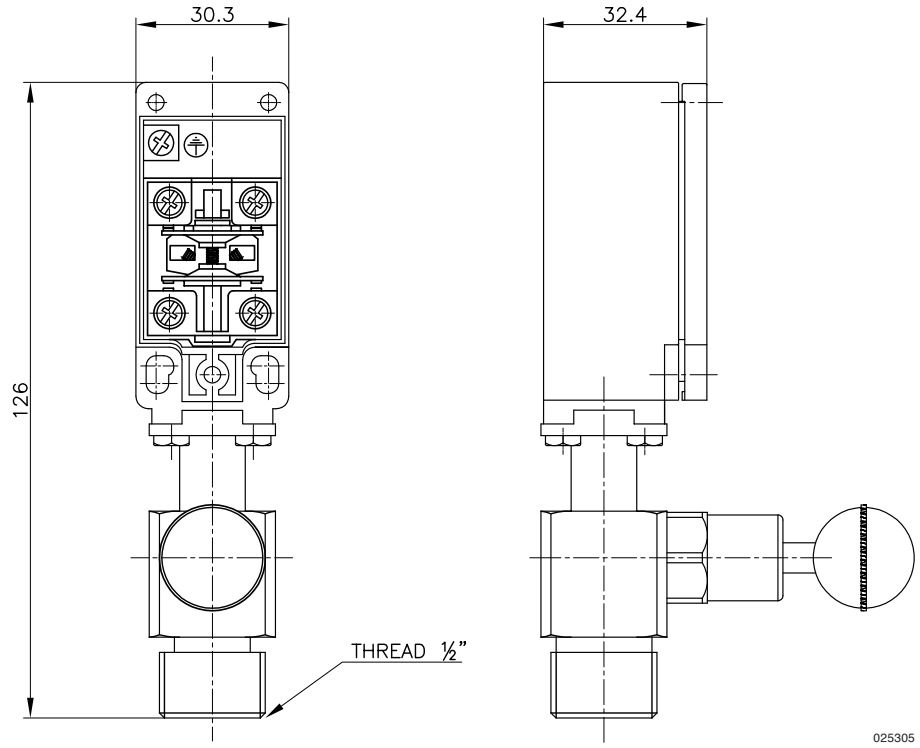


FIG. 3-19 PART NO. 30330010 PRESSURE SWITCH

Technical Specification

Locking System:	Brass
Electrical Box System:	Duraluminium
Connection:	1/2 in. BSPT
Set Point:	10 bar Rising at 20 °C (with Manual Reset)
Working Temperature Range:	-25 °C to 80 °C
▸	-20 °C to 50 °C (EN 12094-10)
Maximum Working Pressure:	370 bar
Weight:	0.41 kg
Maximum Current:	6 A
Maximum Voltage:	250 v dc
▸	500 v ac
Ingress Protection Class:	IP65
Conforms to:	UL-580
▸ Approvals:	LPCB, VdS
Marking:	Manufacturer, Part Number, Serial No, Working Pressure
Method of Marking	Engraving
Overall Size:	126 mm x 30.3 mm x 32.4 mm

Location on System
Connected to either the manifold or the discharge pipework.

Installation Instructions

Mechanical Installation:
Refer to page 4-8 of the manual.

Electrical Installation:
The switch has normally open and normally closed contacts.

Operating Instructions
The discharge pressure switch is designed to work within the pre-determined system operating conditions. The switch requires to be manually reset following operation.

Maintenance Instructions
To reset after activation pull and release the knob on the side of the unit

PRESSURE GAUGE ASSEMBLY (300 BAR SYSTEM)

(Part Nos. 42116056 and 42116057)

There are two types of container pressure gauge, a standard ▸ version, Part No. 42116056 consists of a 0 - 450 bar pressure gauge, and Part No. 42116057 consists of a 0 - 400 bar pressure gauge complete with a contact switch set to signal if the container pressure drops to 270 bar. Both of these pressure gauges can be provided factory fitted to the iFLOW container or ordered separately to be fitted on site if necessary.

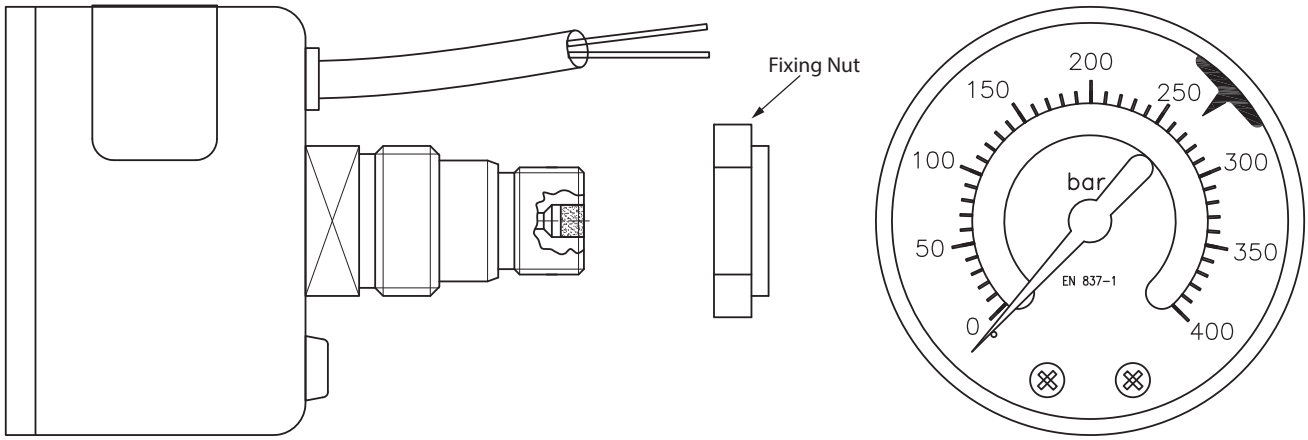


FIG. 3-20 PART NO. 42116057 PRESSURE GAUGE ASSEMBLY (0 - 400 BAR) CONTACTED TYPE SHOWN
▸ PART NO. 42116056 PRESSURE GAUGE ASSEMBLY (0 - 450 BAR) NON CONTACTED

Technical Specification

Type:	Bourdon Tube Pressure Gauge
Entry:	Back Axial
Nominal Size:	Dia 40 mm x Dia 40 mm
Pressure Range:	0 to 400 bar
Connection:	M10 x 1 DIN13
Ingress Protection Class:	IP43 IP54 for Contacted Type
Class Accuracy:	1.6
Language:	English
Working Temperature Range:	-20 °C to 50 °C
Weight:	0.66 kg (Part No. 42116056) 0.10 kg (Part No. 42116057)
Approvals:	VdS
Certification:	EN 12094-10 and EN 837-1
CE Certification Number:	0786-CPD-30071 (Part No. 42116056) 0786-CPD-30089 (Part No. 42116057)
Year of CE Marking:	2008 (Part No. 42116056) 2009 (Part No. 42116057)
CE Marking Requirements:	bar, CL1.6, EN837-1, CE0786
Method of Marking:	Part of gauge artwork
Gauge Part Number	30116043 and 30245003 (contacted)
Fixing Nut	30210808
Protector Part Number	61110006 (required when gauge is not factory fitted)

Location on System
The pressure gauge is fitted to every container discharge valve.

Installation Instructions
The valve is supplied pre-assembled with the pressure gauge installed, or as separate site-fitted option.

Refer to page 4-15 of the manual.

Operating Instructions
The pressure gauge is designed to work within the pre-determined system operating conditions.

Maintenance Instructions
In case of faults or suspected faults contact customer services to organize replacement.
If pressure drops to 270 bar when adjusted for temperature, refill or replace container.
Pressure gauges should be checked weekly by end users.
Pressure gauges are field replaceable.

PRESSURE GAUGE ASSEMBLY (200 BAR SYSTEM)

(Part Nos. 42116054 and 42116055)

There are two types of container pressure gauge, a standard version, Part No. 42116054 consists of a 0 - 315 bar pressure gauge, and Part No. 42116055 consists of a 0 - 315 bar pressure gauge complete with a contact switch set to signal if the container pressure drops to 180 bar. Both of these pressure gauges can be provided factory fitted to the iFLOW container or ordered separately to be fitted on site if necessary.

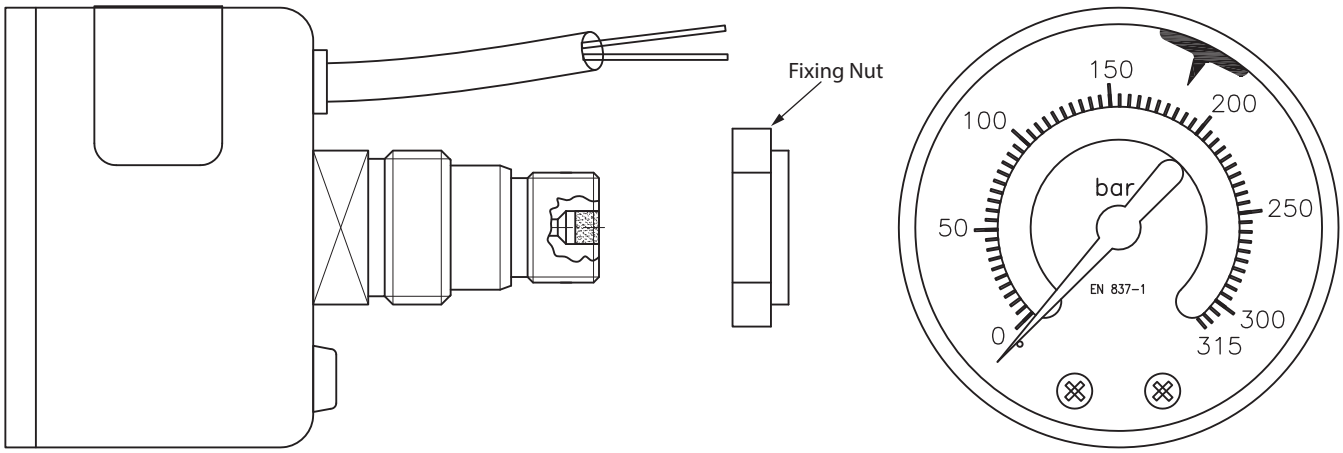


FIG. 3-21 PART NO. 42116055 PRESSURE GAUGE ASSEMBLY (0 - 315 BAR) CONTACTED TYPE SHOWN
PART NO. 42116054 PRESSURE GAUGE ASSEMBLY (0 - 315 BAR) NON CONTACTED

Technical Specification

Type:	Bourdon Tube Pressure Gauge
Entry:	Back Axial
Nominal Size:	Dia 40 mm x Dia 40 mm
Pressure Range:	0 to 315 bar
Connection:	M10 x 1 DIN13
Ingress Protection Class:	IP43 IP54 for Contacted Type
Class Accuracy:	1.6
Language:	English
Working Temperature Range:	-20 °C to 50 °C
Weight:	0.66 kg (Part No. 42116054) 0.10 kg (Part No. 42116055)
Approvals:	VdS
Certification:	EN 12094-10 and EN 837-1
▸ CE Certification Number:	0786-CPD-30071 (Part No. 42116054) 0786-CPD-30089 (Part No. 42116055)
▸ Year of CE Marking:	2008 (Part No. 42116054) 2009 (Part No. 42116055)
CE Marking Requirements:	bar, CL1.6, EN837-1, CE_{0786}
Method of Marking:	Part of gauge artwork
Gauge Part Number	3021316B and 30116035 (contacted)
Fixing Nut Number	30210808
Protector Part Number	61110006 (required when gauge is not factory fitted)

Location on System
The pressure gauge is fitted to every container discharge valve.

Installation Instructions
The valve is supplied pre-assembled with the pressure gauge installed, or as separate site-fitted option.

Refer to page 4-15 of the manual.

Operating Instructions
The pressure gauge is designed to work within the pre-determined system operating conditions.

Maintenance Instructions
In case of faults or suspected faults contact customer services to organize replacement.
If pressure drops to 180 bar when adjusted for temperature, refill or replace container.
Pressure gauges should be checked weekly by end users.
Pressure gauges are field replaceable.

▸ PILOT CONTAINER - STANDARD

(Part No. see Table 3-5)

There are three sizes of pilot container 3 litre, 13 litre and 50 litre. Each size of pilot container is charged with Nitrogen to 100 bar.

These pilot containers are used to pneumatically operate an iFLOW system. They can also operate Selector valves if fitted to the system.

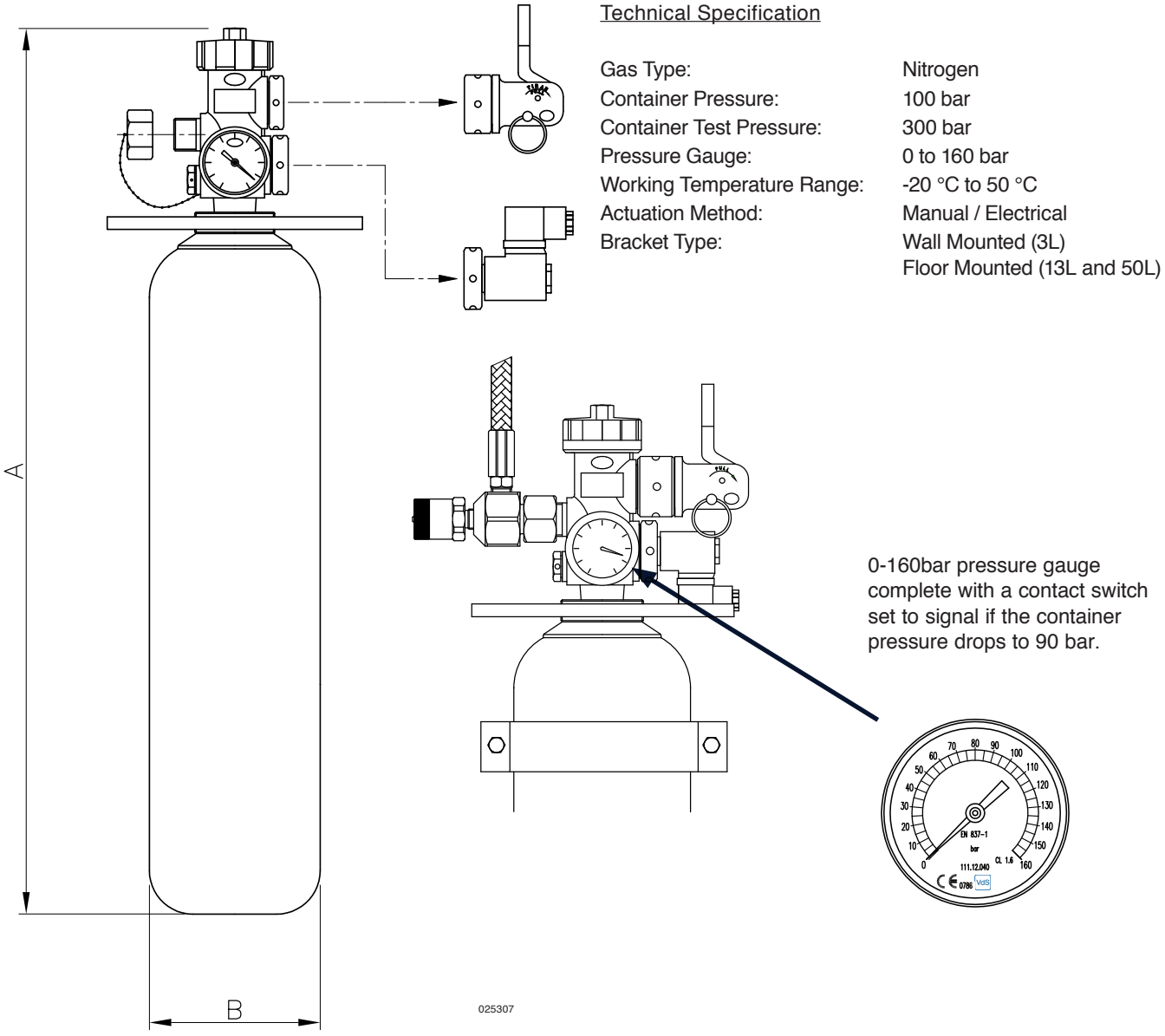
The maximum number of iFLOW containers that can be operated by these pilot containers are shown in table 3-5.

The solenoid valve is factory-fitted and must not be removed on site for testing purposes.

The pilot container is supplied with a solenoid, manual actuator, contacted pressure gauge, mounting bracket, outlet adaptor, 700mm actuation hose, ¼ BSPT Male to 6mm compression adaptor and a bleed valve.

Part Number	Container Size	Height Dim.A (mm)	Diameter Dim. B (mm)	Max. No. Containers Operated
70100075	3 litre	635	100	40
70100082	13 litre	1210	140	75
70121011	50 litre	1620	229	100
70100084*	3 litre	635	100	40
70100083**	13 litre	1210	140	75
70121012**	50 litre	1620	229	100

Table 3-5 Pilot Container Details
*Australian Approved Market Only
**PESO (India) Approved Market Only



Technical Specification

Gas Type:	Nitrogen
Container Pressure:	100 bar
Container Test Pressure:	300 bar
Pressure Gauge:	0 to 160 bar
Working Temperature Range:	-20 °C to 50 °C
Actuation Method:	Manual / Electrical
Bracket Type:	Wall Mounted (3L) Floor Mounted (13L and 50L)

FIG. 3-22 iFLOW PILOT CONTAINER DETAILS

PILOT CONTAINER - STANDARD (CONTINUED)

The solenoid is supplied factory-fitted to the pilot container, and is described below.

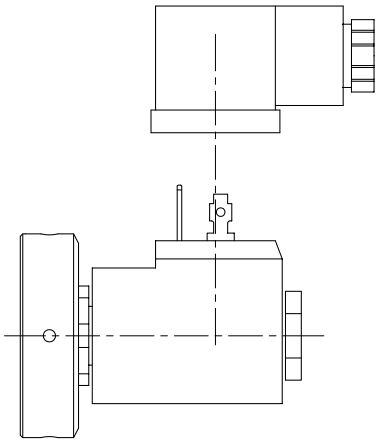


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FIG. 3-23 PILOT CONTAINER SOLENOID VALVE

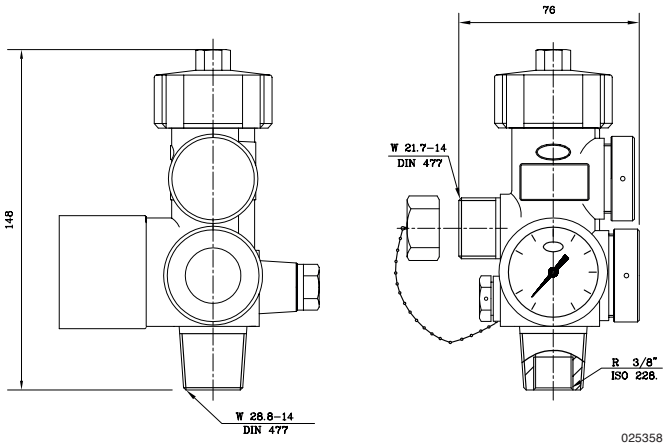

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FIG. 3-24 PILOT CONTAINER VALVE

Technical Specification

Actuation Type:	Solenoid (normally closed)
Reset Method:	Manually
Connection:	N/A (Factory Fitted)
Voltage:	24 V dc (20.4 - 27.6)
Maximum Working Pressure:	166 bar
Consumption:	13 W (low temperature) 11 W (nominal) 10 W (high temperature)
Min Duration of Trigger Signal:	Continuous Duty
Electrical Connection:	3 pin PG9 (DIN 40430) conduit thread DIN plug connector
Protection	IP 65
Working Temperature Range:	-20 °C to 50 °C
Weight:	0.25 kg
Approvals:	LPCB, VdS
Certification:	EN 12094-4
CE Marking Requirements:	Manufacturer, Part Number, Serial No, Voltage, Current, CE_{0786}
▸ Solenid Marking Part Number:	3023024B
Method of Marking:	Laser

Technical Specification

Max Working Pressure:	166 bar
Min Working Pressure:	6 bar
Working Temperature:	-20 °C to 50 °C
Safety Bursting Disc:	270 bar ± 10 bar
Weight:	1.95 Kg
Body:	Brass
Piston:	Brass
Approvals:	LPCB, VdS
Certification:	EN 12094-4
CE Marking Requirements:	Manufacturer, Part Number, Serial No, Voltage, Current, CE_{0786}
▸ Valve Marking Part Number:	2901280B
Method of Marking:	Stamp

Location on System

Factory fitted to the Pilot Container

Installation Instructions

Mechanical Installation:

Refer to page 4-6 of the manual.

Maintenance Instructions

Do not remove Solenoid from Pilot Container during maintenance, this unit is factory fitted.
The coil can be removed for testing purposes.

⚠ WARNING

Should the solenoid valve malfunction in any way return the complete pilot container to TYCO.

DO NOT ATTEMPT TO REMOVE THE SOLENOID VALVE ON SITE !

GAS METRON

(Part No. 30110604)

A gas metron can be fitted to the iFLOW master container and can operate systems up to 8 containers. It is fitted to the pneumatic -manual actuator (Part No. 3018APB).

- When connecting the gas metron to the pneumatic-manual actuator a 1/8 in. bonded seal (Part No. 31199814) must be used.

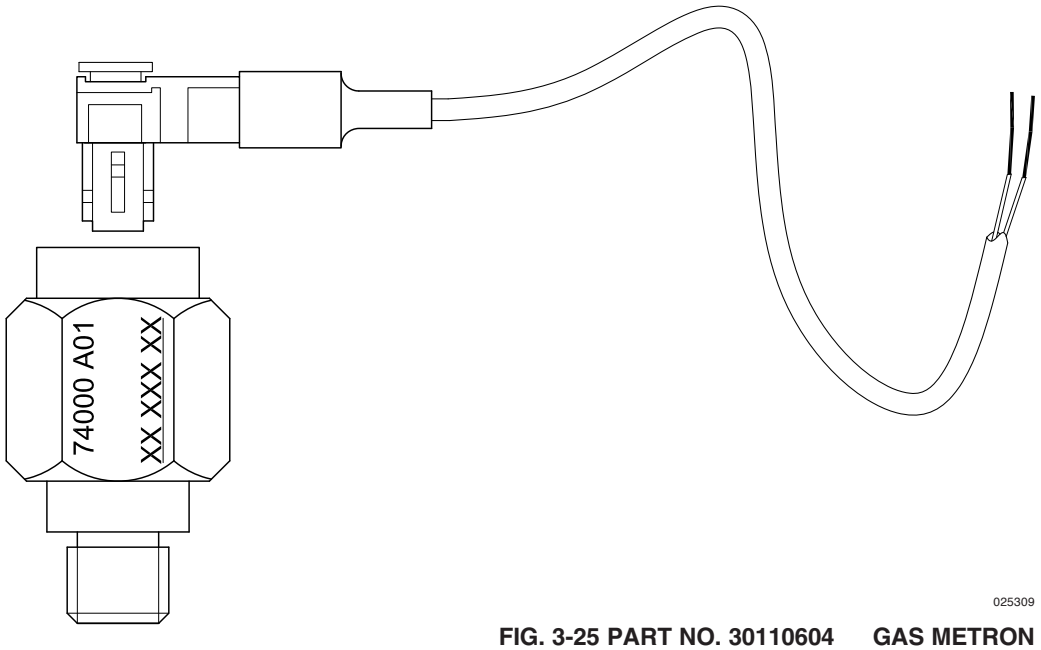

FIG. 3-25 PART NO. 30110604 GAS METRON

Technical Specification

Body:	Brass
Actuation Type:	Latching
Reset Method:	Manually
Connection:	G 1/8 in.
Triggering Voltage:	> 3 V dc
Minimum Firing Voltage:	65% of Nominal
Nominal Minimum Current:	1.0 A
Nominal Maximum Current:	1.2 A
Maximum monitoring current	160 mA
Resistance:	1.7 - 2.5 Ω
Working Time:	< 2 ms
Output Pressure:	35 bar - 70 bar (In 10cc Free Volume)
Working Temperature Range:	-20 °C to 50 °C
Weight:	0.2 kg
Life Span:	Nominal 15 years from manufacture
Approvals:	VdS
▸ Certification:	EN 12094-4, EN 60529 (IP67)
▸ Marking:	Manufacturer, Product reference, Batch Number, Expiration date
Method of Marking:	Engraving
Overall Size:	45 mm x 22 mm x 25.4 mm

- Note: CE marked only when assembled with the pheumatic-manual actuator (Part No. 3018APB)

Location on System
Fitted to the pneumatic-manual actuator on the Master container.

Installation Instructions
Mechanical Installation:
Fitted to the manual-pneumatic actuator

Operating Instructions
N/A

Maintenance Instructions

- The replacement date is marked on the hex. of the gas metron, this is nominally 15 years from the date of manufacture.

iFLOW CHECK VALVE

(Part No. 21114011)

The iFLOW check valve is supplied with a 3/4 in. male coupling and dowty seal. It is interconnected with two hoses (Part No. 91116026 and 91116030). The male end of this hose is sealed by a bonded seal and the female end of the hose connects to the 3/4 in. male coupling supplied with the iFLOW check valve. The inlet to the iFLOW check valve is fitted with a female swivel nut which fits directly on to the outlet of the iFLOW container valve. When necessary a blind cap (Part No. 30390160) is used to blank off any unused ports, see figure 3-27. This blind cap is sealed with a dowty seal (Part No. 95108010).

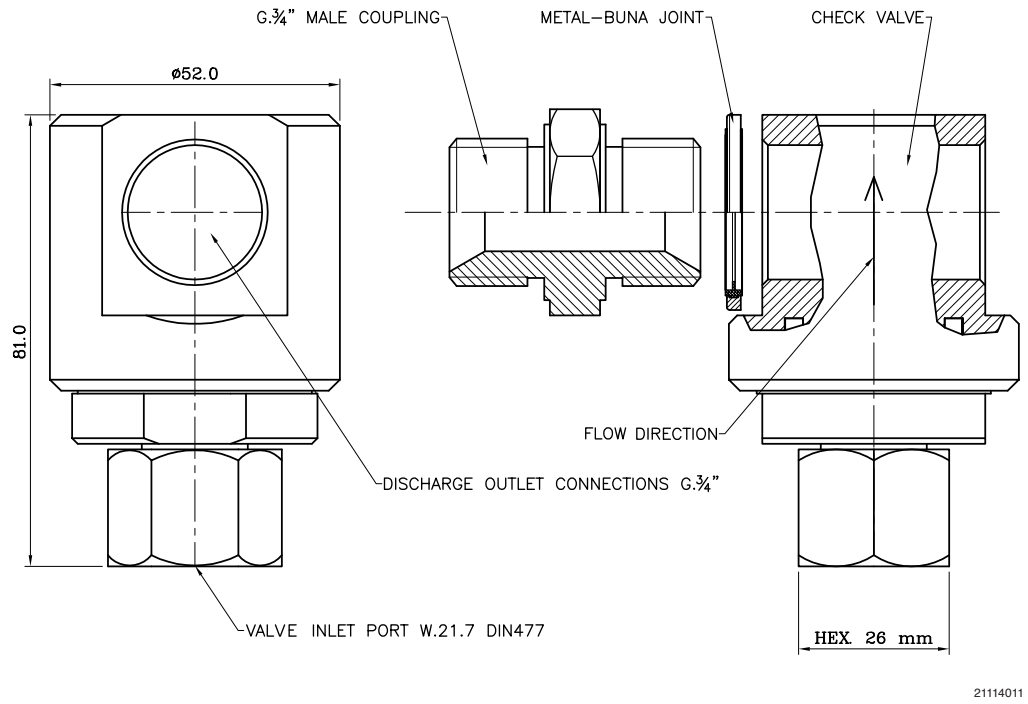

FIG. 3-26 PART NO. 21114011 iFLOW CHECK VALVE

iFLOW CHECK VALVE (CONTINUED)

Technical Specification

Body:	Brass
Cap:	Brass
Piston:	Brass
Nut:	Brass
Spring:	Stainless Steel
Inlet Connection Thread:	W.21.7 DIN477
Outlet Connection Thread:	3/4 in. ISO228
Typical Working Pressure:	60 bar at 20 °C
Maximum Working Pressure:	140 bar
Test Pressure:	140 bar
Cross Sectional Area:	113 mm²
Weight:	0.70 kg
► Maximum Torque:	50 Nm
Approvals:	VdS
Certification:	EN 12094-13
CE Certification Number:	0786-CPD-30138
Year of CE Marking:	2011
CE Marking Requirements:	Manufacturer, Part Number, 3/4", Working Pressure, Direction of Flow, Serial No, CE_{0786}
Method of Marking:	Engraving
Overall Size:	81 mm x Dia 52 mm

Location on System
Connected between the container valve and the discharge hose(s).

Installation Instructions
Refer to page 4-4 of the manual.

Operating Instructions
The manifold check valve will automatically open on system discharge and close at end of discharge and therefore requires no operating instructions.

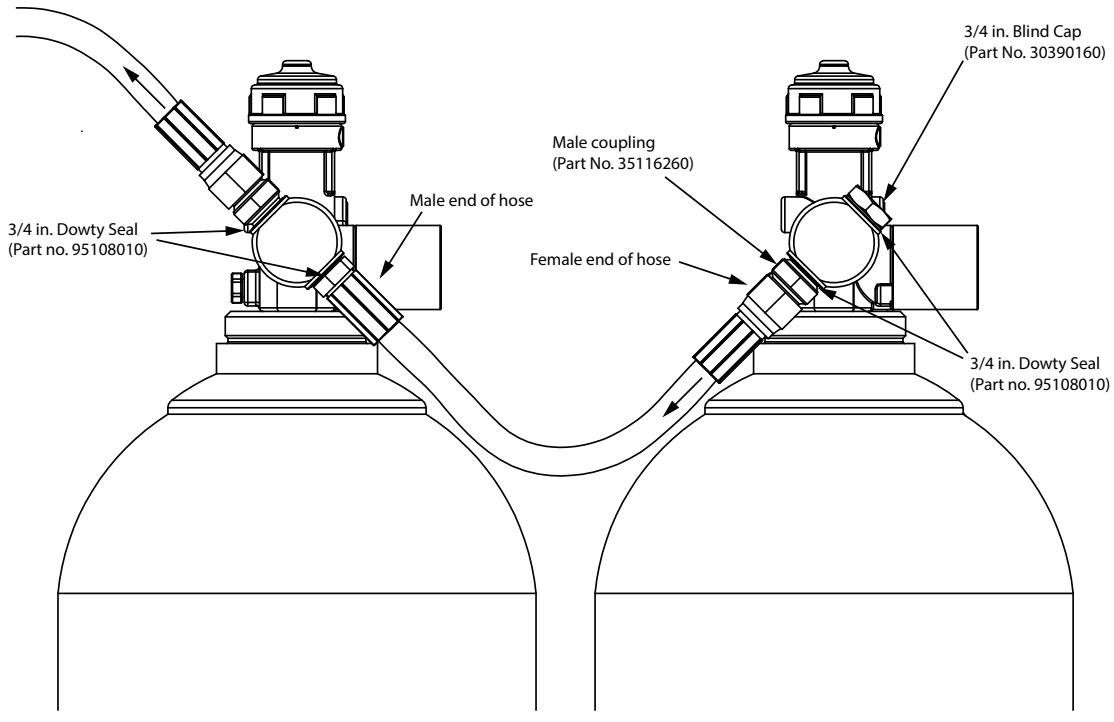

FIG. 3-27 iFLOW HOSE CONNECTION DETAILS

iFLOW DISCHARGE HOSE

(Part Nos. as shown in table)

Discharge hoses are used to connect between check valves and to connect the last container to the manifold or discharge pipework.

The iFlow discharge hoses have a 3/4 in. nominal diameter and are made of synthetic rubber with one mid metal braid and an outer layer of synthetic rubber resistant to weathering.

Each iFlow discharge hose is supplied with a 3/4 in. dowty seal (Part No. 95108010) on the male threaded connection.

For single container systems a 1/2 in. discharge hose (Part No. 30521041) can be connected directly to the discharge valve outlet without the need for the iFlow check valve (Part No, 21114011).

Part Number	End Thread	Length Dimension A	Container Size
30521041	G 1/2 in. ISO228	350 mm	80 L 140 L
91116026	G 3/4 in. ISO228	350 mm	80 L
91116030	G 3/4 in. ISO228	590 mm	80 L
91116045	G 3/4 in. ISO228	450 mm	140 L
91116046	G 3/4 in. ISO228	690 mm	140 L

TABLE. 3-6 DISCHARGE HOSE DETAILS

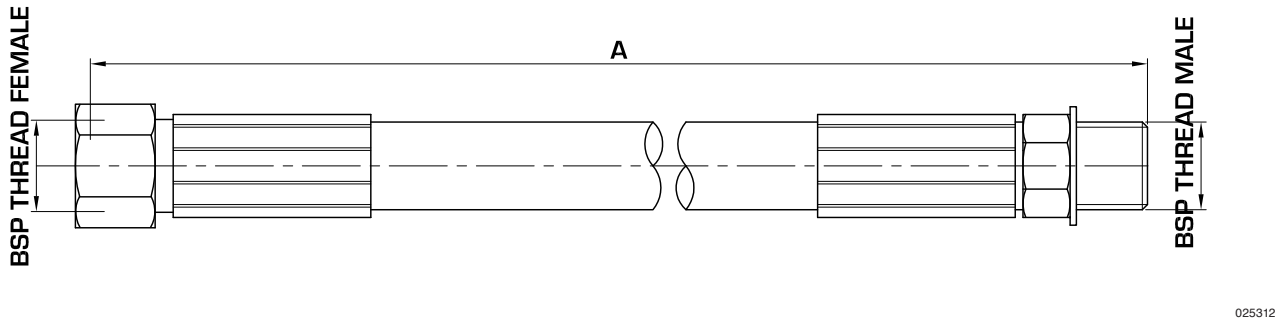

FIG. 3-28 iFLOW DISCHARGE HOSE

Technical Specification

Internal Hose Inner Diameter:	12 mm (Part No. 30521041) 19 mm (Part Nos. 911160xx)
Connection Inner Diameter:	16 mm (Part Nos. 911160xx)
Maximum Working Pressure:	241 bar (Part No. 30521041) 155 bar (Part Nos. 911160xx)
Test Pressure:	362 bar (Part No. 30521041) 233 bar (Part Nos. 911160xx)
Minimum Burst Pressure:	965 bar (Part No. 30521041) 620 bar (Part Nos. 911160xx)
Minimum Bend Radius:	175 mm (Part Nos. 911160xx)
Maximum Bend Angle:	360 °
Weight:	0.46 kg (Part No. 30521041) 0.63 kg (Part No. 91116026) 0.79 kg (Part No. 91116030) 0.68kg (Part No. 91116045) 0.82kg (Part No. 91116046)
Approvals:	VdS
Certification:	EN 12094-8
CE Certification Number:	0768-CPD-30123
Year of CE Marking:	2013
CE Marking Requirements:	Manufacturer, Part Number, Batch No, Working Pressure, Hose Type, CE_{0768}
Method of Marking:	Engraving

Location on System
The 1/2 in. hose is connected between the discharge valve outlet and the discharge pipework.
The 3/4 in. hose is connected between the iFlow container check valves and between the last iFlow container check valve and the manifold or discharge pipework.

Installation Instructions
See page 4-5 of the manual.

Operating Instructions
The discharge hose is a pressure connector and requires no operating instructions.

Maintenance Instructions
In case of faults or suspected faults contact customer services to organize replacement.

iFLOW DISCHARGE HOSE CONNECTORS

(Part No. 35116260 and 35116261)

- The discharge hose connectors are used to connect discharge hoses to distribution pipework when manifolds are not used.

The iFlow connector (Part No. 35116260) is used on 80 litre single row 2-4 container and 140 litre single row 2 container arrangements. The iFlow 'T' connector (Part No. 35116261) is used on 5-8 80 litre container and 3-4 140 litre container arrangements.

The G1/2 in. connection allows the connection of the discharge pressure switch (Part No. 30330010)

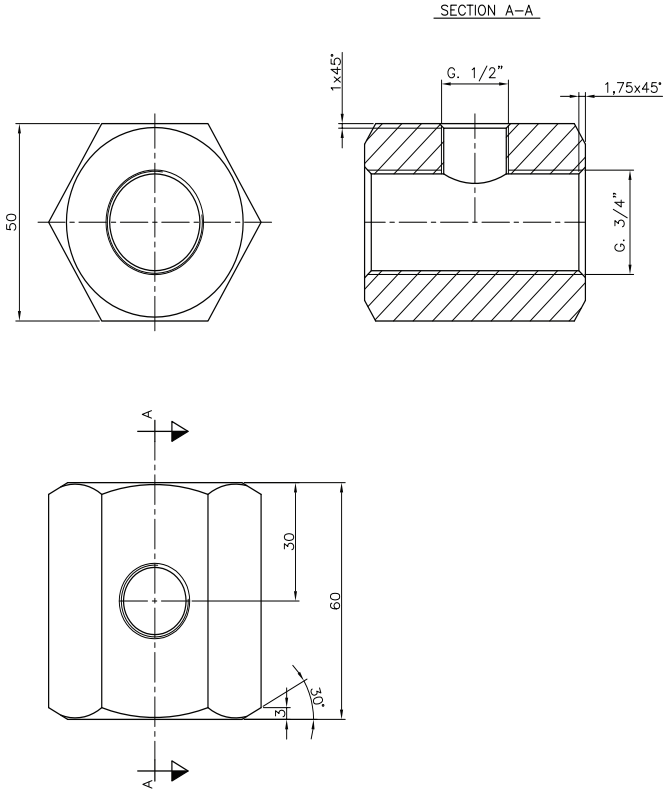

FIG. 3-29 PART NO. 35116260 iFLOW CONNECTOR (MATRIX BANK 2-4 CONTAINER, SINGLE ROW)

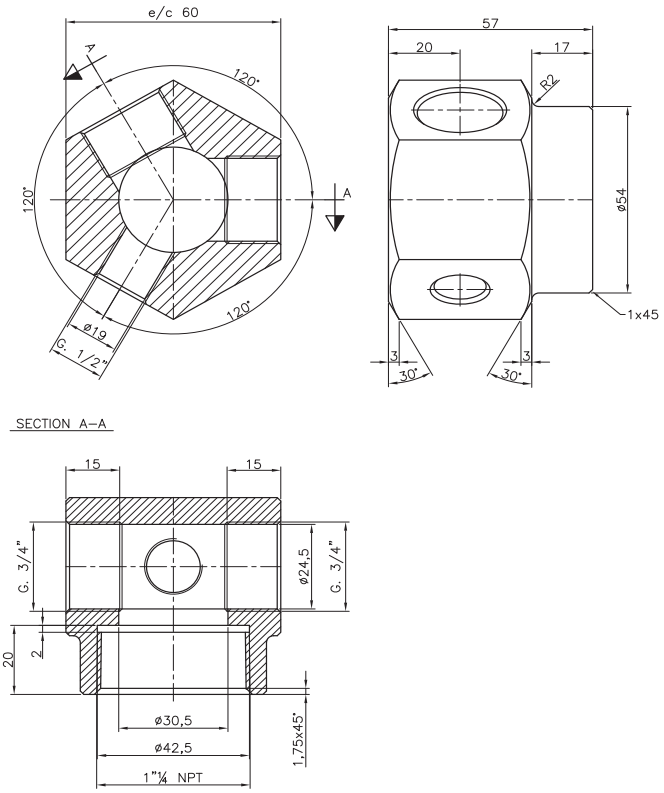

FIG. 3-30 PART NO. 35116261 iFLOW 'T' CONNECTOR (MATRIX BANK 5-8 CONTAINER, DOUBLE ROW)

Technical Specification

Material	Steel
Finish	White Zinc Plate
Maximum Working Pressure:	140 bar
Test Pressure:	210 bar
Weight:	0.7 kg
Certification:	PED (article 3,point 3)

Location on System
Connects the discharge hose(s) to the system pipework.

Installation Instructions
See page 4-5 of the manual.

Operating Instructions
Discharge hose connectors are pressure connectors and require no operating instructions.

Maintenance Instructions
In case of faults or suspected faults contact customer services to organize replacement.

iFLOW MATRIX BRACKETS

(Part Nos. as shown below)

The iFLOW matrix brackets are used with the 80 litre containers only and are designed to securely fix containers to a wall or supporting structure. The containers are to be floor mounted only.

The components used are detailed in Table 3-7

Please note:
Manifold brackets and 'U Bolts' are ordered separately

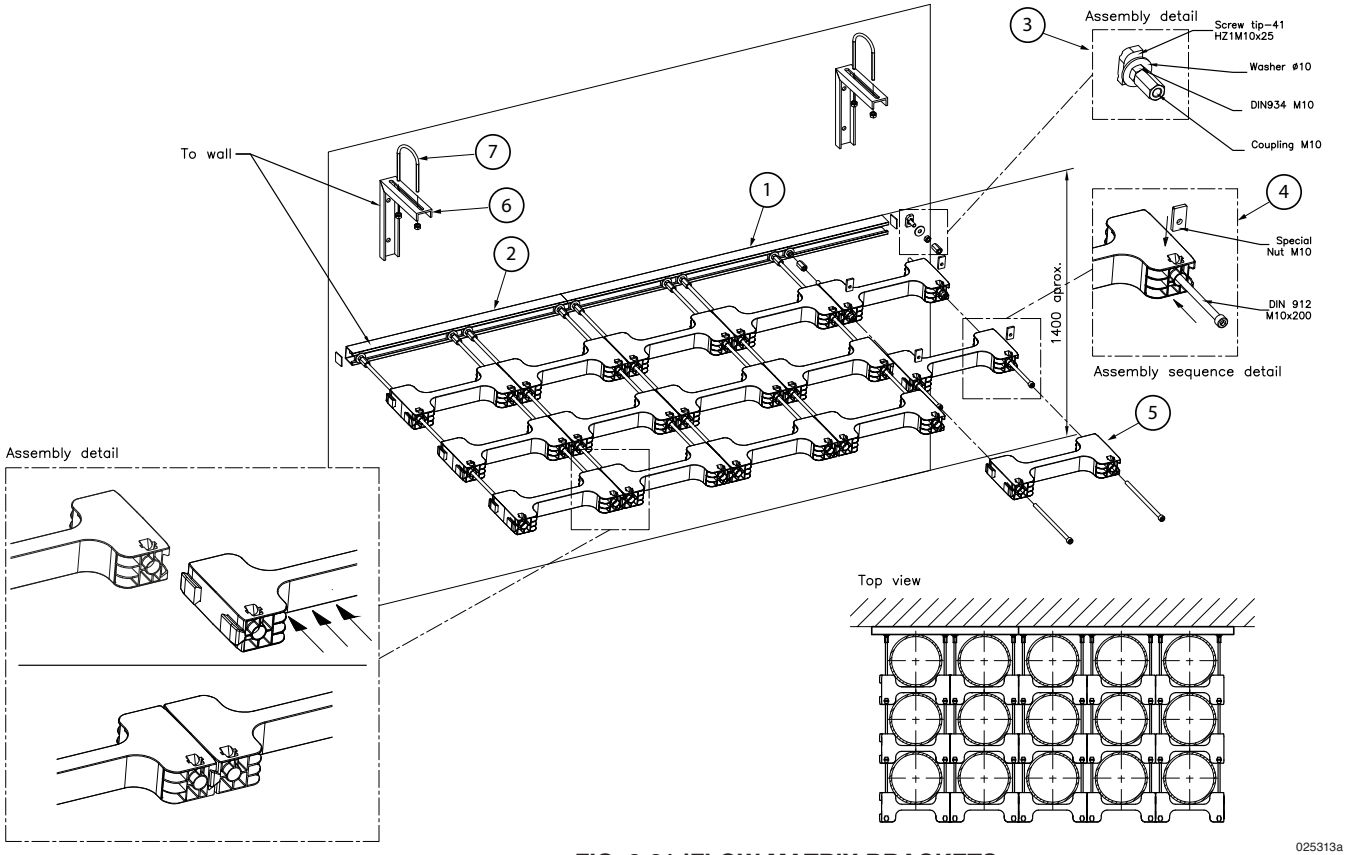

FIG. 3-31 iFLOW MATRIX BRACKETS

Item Number	Part Number	Description	Qantity Required
1	36116200	Wall Mount Bracket (3 Containers)	As required *
2	36116274	Wall Mount Bracket (2 Containers)	As required *
Not Shown	14267	Wall Mount Bracket (1 Container)	1
3	36116291	Support Screw Assembly (Set of 2)	1 per back row (wall mounted) container
4	36116292	Bolt Assembly (Set of 2)	1 per container
5	36116293	iFLOW Bracket	1 per container
6	30640006	Single / Double Row Manifold Support (80 Litre Containers)	2 for 1-6 port manifolds 3 for 7-12 port manifolds (Maximum 2.2m between manifold supports)
7	30600050	Manifold U Bolt (3/4 in.)	Same as single / double row manifold support
	30600060	Manifold U Bolt (1 in.)	Same as single / double row manifold support
	30600070	Manifold U Bolt (1 1/4 in.)	Same as single / double row manifold support
	30600080	Manifold U Bolt (1 1/2 in.)	Same as single / double row manifold support
	30600090	Manifold U Bolt (2 in.)	Same as single / double row manifold support
	30600100	Manifold U Bolt (2 1/2 in.)	Same as single / double row manifold support
	30600110	Manifold U Bolt (3 in.)	Same as single / double row manifold support
	30600120	Manifold U Bolt (4 in.)	Same as single / double row manifold support

TABLE 3-7 MATRIX BRACKET DETAILS

* Combinations of 2 and 3 container wall mount brackets are used to create different container bank configurations. So for the example in figure 3-31 above with 5 wall mounted containers a 2 container (Part No. 36116274) and a 3 container (Part No. 36116200) wall mount bracket is combined.
Please note that the single container bracket (Part No. 14267) cannot be used to create other container bank configurations.

iFLOW 140 LITRE CONTAINER BRACKETS

(Part Nos. as shown below)

The 140 litre iFLOW container brackets are designed to securely fix containers to a wall or supporting structure. The containers are to be floor mounted only.

Each single row bracketing option and the components used are detailed in Table 3-8.

Each 140 litre container must be supported by two brackets, see appendix page 7-2 for a typical system layout.

Please note:
Manifold brackets and 'U Bolts' are ordered separately

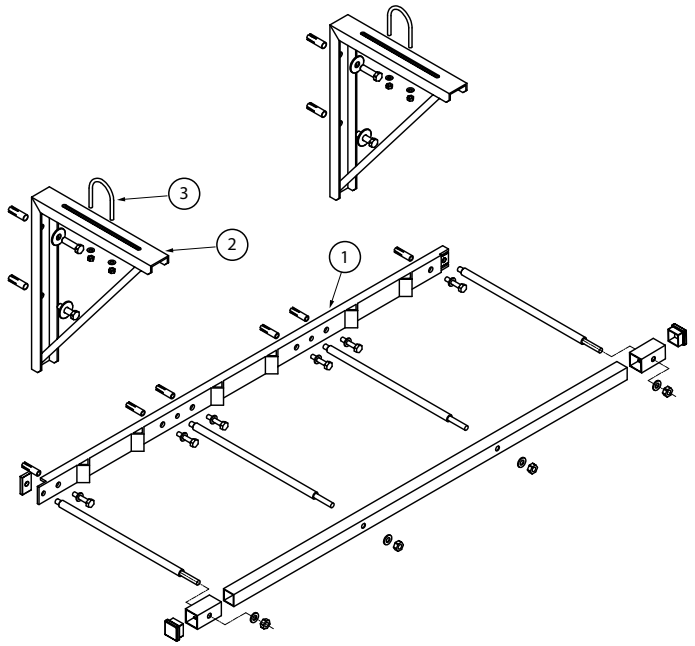

FIG. 3-32 iFLOW SINGLE ROW 140 LITRE CONTAINER BRACKETS

Item Number	Part Number	Description	Qantity Required
1	30602100	Single Row (2 Containers)	2 sets per 2 containers
	30603100	Single Row (3 Containers shown)	2 sets per 3 containers
	30621010	Modular bracket (1 Container)	2 sets per single container
2	30680006	Single / Double Row Manifold Support (140 Litre Containers)	2 for 1-5 port manifolds 3 for 6-10 port manifolds (Maximum 2.2m between manifold supports)
3	30600050	Manifold U Bolt (3/4 in.)	Same as single / double row manifold support
	30600060	Manifold U Bolt (1 in.)	Same as single / double row manifold support
	30600070	Manifold U Bolt (1 1/4 in.)	Same as single / double row manifold support
	30600080	Manifold U Bolt (1 1/2 in.)	Same as single / double row manifold support
	30600090	Manifold U Bolt (2 in.)	Same as single / double row manifold support
	30600100	Manifold U Bolt (2 1/2 in.)	Same as single / double row manifold support
	30600110	Manifold U Bolt (3 in.)	Same as single / double row manifold support
	30600120	Manifold U Bolt (4 in.)	Same as single / double row manifold support

TABLE 3-8 140 LITRE CONTAINER BRACKET DETAILS

Larger container bank configurations are created by using the above bracket sets multiple times, for example a five container single row system requires 2 x Part No. 30602100 and 2 x Part No. 30603100.

Please note: Modular brackets cannot be configured this way.

iFLOW 140 LITRE CONTAINER BRACKETS

(Part Nos. as shown below)

The 140 litre iFLOW container brackets are designed to securely fix containers to a wall or supporting structure. The containers are to be floor mounted only.

Each double row bracketing option and the components used are detailed in Table 3-8.

Each 140 litre container must be supported by two brackets, see appendix page 7-2 for a typical system layout.

Please note:
Manifold brackets and 'U Bolts' are ordered separately

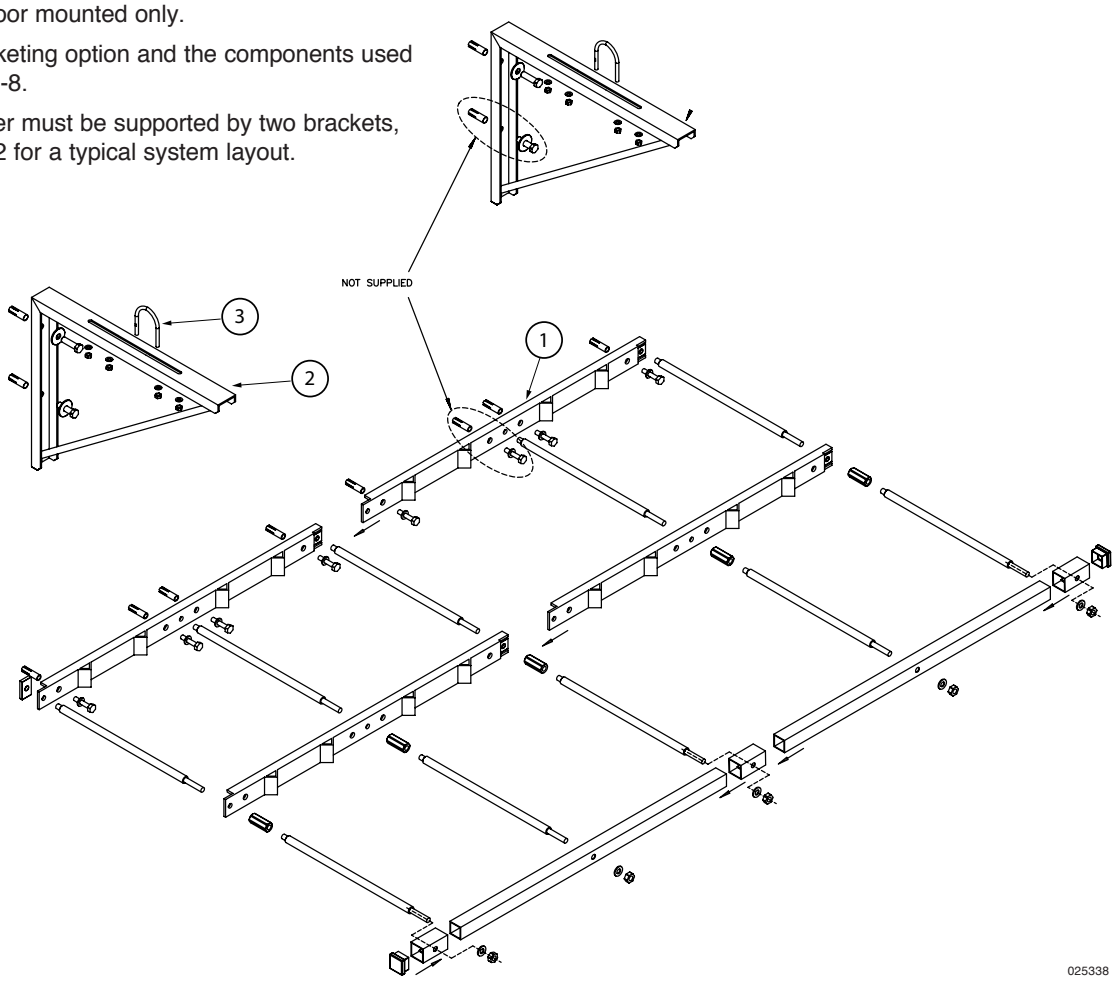

FIG. 3-33 iFLOW DOUBLE ROW 140 LITRE CONTAINER BRACKETS

- Note two double row (4 containers) brackets shown (2 x Part No. 3060410D).

Item Number	Part Number	Description	Qantity Required
1	3060410D	Double Row (4 Containers)	2 sets per 4 containers
	3060610D	Double Row (6 Containers)	2 sets per 6 containers
2	30680006	Single / Double Row Manifold Support (140 Litre Containers)	2 for 1-5 port manifolds 3 for 6-10 port manifolds (Maximum 2.2m between manifold supports)
3	30600050	Manifold U Bolt (3/4 in.)	Same as single / double row manifold support
	30600060	Manifold U Bolt (1 in.)	Same as single / double row manifold support
	30600070	Manifold U Bolt (1 1/4 in.)	Same as single / double row manifold support
	30600080	Manifold U Bolt (1 1/2 in.)	Same as single / double row manifold support
	30600090	Manifold U Bolt (2 in.)	Same as single / double row manifold support
	30600100	Manifold U Bolt (2 1/2 in.)	Same as single / double row manifold support
	30600110	Manifold U Bolt (3 in.)	Same as single / double row manifold support
	30600120	Manifold U Bolt (4 in.)	Same as single / double row manifold support

- Larger container bank configurations are created by using the above bracket sets multiple times, for example a ten container double row system (5 wide x 2 deep arrangement) requires 2 x Part No. 3060410D and 2 x Part No. 3060610D.

TABLE 3-9 140 LITRE CONTAINER BRACKET DETAILS

iFLOW ACTUATION HOSES

(Part Nos. as shown in table)

Actuation hoses are used to connect between pneumatic actuators, the pilot container and the master iFLOW container, and to connect the manual-pneumatic actuator. They are available in two lengths, 580mm and 700mm.

The hose has brass male swivel ends and when fitting to the pneumatic actuators no sealing tape is required. Care must be taken to avoid twisting the hose during installation.

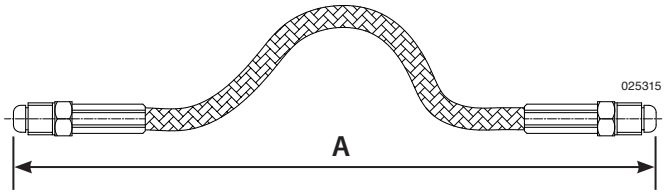

FIG. 3-34 iFLOW ACTUATION HOSES

Part Number	Length Dimension A	Container
30506014	580 mm	Slave to Slave 80 litre Pilot Actuated
30506015 30506016*	580 mm	Master to Slave 80 litre Metron Actuated
30522001	700 mm	Slave to Slave 140 litre Pilot Actuated
		Pilot to Slave
30522003 30522004*	700 mm	Master to Slave 140 litre Metron Actuated

* Secondary supply component (see note below).

Table 3-10 Actuation Hose Details

Location on System
Fitted between pneumatic actuators, to the manual-pneumatic actuator or between the pilot container and the master iFLOW container.

Installation Instructions
Refer to page 4-13 of the manual.

Operating Instructions
The iFLOW actuation hose is a pressure connector and requires no operating instructions.

Maintenance Instructions
In case of faults or suspected faults contact customer services to organize replacement.

Dual Supply Components
Primary and secondary supply components are used in order to maintain the supply chain and ensure that adequate stock levels are available to fully support customers and installers. The customer may receive secondary supply components if the stock levels are not sufficient to complete the order with primary supply components.

Technical Specification

Type:	Primary Supply (PTFE)	Primary Supply (2SC)	Secondary Supply (2SNK)
Hose Construction:	Stainless Steel Wire Braid PTFE Liner	Twin Steel Wire Braid 2SC Liner	Twin Steel Wire Braid 2SNK Liner
Connection:	1/4 in. BSPP Male Swivel Union (Brass)	1/4 in. BSPP Male Swivel Union (Brass)	1/4 in. BSPP Male Swivel Union (Brass)
Internal Hose Inner Diameter:	5.8 - 6.2 mm	6.2 - 7.0 mm	6.2 - 7.0 mm
Connection Inner Diameter:	4 mm	4 mm	4 mm
Maximum Working Pressure:	260 bar	420 bar	450 bar
Minimum Burst Pressure:	700 bar	1680 bar	1800 bar
Bend Angle:	360°	360°	360°
Minimum Bend Radius:	30 mm	50 mm	45 mm
Approvals:	VdS	VdS	VdS
Certification:	EN 12094-8	EN 12094-8	EN 12094-8
CE Certification Number:	0786-CPD-30099	0786-CPD-30150	0786-CPD-xxxxx
Year of CE Marking:	2009	2012	2016
CE Marking Requirements:	Manufacturer, Part Number, Batch No, Working Pressure, Hose Type, CE_{0786}	Manufacturer, Part Number, Batch No, Working Pressure, Hose Type, CE_{0786}	Manufacturer, Part Number, Batch No, Working Pressure, Hose Type, CE_{0786}
Method of Marking:	Engraving	Engraving	Engraving
Weight:	0.12 kg (Part No. 30506014) 0.14 kg (Part No. 30522001)	0.25 kg (Part No. 30506015) 0.29 kg (Part No. 30522003)	0.26 kg (Part No. 30506016) 0.31 kg (Part No. 30522004)

▸ 1/4 IN. BLEED VALVE

(Part No. 302.200.075)

The bleed valve is used in the actuation line of systems where an unintentional build-up of pressure, perhaps through a leak, could be problematic.

The device will automatically relieve pressure caused by small leaks but will seal to completely prevent loss of actuation pressure when, typically, the pilot container operates.

As an option on single hazard system. This can be fitted on the last pneumatic actuator.

When installing the bleed valve a 1/4 in. bonded seal (Part No. 31199816) should be used.

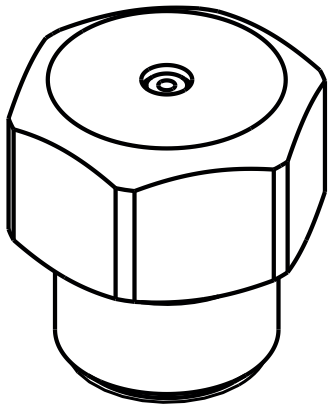

FIG. 3-35 PART NO. 302.200.075 1/4 IN. BLEED VALVE

Technical Specification

Body:	Stainless Steel
Internal Parts:	Stainless Steel
Connection:	1/4 in. BSPP Male
Minimum Activation Pressure:	10 bar
Maximum Working Pressure:	370 bar
Weight:	0.02 kg
Approvals:	VdS
Marking:	Manufacturer, Part Number, Serial No, Working Pressure
Method of Marking:	Engraving
Overall Size:	A/F 16 mm x 19 mm

PILOT VALVE ADAPTOR

(Part No. 35116381)

The Pilot Container Valve Adaptor is used to connect the Valve to the Pilot Actuation Hose or Tubing and Bleed Valve.

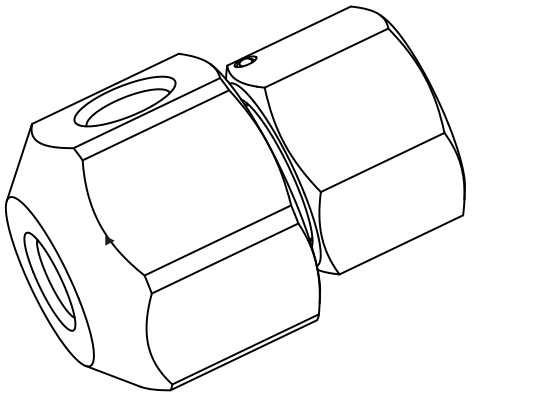

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FIG. 3-36 PART NO. 35116381 PILOT VALVE ADAPTOR

Technical Specification

Body:	Steel (Zinc Coated)
Internal Parts:	Steel (Zinc Coated)
Connection:	1/4 in. BSPP
Maximum Working Pressure:	120 bar
Overall Size:	53.5 mm x 39 mm
Weight:	0.26 kg

PILOT LINE NON RETURN VALVE

(Part No. 20006020)

The pilot line non return valve is used when there is a requirement to either maintain pressure in a particular section of the pilot line or to ensure that nitrogen pressure from the pilot container is operating the correct iFLOW INERGEN containers.

For example, a system using Selector valves where differing numbers of containers are required for each risk will use the pilot line non return to ensure that pilot pressure opens only the correct bank of containers and the correct selector valve.

Various adaptors are available to fit the pilot line non return valve and these are detailed in the installation section of this manual.

▸ Please note that the non-return valve is marked with the part number of the body (20006025) not the part number of the assembly (20006020) with the 1/4" male adaptor.

Technical Specification

Body:	Brass
Size:	¼ in.
Typical Working Pressure:	100 bar @ 20 °C
▸ Maximum Working Pressure:	240 bar
Working Temperature Range:	-20 °C to 50 °C
Minimum Opening Pressure:	55 bar
Weight:	0.150 kg
Approvals:	VdS
Certification:	EN 12094-13
▸ CE Marking Requirements:	Manufacturer, Part Number, 1/4", Working Pressure, Direction of Flow, Serial No, CE0786
▸ Valve Marking Part Number:	20006025 (Base Non-Return Valve Without 1/4" Male Adaptor)
Method of Marking:	Engraving

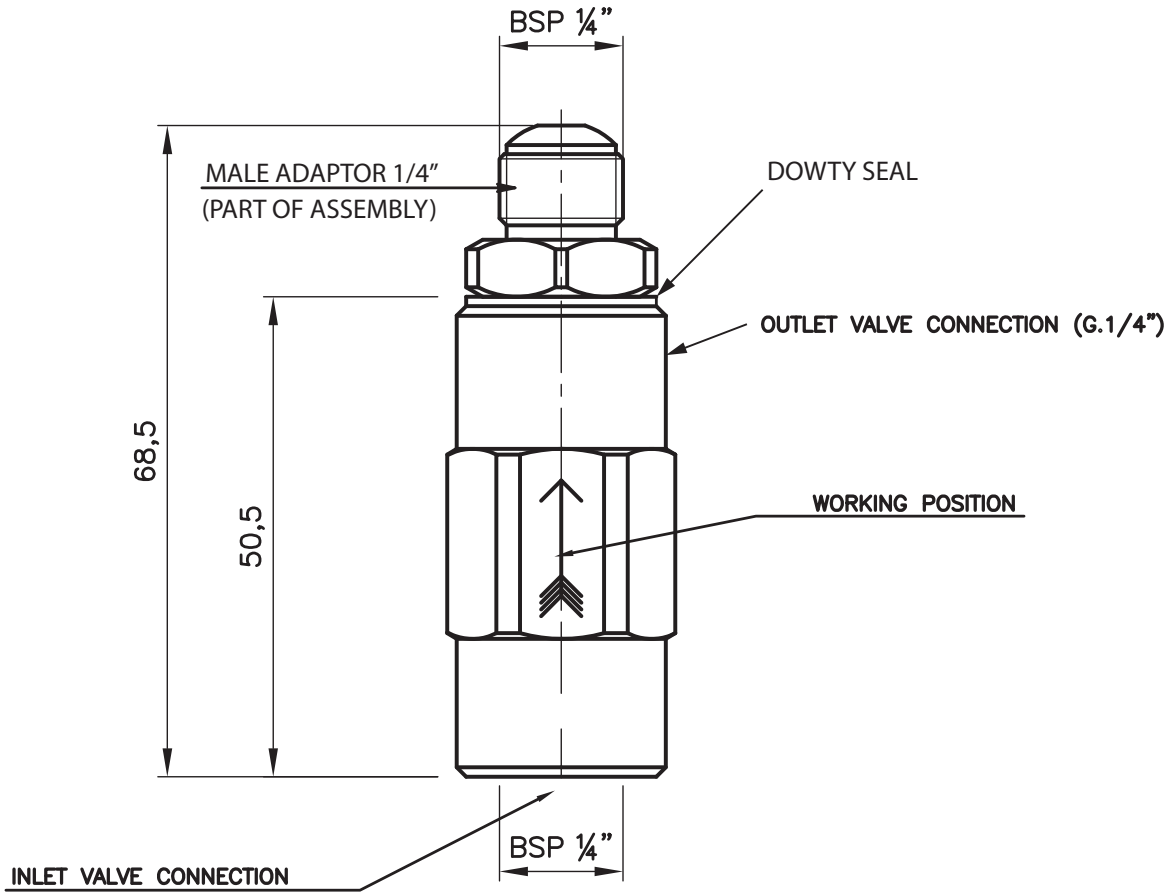


FIG. 3-39 PART NO. 20006020 PILOT LINE NON RETURN VALVE

⚠ WARNING

DO NOT REMOVE THE MALE ADAPTOR AS SUPPLIED

DECOMPRESSION SCREW

(Part No. 30027301)

After actuation of a container bank the pneumatic acuation line retains pressure from the pilot container. To enable safe release of the pressure a decompression screw is fitted to the last pneumatic actuator in place of the normal pneumatic actuator fixing screw. The pneumatic actuator has a blanking plate fitted and this must be removed prior to installing the decompression screw.

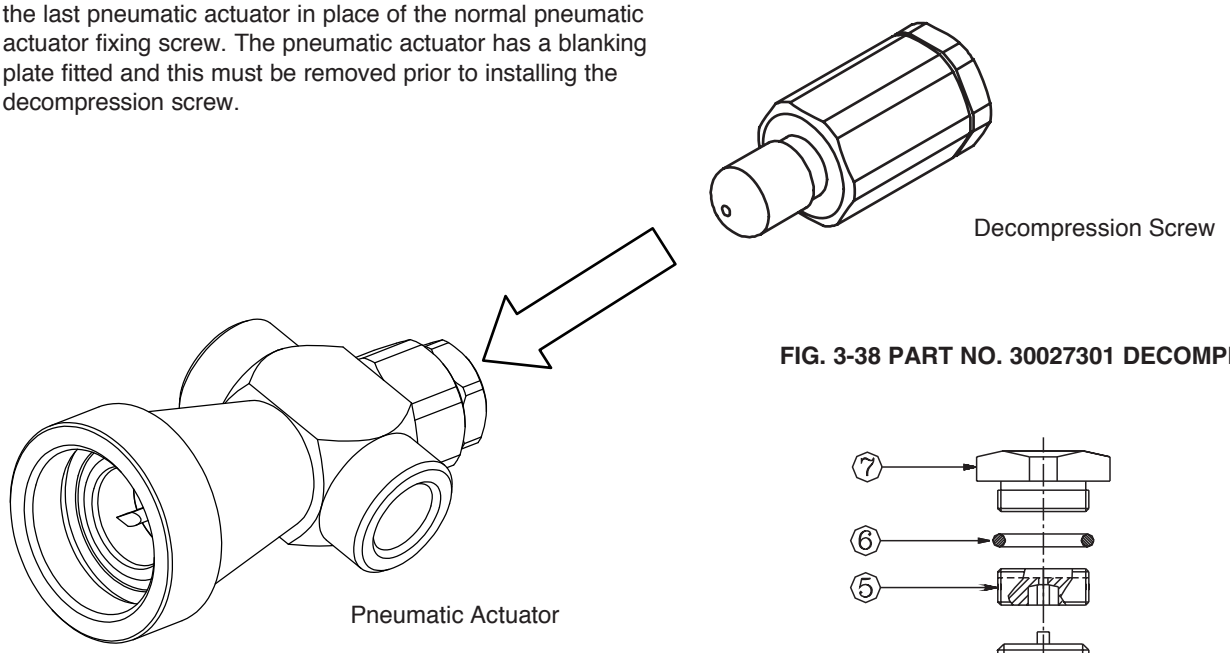
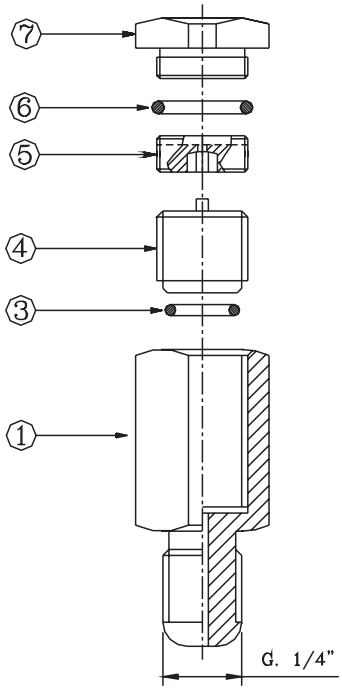


FIG. 3-38 PART NO. 30027301 DECOMPRESSSION SCREW



Following a discharge the following procedure is used to release the Nitrogen trapped in the pneumatic actuation line:

i) Remove cap (7)

ii) Using a flat screwdriver remove internal cap (5).

iii) Reverse the internal cap (5) and re-install in the decompression screw. The hexagon will be facing outwards. Fit cap (7) back onto the unit and begin to tighten using a 6mm Allen wrench. As you tighten pressure will begin to escape from the pneumatic actuation line.

iv) When all internal pressure has been vented unscrew cap (7) remove internal cap (5) and re-install in its original orientation.

v) Re-fit cap (7) checking that its o-ring is still retained in its groove.

Technical Specification

Body:	Brass
Internal Parts:	Nitrile
Connection:	1/4 in. BSPP
Test Pressure:	420 bar
Working Pressure:	140 bar
Overall Size:	68mm x 23.5mm (hex. 22mm)
Weight:	0.23 kg
Marking:	Manufacturer, Part Number, UL, Serial No, Working Pressure
Method of Marking:	Engraving

SELECTOR VALVE

(Part no. see table 3-11)

The selector valve is used in applications where multiple areas require to be protected from a single bank of containers.

The valves are pneumatically operated by a pilot container (see page 3-22).

The pressure enters through the inlet port (see figure 3-39) and when the selector valve is fully open the contained pressure exits through the outlet port. Pressure from the bottom port is connected via a suitable pilot line to operate the appropriate number of containers required to protect a particular hazard.

A typical selector valve system is shown in figure 3-40.

The operation of a typical system is as follows:

The fire detection system in one of the protected hazards operates. A fire signal is sent to the solenoid on the pilot container and it operates. At the same time a signal operates a second solenoid which is connected to the pilot line from the pilot container. This second solenoid opens and allows pilot container pressure to pass to the appropriate selector valve. The selector valve piston operates and opens the selector valve. When the piston is at its fullest travel the selector valve is fully open, pressure then passes from a port in the bottom of the piston to the container bank. This pressure operates the container bank and IG-541 discharges through the selector valve into the hazard. The unit is supplied with a non-return valve.

- Union connectors to connect the selector valves to pipework must be ordered separately and are detailed in table 3-16.

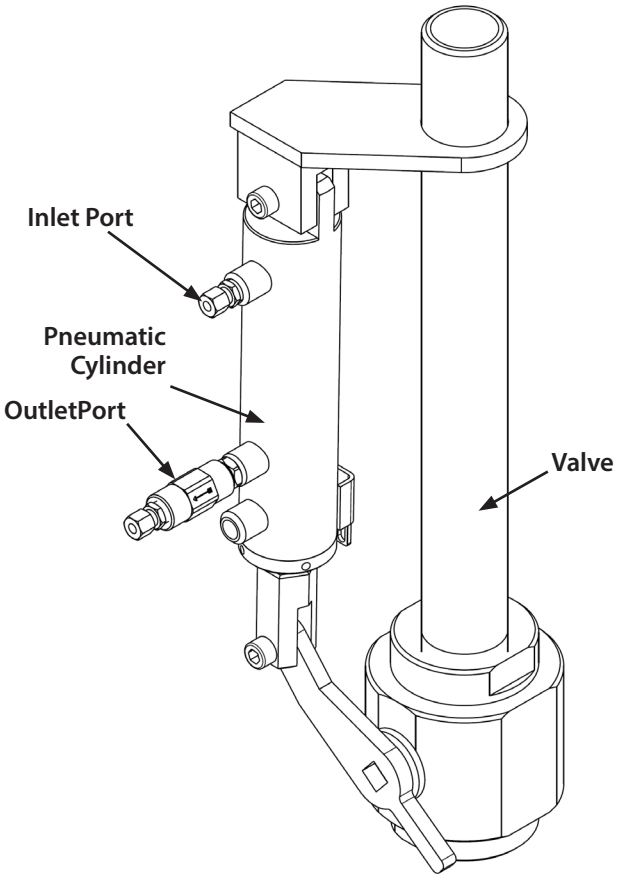


FIG. 3-39 IFLOW SELECTOR VALVE

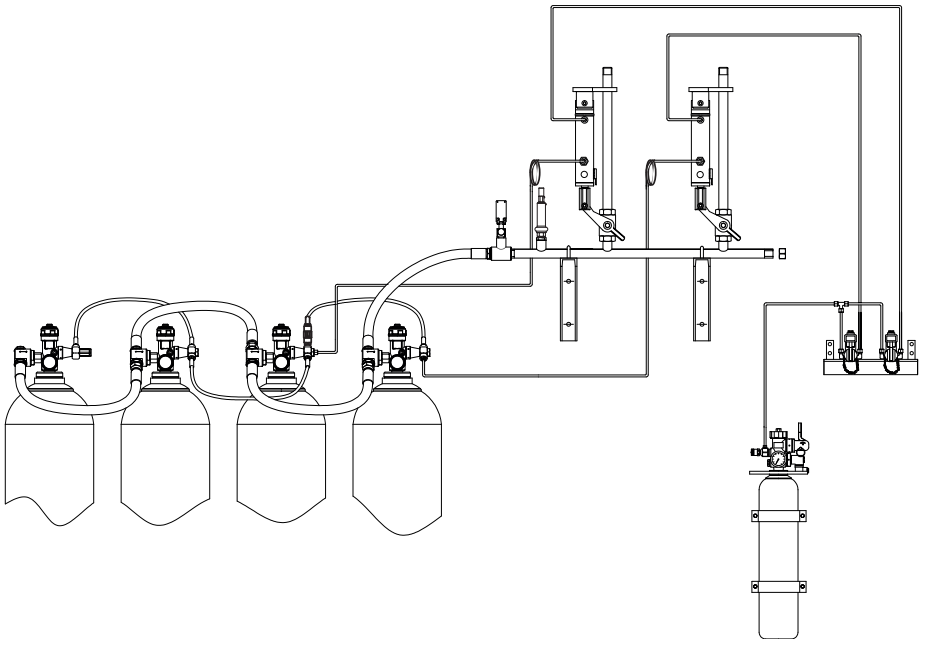


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FIG. 3-40 IFLOW SELECTOR VALVE SYSTEM (UNEQUAL SIZE RISKS)

SELECTOR VALVE (CONTINUED)

Location on System
Fitted to the selector valve manifold.

Installation Instructions
Refer to page 4-8 of the manual.

Maintenance Instructions
In case of faults or suspected faults contact customer services to organize replacement.

Technical Specification

Valve Bore Size:	20mm (3/4 in.) - 100mm (4 in.)
Valve Construction:	Steel
Valve Connection (Threaded):	Threaded NPT Female Inlet NPT male outlet
Pneumatic Port Connection	1/4 in. BSPP
Working Temperature Range:	-20 °C to 50 °C
Mounting Position:	Horizontal or Vertical
Nominal Actuation Pressure:	100 bar
Approvals:	VdS
Certification:	EN 12094-5
CE Certification Number:	0786-CPD-30052
Year of CE Marking:	2010
CE Marking Requirements:	Manufacturer, Part Number, DNXX, Serial No, CE_{0786}

Selector Valve Assembly with Manual Release	Selector Valve Assembly with Blind Caps*	Size (mm/in.)	Dimensions (length x width) (mm /in.)	Weight (Kg) (kg/lbs)
445043	442795	20mm (3/4 in.)	511 x 192 (20.1 x 7.6 in.)	7.5 (16.5 lbs.)
445044	442796	25mm (1 in.)	524 x 203 (20.6 x 8.0 in.)	8.8 (19.4 lbs.)
445045	442797	32mm (1 1/4 in.)	527 x 227 (20.7 x 8.9 in.)	11.5 (25.4 lbs.)
445046	442798	40mm (1 1/2 in.)	543 x 243 (21.4 x 9.6 in.)	13.0 (28.7 lbs.)
445047	442799	50mm (2 in.)	560 x 256 (22 x 10.1 in.)	17.0 (37.5 lbs)
445048	442800	65mm (2 1/2 in.)	590 x 283 (23.2 x 11.1 in.)	27.5 (60.6 lbs)
445049	442801	80mm (3 in.)	612 x 310 (24.1 x 12.2 in.)	33.9 (74.4 lbs)
445050	442802	100mm (4 in.)	748 x 363 (29.4 x 14.3 in.)	58.0 (127.9 lbs.)

* For Vds System Approval, manual release devices cannot be used and so blind caps are substituted.

TABLE 3-11 SELECTOR VALVE

Note:

With each selector valve shipping assembly the selector valve solenoid actuator and appropriate fittings will be included with the selector valve. Additionally selector valve solenoid brackets must be ordered separately (see Figure 3-42).

Selector Valve Ancillaries

A selector valve microswitch (Part No. 30116011) is available and when fitted, will electronically signal that the selector valve has operated.

A lever (Part No. 20010013) is available to manually close the selector valve after operation. **When mounting the selector valve sufficient clearance must be allowed for operating the manual lever.**

Pneumatic Cylinder Volumes

The volume of a pneumatic cylinder on a 3/4 in. to 3 in. selector valve is equivalent to 14m of 1/4 in. O.D. pneumatic actuation line tubing. For a 4 in. selector valve the volume equates to 32m of tubing. These volumes must be deducted from the total allowable volume of pneumatic actuation line when using a selector valve in a system. Refer to the installation instructions for Selector Valves on page 4-8.

SELECTOR VALVE SOLENOID AND BRACKETS

- 30130253V (Solenoid with Manual Release) or
- 30130255V (Solenoid only with blind cap)

The selector valve solenoid is installed between the pilot container and selector valve and allows pneumatic release on receipt of electrical signal from control panel.

- Selector valve solenoids are offered as standard with manual release or solenoid operation only and are supplied as part of the selector valve shipping assenbly as detailed in Table 3-11.

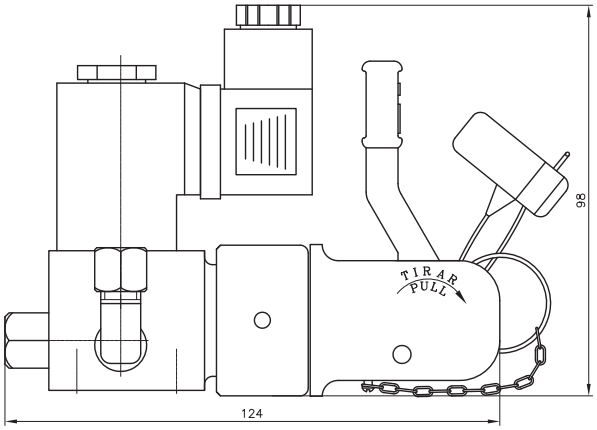

FIG 3-41 SELECTOR VALVE SOLENOID C/W MANUAL RELEASE
PART NO. SHOWN 30130253V
SOLENOID ONLY WITH BLIND CAP PART NO. 30130255V

Technical Specification

Actuation Type:	Solenoid (normally closed)
Reset Method:	Manually
Connection:	6mm Stud Coupling
Voltage:	24 V dc ± 15%
Maximum working Pressure :	170 bar (2465 psi)
Consumption:	13 W
Min Duration of Trigger Signal:	Continuous Duty
Electrical Connection:	DIN Plug
Protection	IP 65
Working Temperature Range:	-20 °C to 50 °C
Weight:	0.25 kg
Approvals:	VdS
Certification:	EN 12094-4
CE Marking Requirements:	Manufacturer, Serial No, Voltage, Current, CE_{0786}
Method of Marking:	Stamp

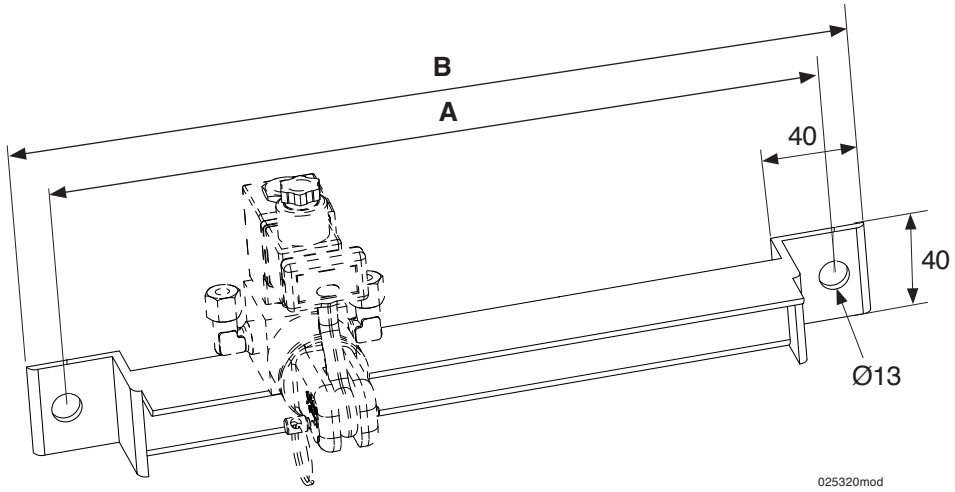

FIG. 3-42 IFLOW SELECTOR VALVE SOLENOID BRACKETS

Part Number	Description	Hole Centres (Dimension A)	Overall Length (Dimension B)
30650022	Selector Valve Solenoid Mounting Bracket (2 Solenoids)	330 mm	360 mm
30650013	Selector Valve Solenoid Mounting Bracket (3 Solenoids)	475 mm	505 mm
30650014	Selector Valve Solenoid Mounting Bracket (4 Solenoids)	620 mm	650 mm

TABLE. 3-12 SELECTOR VALVE SOLENOID MOUNTING BRACKET PART NUMBERS

(Part No. 30650013, 30650014 and 30650022)
Brackets are available to mount the selector valve solenoid.

- These are not included in the selector valve shipping assembly (Table 3-11) and must be ordered seperately, depending upon the system design.

LOCK OFF ASSEMBLY

(Part No. 302.200.072)

The Lock-off unit can be used to lock the extinguishing process and to release it again. The Lock-off unit consists of a 2/2-directional ball valve with a relief bore hole and built-on parts. Two switches can be built onto the device to monitor the two positions. These switches can be ordered individually (Part No. KO 246 2526) or as part of a fixing kit (Part No. KO 246 2876). In either case two sets would need to be ordered. The padlock enclosed with the product can be used to secure each of the end positions. The ball valve must be installed so that it points in the correct direction. A fixing bracket and screws are enclosed in the package, together with two adapters.

Two adaptors (Part No. 309.010.010) are included with the assembly to provide a connection between the lock-off unit and the 6mm copper nickel pipe actuation arrangement.

Technical Specification

Nominal diameter:	DN 8
Max. operating pressure:	240 bar
Test pressure:	315 bar
Material:	Steel, nickel-plated
Weight:	0.8 kg
Approval:	VdS
Identification marking:	CE
Certification body:	0786-VdS

Maintenance Instructions
If the Lock off unit is used properly, it requires no maintenance. Damaged Lock-off units must be replaced immediately. The warnings in the Operating Instructions for the extinguishing system must be followed.
In case of faults or suspected faults contact customer services to organize replacement.

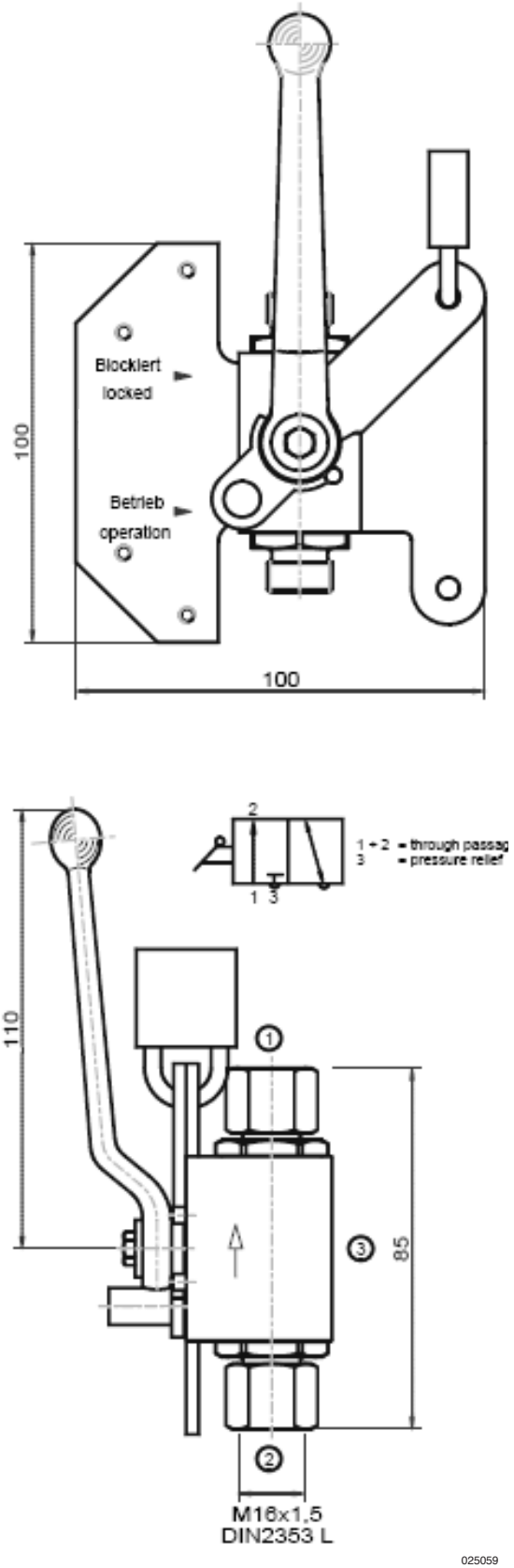

FIG. 3-43 LOCK OFF ASSEMBLY (NOTE: ADAPTORS NOT SHOWN)

▸ SELECTOR VALVE MANIFOLDS

(Part No. as shown in table)
iFLOW selector valve manifolds are designed to enable selector valves to be fitted to iFLOW container banks. They are available in two to six ports and 3/4 in. to 4 in. sizes to allow connection of all selector valve types. They are supplied with a matt black painted finish (synthetic enamel). The manifolds are manufactured from schedule 80 pipe and all pressure tested to 250 bar. All connections are NPT. A plugged port is included for the pressure relief valve (Part No. 62104002) which is required on all VdS Approved systems. A 3000 lb threaded cap is also included to blank off one end of the manifold.

Technical Specification

Material:	Steel Sch. 80
Specification:	ASTM A106 GR. B
Finish:	Painted, Black (RAL 9005)
Test Pressure:	250 bar
Pressure Relief Valve Port:	G 1/2 in.
Pipe Connections:	NPT Thread
Supplied Length:	800mm (2 Port) 1150mm (3 Port) 1500mm (4 Port) 1850mm (5 Port) 2200mm (6 Port)

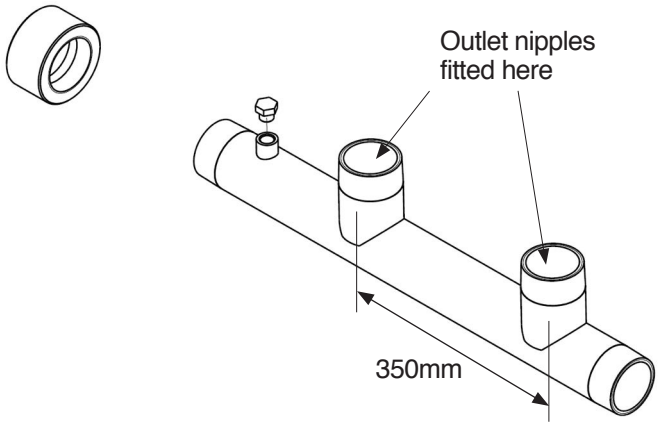

FIG. 3-44 SELECTOR VALVE MANIFOLD (2 PORT EXAMPLE)

Manifold Size (mm/in.)	2 Port	3 Port	4 Port	5 Port	6 Port
20mm (3/4 in.)	36211000	36311100	36411110	36511111	36611111
25mm (1 in.)	36222000	36322200	36422220	36522222	36622222
32mm (1 1/4 in.)	36233000	36333300	36433330	36533333	36633333
40mm (1 1/2 in.)	36244000	36344400	36444440	36544444	36644444
50mm (2 in.)	36255000	36355500	36455550	36555555	36655555
65mm (2 1/2 in.)	36266000	36366600	36466660	36566666	36666666
80mm (3 in.)	36277000	36377700	36477770	36577777	36677777
100mm (4 in.)	36288000	36388800	36488880	36588888	36688888

TABLE. 3-13 SELECTOR VALVE MANIFOLD PART NUMBERS

Outlet Nipple Size (mm/in.)	Part Number
20mm (3/4 in.)	94116021
25mm (1 in.)	94116022
32mm (1 1/4 in.)	94116023
40mm (1 1/2 in.)	94116024
50mm (2 in.)	94116025
65mm (2 1/2 in.)	94116026
80mm (3 in.)	94116027
100mm (4 in.)	94116028

Outlet nipples required for connection to the selector valves are included in the above manifold part numbers, but must be specified at the point of order. See table 3-14 for the outlet nipple part numbers.

TABLE. 3-14 SELECTOR VALVE MANIFOLD OUTLET NIPPLE PART NUMBERS

▸ MANIFOLD DROP SECTIONS

A range of manifold drop sections are available to aid in the connection of the selector valve manifold to the main system manifold where sufficient ceiling height is not available. The drop sections give a drop of 900 mm or 1500 mm from pipe centres and all have NPT connections.
They are supplied with a matt black painted finish (synthetic enamel)

Technical Specification

Material:	Steel Sch. 80
Specification:	ASTM A106 GR. B
Finish:	Painted, Black (RAL 9005)
Test Pressure:	250 bar
Connections:	NPT Thread

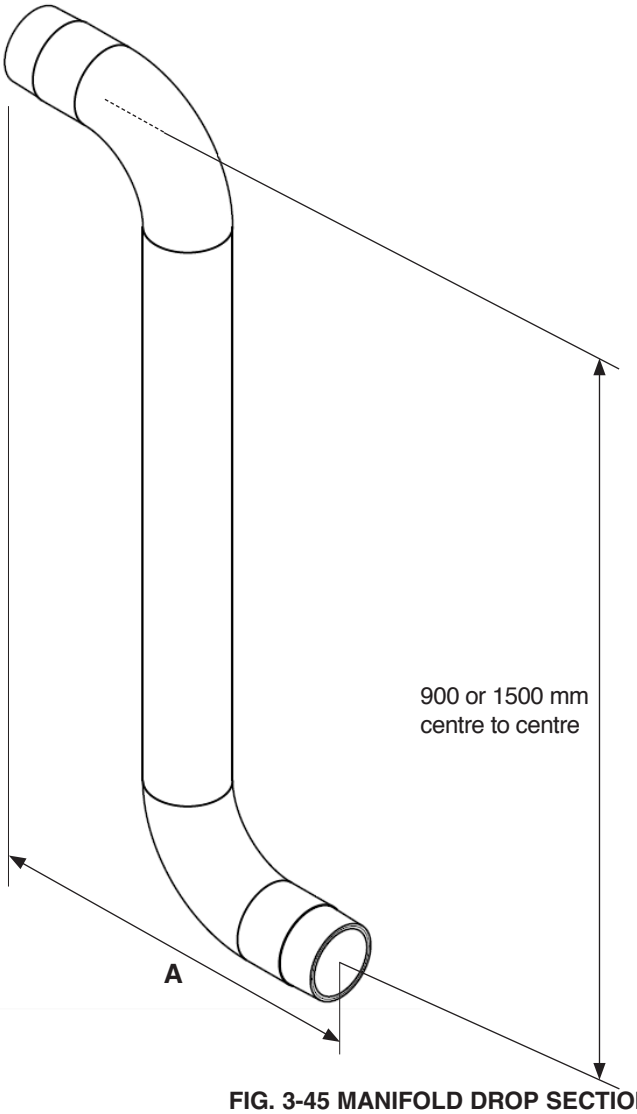

FIG. 3-45 MANIFOLD DROP SECTION

Drop Section Size (mm/in.)	900 mm Centres	1500 mm Centres	Width Dim. A
20mm (3/4 in.)	19263001	19263009	284 mm
25mm (1 in.)	19263002	19263010	310 mm
32mm (1 1/4 in.)	19263003	19263011	337 mm
40mm (1 1/2 in.)	19263004	19263012	363 mm
50mm (2 in.)	19263005	19263013	413 mm
65mm (2 1/2 in.)	19263006	19263014	464 mm
80mm (3 in.)	19263007	19263015	518 mm
100mm (4 in.)	19263008	19263016	620 mm

TABLE. 3-15 MANIFOLD DROP SECTION PART NUMBERS

UNION CONNECTORS

A range of union connectors are available to connect selector valve manifolds, drop sections and iFLOW manifolds together as appropriate, as well as conecting selector valves to pipework. Two types are available, NPT to NPT, which allows connection of selector valve manifolds, drop sections and iFLOW manifolds and NPT to BSPT which allows connection to BSPT pipe work.
The direction of flow is marked on the connector with an arrow.

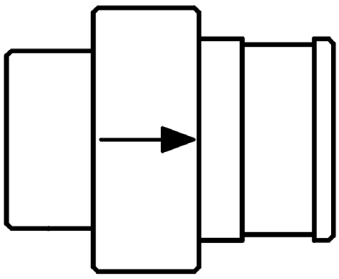

FIG. 3-46 UNION CONNECTOR

Connector Size (mm/in.)	NPT to NPT (Female)	NPT to BSPT (Female)	Weight kg	C Spanner Required
20mm (3/4 in.)	30888001	30888027	0.6	35mm-60mm (Part No. 35017401)
25mm (1 in.)	30888002	30888028	0.8	35mm-60mm (Part No. 35017401)
32mm (1 1/4 in.)	30888003	30888029	1.1	35mm-60mm (Part No. 35017401) - Side Sections 60mm-90mm (Part No. 35017402) - Centre Section
40mm (1 1/2 in.)	30888004	30888030	1.5	60mm-90mm (Part No. 35017402)
50mm (2 in.)	30888005	30888031	3.0	60mm-90mm (Part No. 35017402) - Side Sections 90mm-155mm (Part No. 35017403) - Centre Section
65mm (2 1/2in.)	30888006	30888032	4.1	90mm-155mm (Part No. 35017403)
80mm (3 in.)	30888007	30888033	5.8	90mm-155mm (Part No. 35017403) - Side Sections 155mm-230mm (Part No. 35017404) - Centre Section
100mm (4 in.)	30888008	30888034	8.3	155mm-230mm (Part No. 35017404)

TABLE. 3-16 UNION CONNECTORS PART NUMBERS

Technical Specification

Material:	Steel and Nitrile
Specification:	ASTM A105
Marking: (20mm to 40mm Union Connectors)	Part Number, Nominal Size, Direction of Flow, Serial No, Working Pressure
CE Marking Requirements: (50mm to 100mm Union Connectors)	Part Number, Nominal Size, Direction of Flow, Serial No, Working Pressure, CE

IFLOW MANIFOLDS

iFLOW manifolds are designed to enable containers in the iFLOW container bank to be connected to the supply pipe or to the selector valve manifold (when required).

Manifolds are threaded and manufactured from Schedule 80 Pipe. They are supplied with a matt black painted finish (synthetic enamel).

The manifold is pressure tested to 180 bar.

iFLOW Manifolds are supplied with an NPT male thread at each end. A 3000 lb threaded cap is also included to blank off one end of the manifold. If you need to join any standard manifolds together for a particular installation or container bank configuration, union connectors are available (see page 3-42). You can also use the union connector to connect the discharge pipe work to the end of the manifold.

For ease of transport and installation, manifolds are split into sections with a maximum length of 3 m. Link nuts are welded to the ends of each split section and each side of the joint is marked with a numerical or alphabetical identifier to ensure correct assembly during installation.

A plugged port is included for the discharge pressure switch (Part No. 30330010).

Technical Specification

Material:	Steel Sch. 80
Specification:	ASTM A106 GR. B
Finish:	Painted, Black (RAL 9005)
Test Pressure:	180 bar
Pressure Switch Port:	G 1/2 in.
Outlet Connections:	NPT Threads
Inlet Connections:	G 3/4 in.
Supplied Length:	Max 3m length sections. 750mm (2 Port - 80L) 1100mm (3 Port - 80L) 1450mm (4 Port - 80L) 1800mm (5 Port - 80L) 2150mm (6 Port - 80L) 2500mm (7 Port - 80L) 2850mm (8 Port - 80L) 800mm (2 Port - 140L) 1200mm (3 Port - 140L) 1600mm (4 Port - 140L) 2000mm (5 Port - 140L) 2400mm (6 Port - 140L) 2800mm (7 Port - 140L)

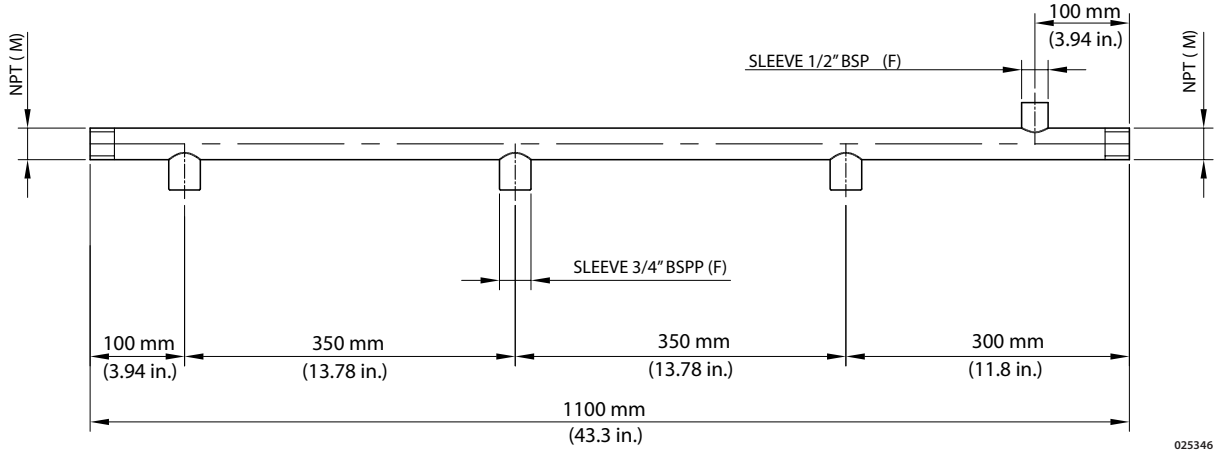

FIG. 3-47 80L IFLOW MANIFOLD (THREE PORT SHOWN)

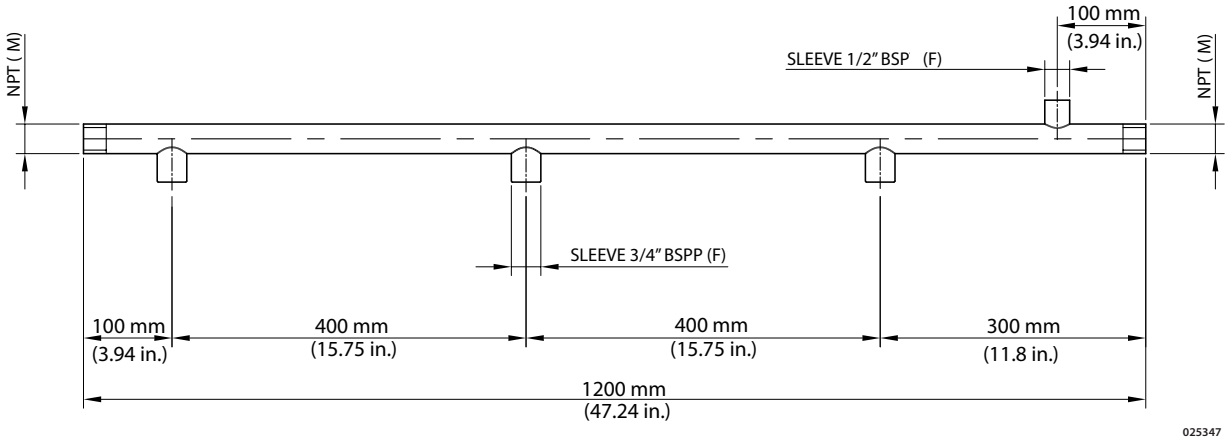

FIG. 3-48 140L IFLOW MANIFOLD (THREE PORT SHOWN)

▸ **IFLOW MANIFOLDS (CONTINUED)**

Standard part numbers for iFLOW manifolds are detailed below. If a larger number of ports are required for manifolds then these may be available as a special item upon request.

Manifold Size (mm/in.)	20mm (3/4 in.)	25mm (1 in.)	32mm (1 1/4in.)	40mm (1 1/2in.)	50mm (2 in.)	65mm (2 1/2in.)	80mm (3 in.)	100mm (4 in.)
2 Port	19263021	19263022	19263023	19263024	19263025			
3 Port	19263031	19263032	19263033	19263034	19263035	19263036	19263037	
4 Port		19263042	19263043	19263044	19263045	19263046	19263047	
5 Port		19263052	19263053	19263054	19263055	19263056	19263057	19263058
6 Port			19263063	19263064	19263065	19263066	19263067	19263068
7 Port			19263073	19263074	19263075	19263076	19263077	19263078
8 Port				19263084	19263085	19263086	19263087	19263088
9 Port					19263095	19263096	19263097	19263098
10 port							19263107	19263108
11 Port							19263117	19263118
12 Port								19263128
13 Port								19263138
14 Port								19263148

TABLE. 3-17 IFLOW MANIFOLD PART NUMBERS (80 L CONTAINERS)

Manifold Size (mm/in.)	25mm (1 in.)	32mm (1 1/4in.)	40mm (1 1/2in.)	50mm (2 in.)	65mm (2 1/2in.)	80mm (3 in.)	100mm (4 in.)
2 Port	19266022						
3 Port	19266032	19266033	19266034	19266035	19266036	19266037	
4 Port		19266043	19266044	19266045	19266046	19266047	
5 Port		19266053	19266054	19266055	19266056	19266057	
6 Port			19266064	19266065	19266066	19266067	
7 Port				19266075	19266076	19266077	19266078
8 Port				19266085	19266086	19266087	19266088
9 Port				19266095	19266096	19266097	19266098
10 port						19266107	19266108
11 Port						19266117	19266118
12 Port						19266127	19266128
13 Port							19266138
14 Port							19266148

TABLE. 3-18 IFLOW MANIFOLD PART NUMBERS (140 L CONTAINERS)

▸ MANIFOLD BURST DISC ASSEMBLY

(Part No. 200CD120)

The safety disc is designed to automatically relieve pressure in the pipework system. It is required in a close section of pipe between the container valves and selector valves.

It is a requirement that the outlet from the safety disc is pipe to atmosphere away from the personnel. A manual by-pass valve must be incorporated into the pressure relief arrangements to allow for trapped to be safely vented away to atmosphere.

Ensure that the Manifold Burst Disc is oriented in the proper direction with the burst disc outside of the pipework

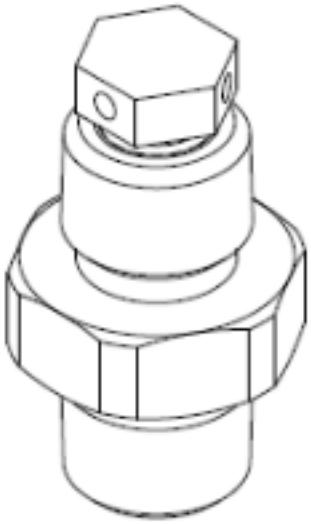

FIG. 3-49 PRESSURE RELIEF VALVE

Technical Specification

Material:	Brass
Connection:	1/2 in. NPT x 1/2 in. NPT Male
Burst Pressure:	110 - 120 bar
Overall Size:	49 mm x 28 mm.
Weight:	0.12 kg

PRESSURE RELIEF VALVE

(Part No.62104002)

The pressure relief valve is designed to automatically relieve pressure in the pipework system. It is normally fitted in all closed section of pipework, i.e. between the container and stop valve, etc. It is set at the factory to 120 bar.

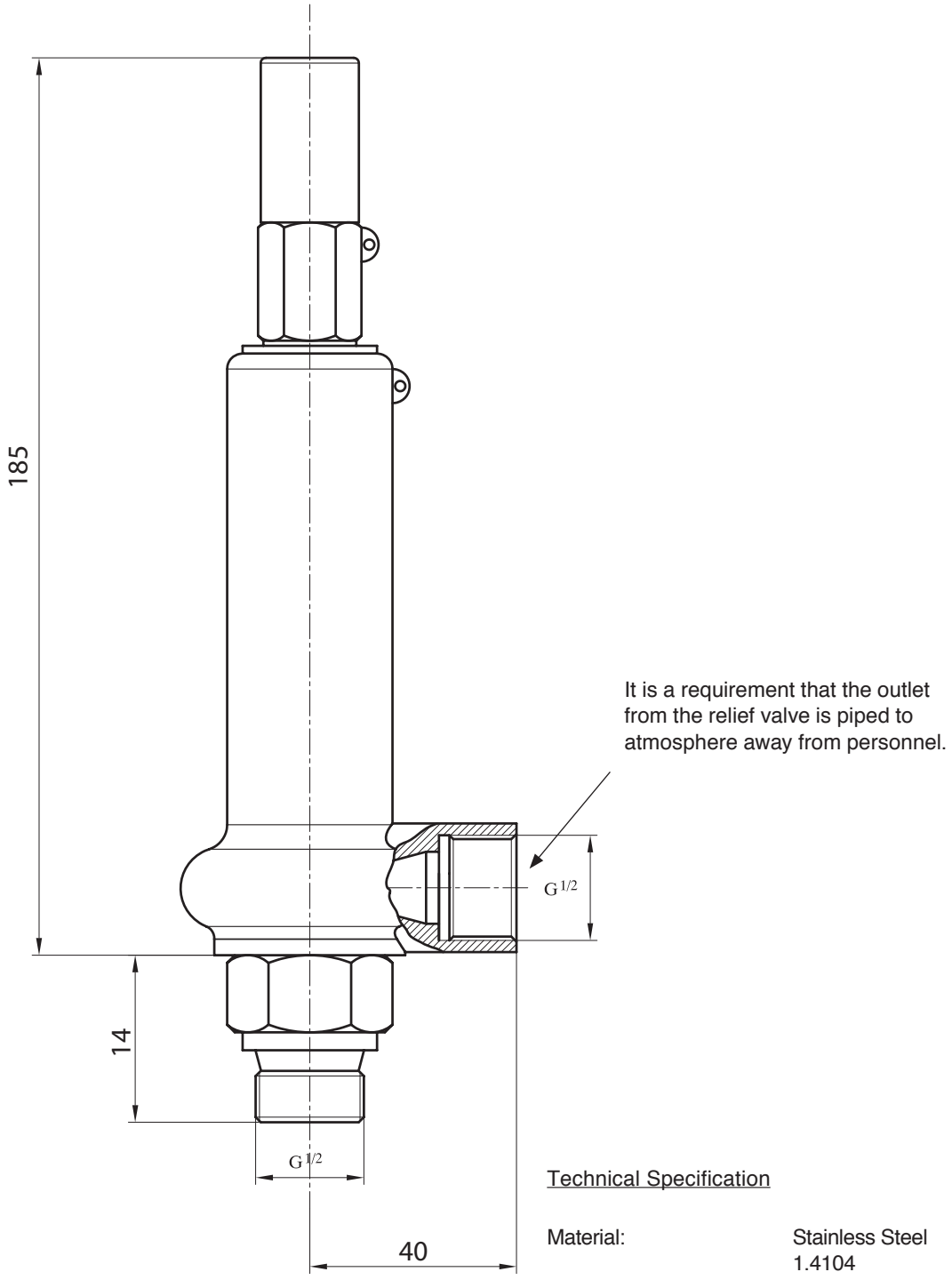

FIG. 3-50 PRESSURE RELIEF VALVE

Technical Specification

Material:	Stainless Steel 1.4104
Connection:	G ½ in.
Overall Length:	199 mm
Weight:	1.0 kg

ACTUATION PIPING
(Part No. as shown in table)

Part Number	Description	Unit of Measure
30804068	Copper Pipe 6mm O/D	1 metre long
308.002.002	6mm half hard copper tube	3 metres long
30880015	Equal Tee (6 mm)	N/A
30880007	Copper Pipe Coupling (1/4 in. x 6mm)	N/A
30880008	Hose Connector (1/4 in. Actuation hose - female/female)	N/A
31199816	1/4 in. Dowty Seal	N/A

TABLE 3-19 ACTUATION PIPING PART NUMBERS

PNEUMATIC ACTUATION COMPONENTS (CONTINUED)

6MM COPPER NICKLE PIPE
(Part No. 30804068)

The copper nickle pipe (suitable for bending) is used to connect pressure activated devices to the system, e.g. slave container, pressure switch, etc.

FIG. 3-51 PART NO. 30804068 6MM O.D. COPPER NICKLE PIPE

Technical Specification

Material:	Copper Nickel Alloy
Specification:	CN102
Maximum Working Pressure:	149.5 bar
Supplied Length:	Cut to length (Max 25 m)
Weight:	0.078 kg/m

6MM HALF HARD PIPE
(Part No. 308.002.002)

Where extensive actuation runs are required, 6mm half hard copper pipe can be used. This is supplied in 3m lengths and is not suitable for bending.

FIG. 3-52 PART NO. 308.002.002 6MM O.D. COPPER HALF HARD

Technical Specification

Material:	Phosphorous De-Oxidised Copper
Specification:	BS6017 Grade Cu-DHP
Maximum Working Pressure:	149.5 bar
Supplied Length:	3 m
Weight:	0.078 kg/m

6MM COMPRESSION TEE
(Part No. 30880015)

This is used primarily for connecting pilot lines from one slave container to the next.

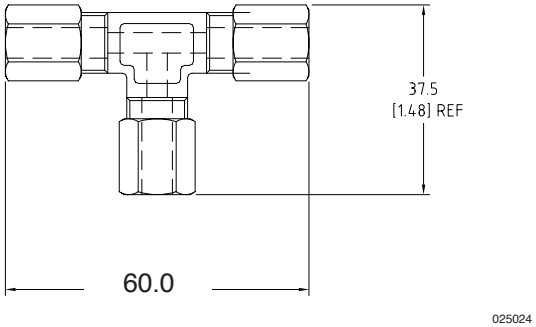

FIG. 3-53 PART NO. 30880015 COMPRESSION TEE

Technical Specification

Material:	Brass
Connection:	6mm DIN 2353 Compression Fittings
Overall Size:	60 mm x 37.5 mm
Weight:	0.064 kg

1/4 IN. BSP SOCKET
(Part No. 30880008)

On systems using both 6mm copper nickle pipe and flexible actuation hose a 1/4 in. BSP socket is used to make the connection. One side of the socket connects to the actuation hose (Part No. 30506014(550mm) or 30522001(700mm). The other side of the socket connects to the pilot line copper nickle pipe via the 1/4 in. BSPT x 6mm stud coupling (Part No. 30880007).

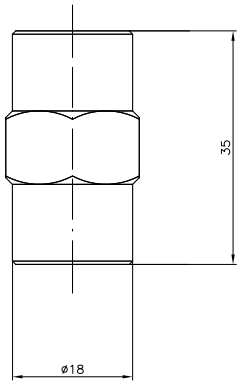

FIG. 3-54 PART NO. 30880008 SOCKET (1/4 IN. BSP)

Technical Specification

Material:	Brass
Type:	3000lb Fitting
Connection:	1/4 in. BSPP Female
Overall Size:	35 mm x 20 mm Hex
Weight:	0.057 kg

¼ IN. BSPT X 6 MM STUD COUPLING
(Part No. 30880007)

This is used in the pilot line when using copper nickel pipe and fits into the pneumatic actuator (Part No. 30118APB). It is also supplied with the pilot containers and fits into the pilot valve adaptor (part No. 35116381) as an alternative to the pilot actuation hose.

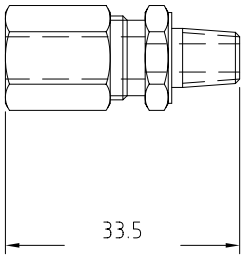

FIG. 3-55 PART NO. 30880007 6MM COUPLING STUD (BSPT)

Technical Specification

Material:	Brass
Connection:	1/4 in. BSPT
Overall Size:	33.5 mm x 16 mm
Weight:	0.024 kg

DOWTY SEAL 1/4 IN.
(Part No. 31199816)
The dowty seal is used for sealing component assemblies

FIG. 3-56 DOWTY SEAL

Technical Specification

Material:	Nitrile and steel
Hardness	85 ± 5 Shore A
Overall Size:	2.03 mm x Dia 20.57 mm
Weight:	0.005 kg

SPECIAL TOOLS

(Part No. as shown in table)

Special tools are required to attach and or tighten various components.

Part Number	Description
35017401	'C' Spanner Dia 35 mm-60 mm, Pin Dia 4 mm
35017402	'C' Spanner Dia 60 mm-90 mm, Pin Dia 5 mm
35017403	'C' Spanner Dia 90 mm-155 mm, Pin Dia 6 mm
35017404	'C' Spanner Dia 165 mm-230 mm, Pin Dia 10 mm
▸ 441564	Pneumatic Actuator Test Tool
▸ 441565	Pneumatic Actuator Test Tool, Package of Five
▸ 441566	Pneumatic Actuator Reset Tool

TABLE 3-20 SPECIAL TOOLS PART NUMBERS

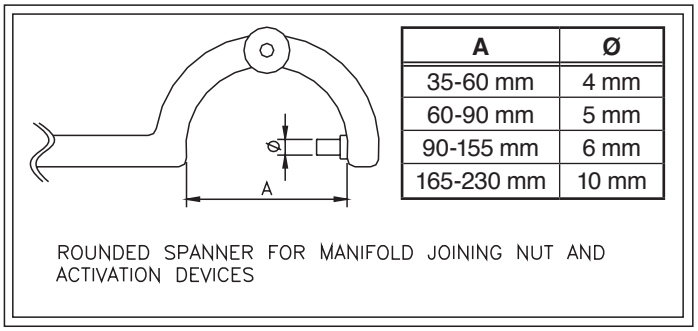

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FIG. 3-57 'C' SPANNER

▸

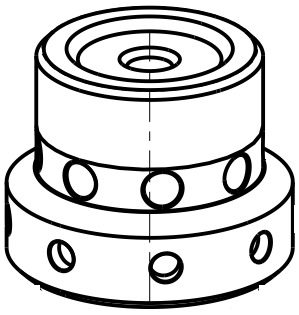

FIG. 3-58 PNEUMATIC ACTUATOR TEST TOOL (PART NO. 441564)

▸

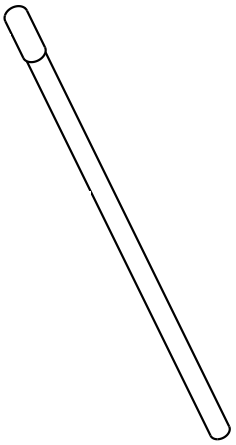

FIG. 3-59 PNEUMATIC ACTUATOR RESET TOOL (PART NO. 441566)

MANUAL RELEASE CAUTION PLATE
(Part No. 63013030)
The Manual Release Caution Plate provides instructions to personnel on the use of manual controls.
One plate is to be fixed adjacent to all positions from where IG-541 can be released manually.

Technical Specification

Material:	PVC
Sign Size:	210 mm x 75 mm
Font Type:	Helvetica Medium
Colours:	Black and Red

FIG. 3-60 MANUAL RELEASE CAUTION PLATE (PART NO. 63013036)

DOOR CAUTION PLATE - LOCK-OFF
(Part No. 63013031)
The Door Caution Plate (lock-off) provides instructions to personnel who may enter an area protected with IG-541. This version of the caution plate is used when it is necessary to instruct personnel to place the system on manual control before entering the protected area.
One plate is to be fixed to all entrance doors into an IG-541 protected area.

Technical Specification

Material:	PVC
Sign Size:	210 mm x 210 mm
Font Type:	Helvetica Medium
Colours:	Black and Yellow

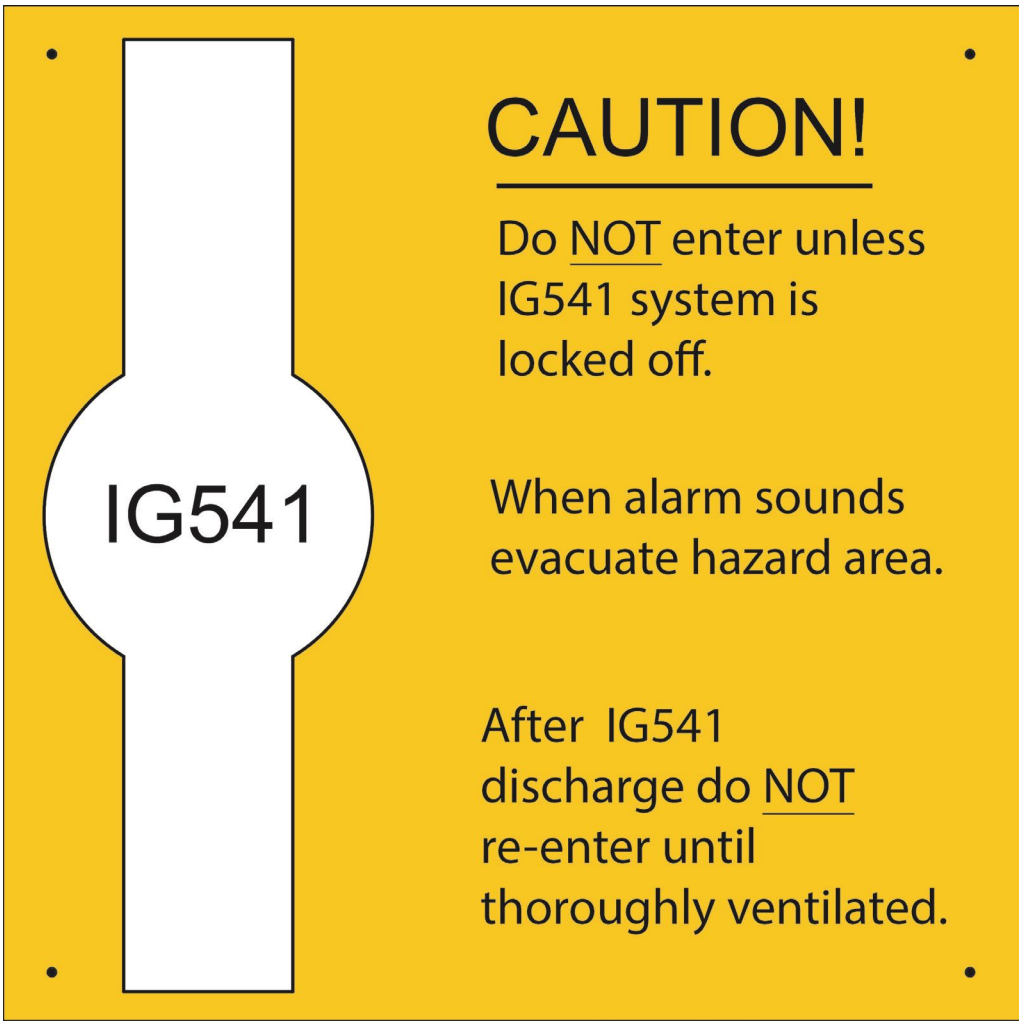

FIG. 3-61 DOOR CAUTION PLATE - LOCK-OFF (PART NO. 63013040)

DOOR CAUTION PLATE - NO LOCK-OFF
(Part No. 63013032)
The Door Caution Plate (no lock-off) provides instructions to personnel who may enter an area protected with IG-541. This version of the caution plate is used when it is permitted to leave the system on automatic control even while the area is occupied.
One plate is to be fixed to all entrance doors into an IG-541 protected area.

Technical Specification

Material:	PVC
Sign Size:	210 mm x 210 mm
Font Type:	Helvetica Medium
Colours:	Black and Yellow

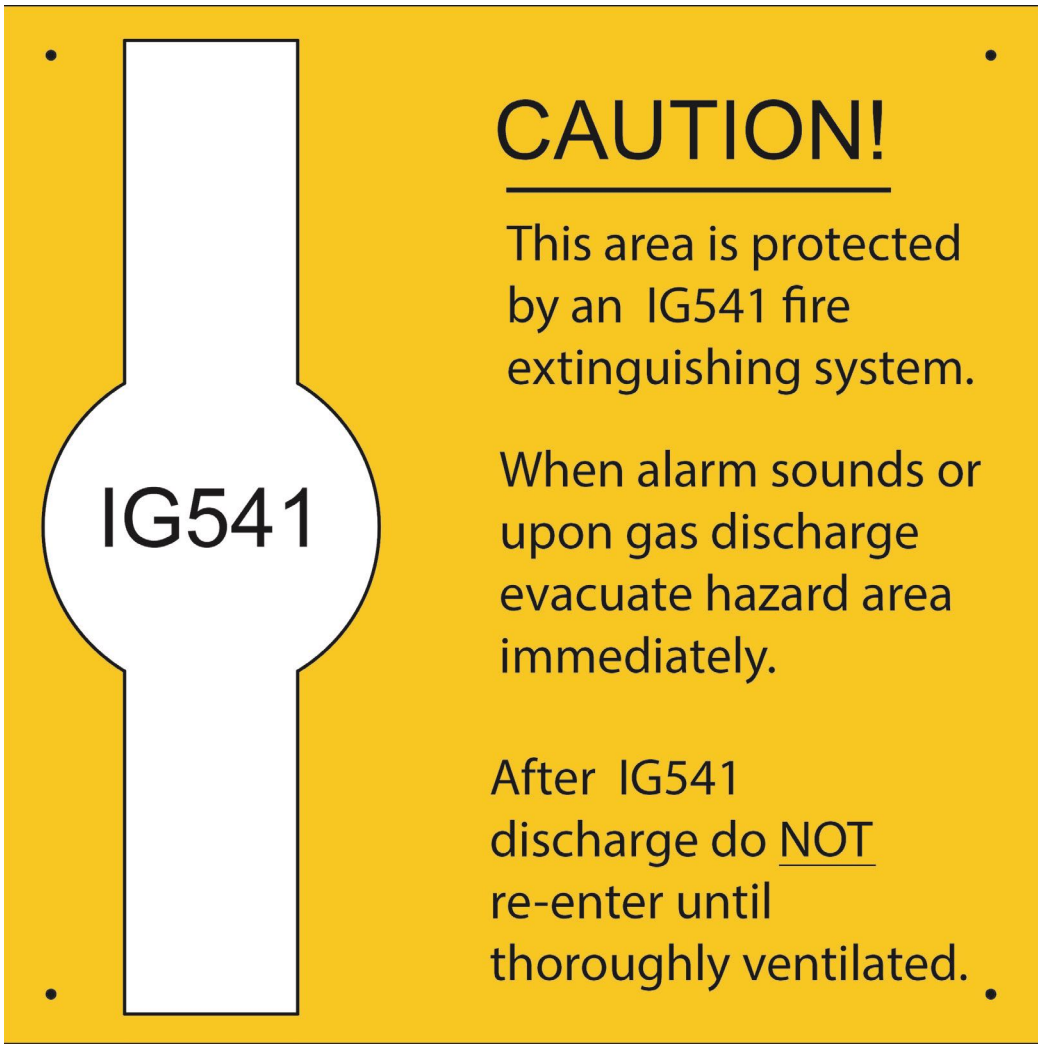

FIG. 3-62 DOOR CAUTION PLATE - NO LOCKOFF (PART NO. 63013045)

INSTALLATION

This section provides general guidance on the installation of iFLOW Fire extinguishing systems. However, it is of paramount importance that persons involved in the installation of this equipment have had previous experience in the installation of this or similar equipment. Appropriate items of safety equipment such as safety shoes should be worn by those involved in the installation work.

Equipment is to be installed in accordance with an approved drawing. It is not permitted for changes to equipment, pipework or nozzle positions to be made without the authority of the Extinguishing Systems Design Engineer.

DELIVERY AND HANDLING OF EQUIPMENT

i) Check all equipment delivered against the Delivery Note. Notify the supplier immediately if there is any discrepancy between the equipment received and that indicated on the Delivery Note.

ii) Store all equipment in a dry room at a temperature between -20 °C and 50 °C and protect from direct sunlight, until it is ready for installation. Keep containers upright and secure them so that they cannot fall over.

⚠ CAUTION

Make no attempt to move iFLOW containers unless they are fitted with transport caps and anti-recoil caps.

iii) It is usual for, but not essential, for the installation to start with the fitting of the containers. To move iFLOW containers use a trolley and if containers are to be raised over steps etc; ensure that appropriate lifting equipment is used. Under no circumstances must containers be rolled or dropped into position.

⚠ CAUTION

Until containers are fully connected into a completed pipework system and secured by the container bracketing the valve transport cap must not be removed.

CONTAINER FIXING

i) The container bank will be constructed to allow fitting to wall/supporting structure.

ii) Check that there is at least 300 mm free access at the ends of the container bank, and at least 1000mm free access at the front of the bank.

iii) Ensure that the floors and walls are flat.

iv) Matrix brackets can only be used with 80 litre iFLOW containers and can only be wall mounted. A maximum of four rows is permitted. The container bank must be configured so that a maximum of 4 x 80 litre iFLOW containers flow through the discharge hoses and check valves before connecting to a manifold or to the discharge pipework. If a manifold is required it is always fixed to the wall. Various typical container bank configurations are shown in the appendix to this manual. The general instructions for Matrix brackets are shown in figure 4-1 below.

v) 140 litre container brackets are only available for wall mounting. There are four types of brackets single row two containers, single row three containers, double row four containers and double row six containers. A maximum of two rows is permitted. The container bank must be configured so that a maximum of 2 x 140 litre iFLOW containers flow through the discharge hoses and check valves before either connecting to a manifold or to the discharge pipework. If a manifold is required it is always fixed to the wall. Various typical container bank configurations are shown in the appendix to this manual. The general instructions for 140 litre brackets are:

Single Row (only suitable for 2 x 140 litre systems):

vi) Fit rear crosspiece brackets to the wall, the lower bracket at the height of 845 mm and the upper bracket at the height of 1290 mm.

vii) Position first container against one end of the rear upper and rear lower cross piece bracket.

viii) Fit Rear separator rods to either side of the container by screwing into the rear upper and rear lower cross piece bracket using either a M12 square nut or a threaded hole in the bracket.

ix) Position the next container beside the first container and fix another separator rod.

x) Attach the front upper and front lower cross piece bracket to the separator rods and fix using a washer and a M12 stainless steel nut.

xi) Complete the pipework installation ready for connection to the container bank.

xii) Remove the container transport cap from the containers and then remove the anti-recoil cap and immediately fit the check valve to the valve outlet, interlink the discharge hoses between the check valves and fit to the installed pipework.

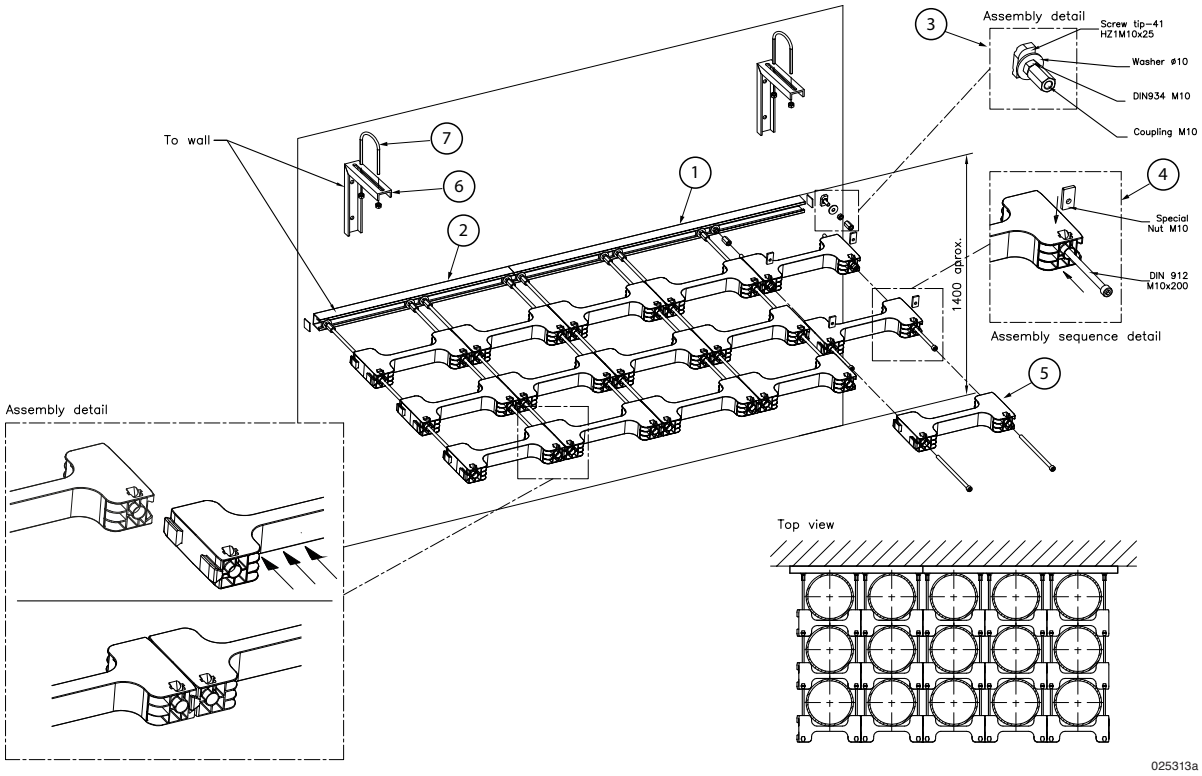

FIG. 4-1 IFLOW 80L MATRIX BRACKETS (80L)

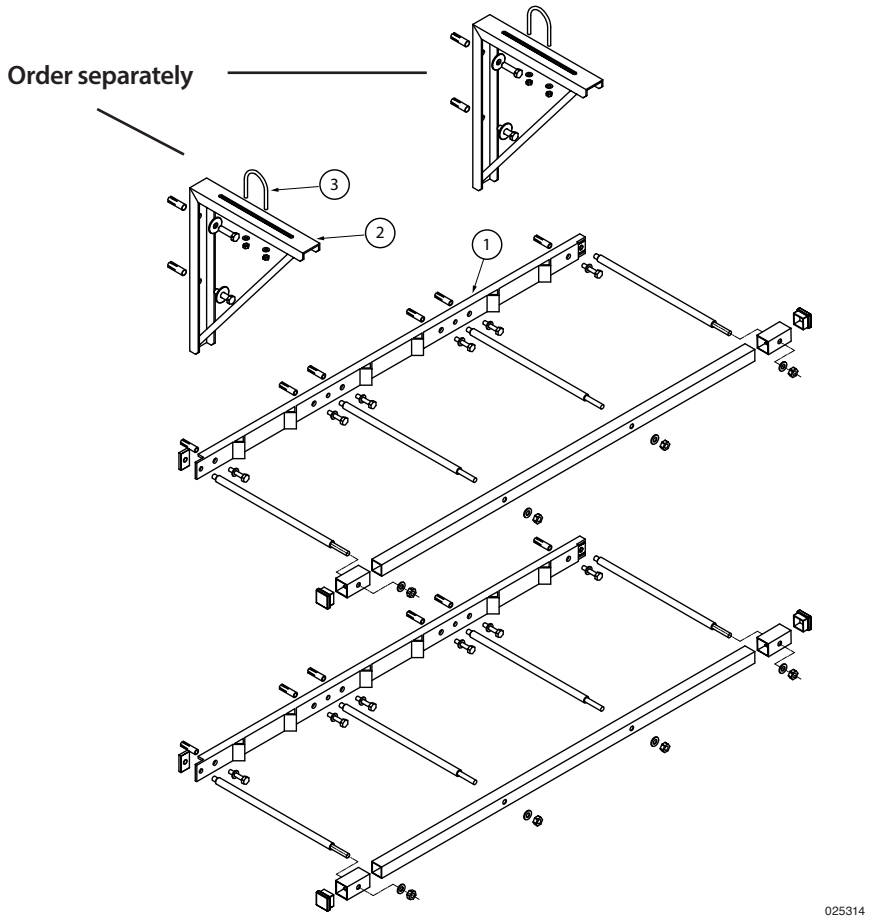

FIG. 4-2 IFLOW 140L SINGLE ROW CONTAINER BRACKETS (140L)

Double Row:

xiii) Fit the correct number of rear crosspiece brackets to the wall, the lower bracket at the height of 845 mm and the upper bracket at the height of 1290 mm.

xiv) Position first container against one end of the rear upper and rear lower cross piece bracket.

xv) Fit rear separator rods to either side of the container by screwing into the rear upper and rear lower cross piece bracket using either a M12 square nut or a threaded tapping in the bracket.

xvi) Position the next container beside the first container and fix another separator rod.

xvii) Repeat xvi) until the required number of containers are in the rear row.

xviii) Attach the middle cross piece bracket to the separator rods and fix using one washer and one M12 separating device per separator rod.

xix) Position the first container in the second row against one end of the middle cross piece and attach a separator rod either side of the container by screwing it into the M12 separating device.

xx) Position the next container in the second row beside the first container in the second row and fix another separator rod.

xxi) Repeat step xx until the required number of containers are in the front row.

xxii) Attach the required number of front cross piece to the separator rods using a washer and M12 stainless steel nut. (Reference Figure 4-3).

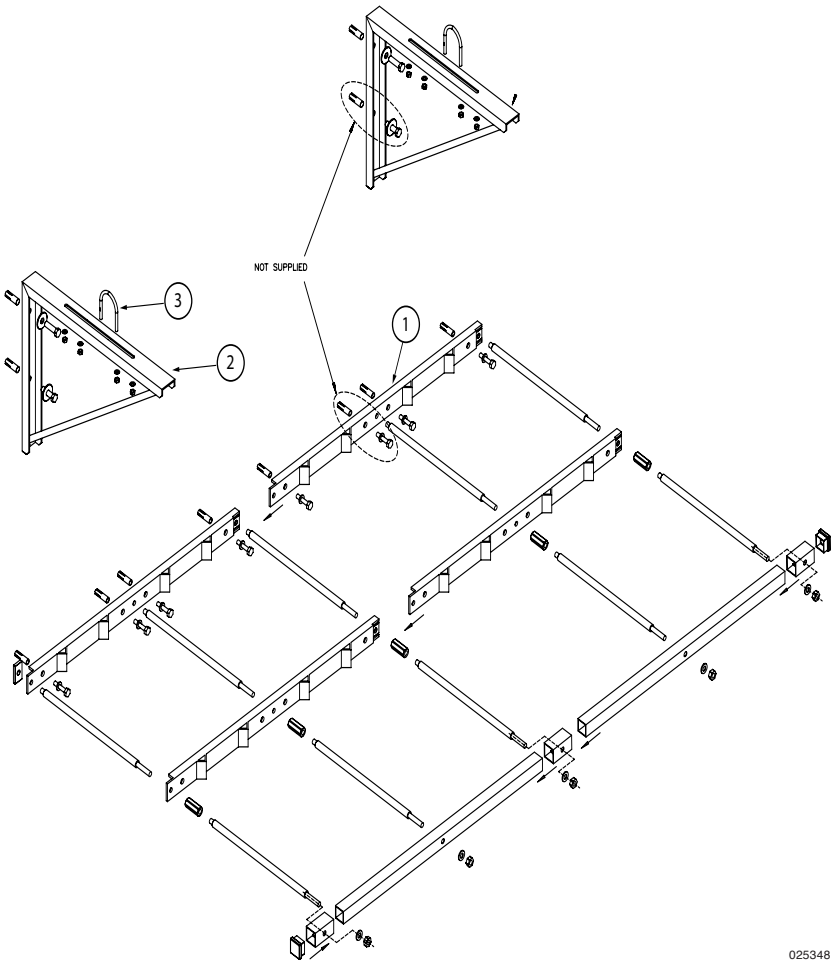

FIG. 4-3 IFLOW DOUBLE ROW CONTAINER BRACKETS

CHECK VALVE INSTALLATION

i) The inlet of the check valves are assembled directly on to the outlet of the iFLOW container valve. The discharge hoses are fitted between the check valves.

ii) To connect the discharge hoses, see page 4-5.

iii) Install the wall mounting bracket, then the manifold and the discharge pipework. Next secure the container with their container brackets before removing the container transport caps and fitting the check valves to the outlet of the container valve.

iv) The check valves are fitted to the outlet of the container valve via the swivel nut. Sealant is not required on this joint.

v) Tighten using a wrench on the swivel nut while at the same time holding the check valve body in the correct orientation with another wrench.

⚠ CAUTION

Should one container need to be removed from the installation due to leakage or similar problem the check valve should be removed from the container valve outlet by unscrewing the swivel nut. The discharge hoses going into and coming from the check valve should be left securely fastened to the check valve. (See label in Figure 4-5)

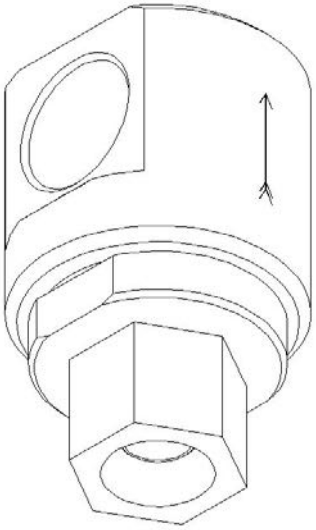

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FIG. 4-4 IFLOW CHECK VALVE

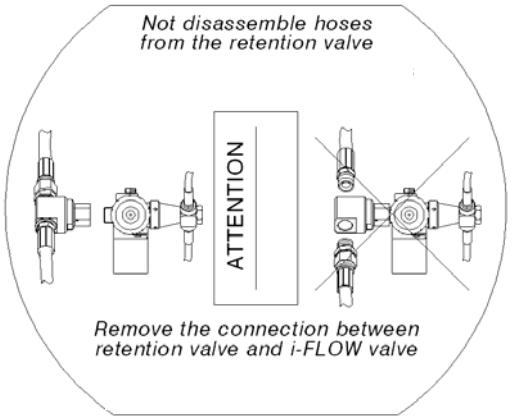

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FIG. 4-5 IFLOW CHECK VALVE LABEL

DISCHARGE HOSE INSTALLATION

i) The discharge hose has a fixed male thread one end and a swivel female thread the other end.

ii) There are four different types of hose available, two for 80 litre containers and two for 140 litre containers (see page 3-28). They are both of the same design and only differ in their overall length. The shorter length hose allows connection between rows, whilst the longer length hose allows connection within the same row.

iii) On the first container one side of the check valve is sealed using a ¾ in. blind cap and a bonded seal. The other side has male adaptor fitted to it.

iv) The male end of the discharge hose is screwed into the second check valve and then the female swivel end of the hose is attached to the male adaptor fitted to the first check valve end (see Figure 4-6).

v) A dowty seal is also used to attach the male adaptor to the check valve. No thread sealant is required on any joints for the discharge hose/check valve process.

vi) Repeat the connection steps for the remaining containers.

vii) At the last container the final discharge hose is connected either to a manifold or directly to the discharge pipework.

Note:

A maximum of 4 x 80 litre and 2 x 140 litre containers can be connected this way. For large systems the container bank needs to be configured to take this into account.

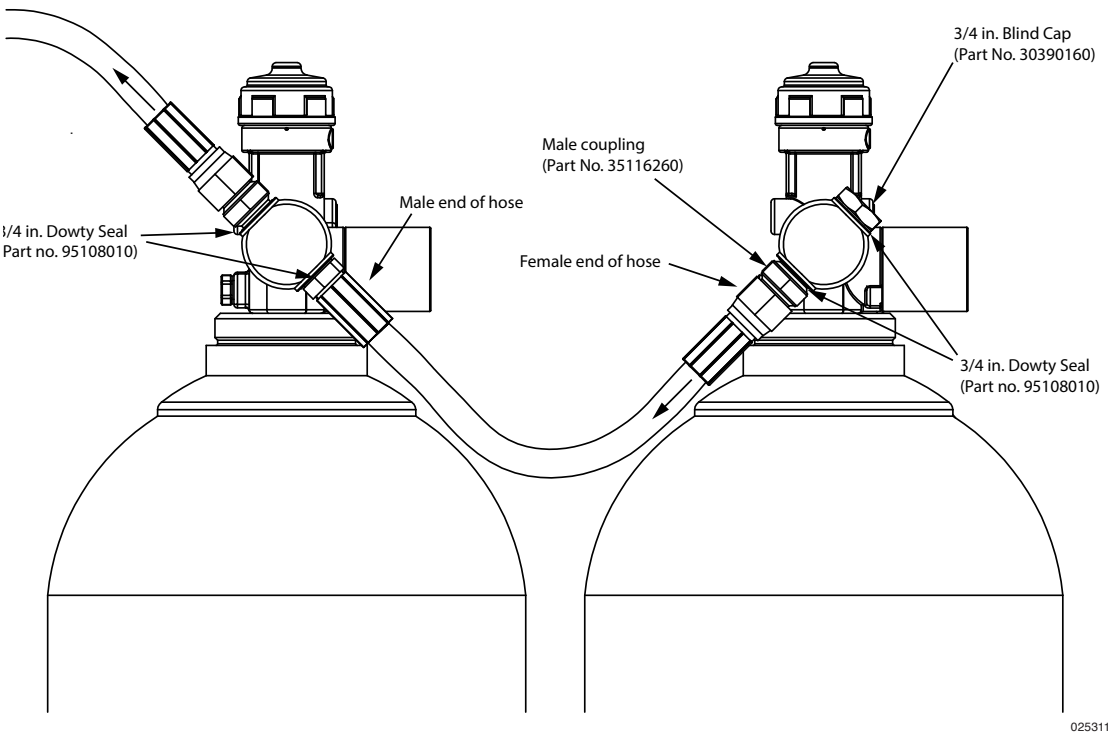

FIG. 4-6 IFLOW DISCHARGE HOSE IN MATRIX SYSTEM

ACTUATION INSTALLATION

PILOT CONTAINER

The iFLOW Container bank is normally operated by a pilot container. The pilot container contains nitrogen at 100bar. There are three sizes available 3 litre, 13 litre and 50 litre. All are supplied with a contacted pressure gauge, solenoid and manual actuator (manual release). The contacted pressure gauge and solenoid are factory fitted but the manual actuator is fitted on site. When the pilot container is operated pressure flows to the pneumatic actuators fitted to the iFLOW container valves.

Fix the pilot container bracket to the wall. Then fit the pilot container to its bracket and ensure that the pressure gauge is visible and that the manual actuator is easily accessible.

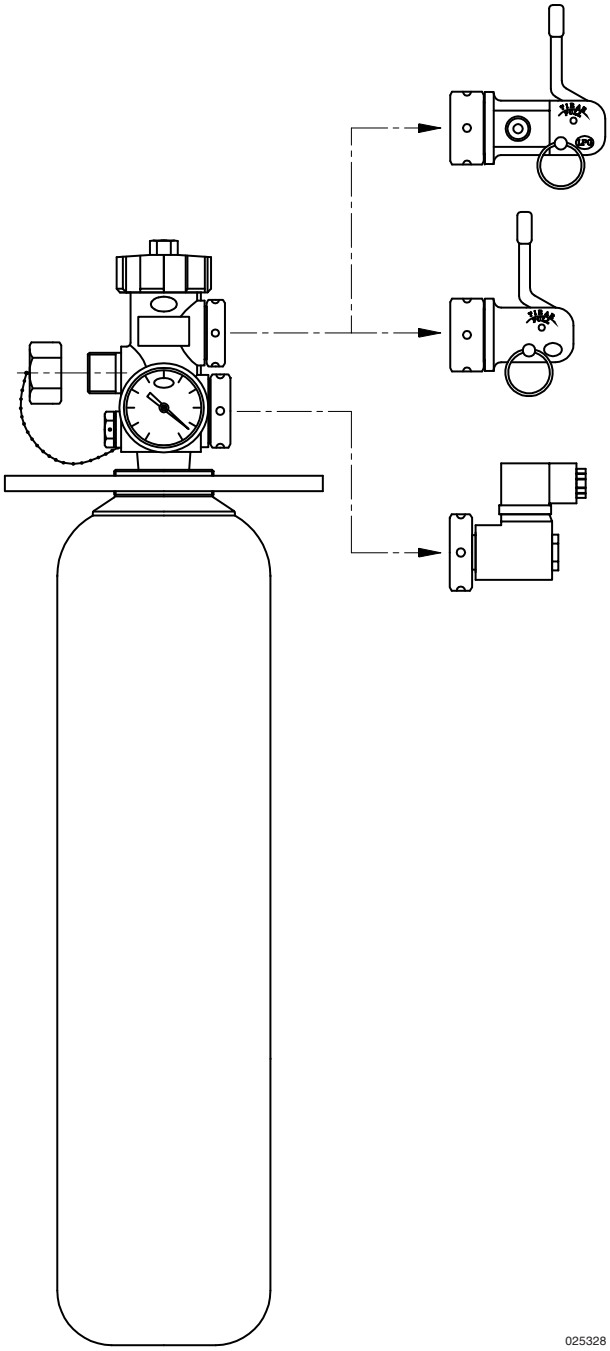

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FIG. 4-7 IFLOW PILOT CONTAINER AND VALVE

Remove the pilot valve top cap when fitting the control actuation hoses and the pneumatic actuators to the iFLOW container valves. When the pilot container top cap is removed if the unit is accidentally operated via one of its actuation devices the valve will not open.

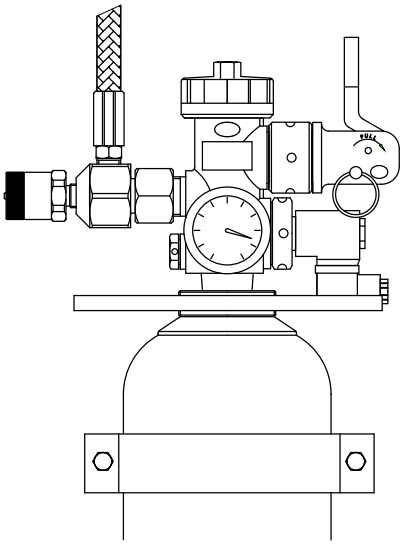
Fit the outlet adaptor to the outlet of the pilot container valve then fit the tee piece to the outlet adaptor.

From the tee piece you can fit either an actuation hose or an adaptor to 6 mm tubing. The bleed valve is fitted to the other port in the tee piece.

All of these components are supplied with the pilot container and do not need to be ordered separately.

Note:

WHEN ALL ACTUATION DEVICES ARE FITTED TO THE CONTAINER BANK REPLACE THE PILOT CONTAINER TOP CAP



MANUAL ACTUATOR LEVER

This device allows a manual actuation of the pilot container. To activate the pilot container first remove the safety pin then manually pull the lever backwards and downwards (see page 3-14).

i) Check that seals in the safety pin are not damaged and that the o-ring is located in its groove.

ii) The release is fitted to the pilot container as indicated in Figure 4-7.

iii) Before fitting check that the pneumatic actuator pin is fully seated (see caution note below).

iv) Tighten using the gooseneck wrench specified in this manual.

v) The unit is sealed by its o-ring and no additional sealant is required.

⚠ CAUTION

Before installing the manual actuator onto the valve, check that the piston is fully seated inside its housing by pushing down with a screwdriver. Afterwards, check with a ruler that the needle has a 3.0 mm - 4.5 mm clearance as shown in Figure 4-9.

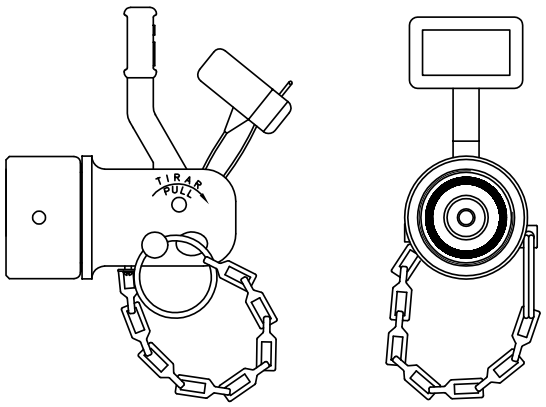


FIG. 4-8 MANUAL ACTUATOR LEVER

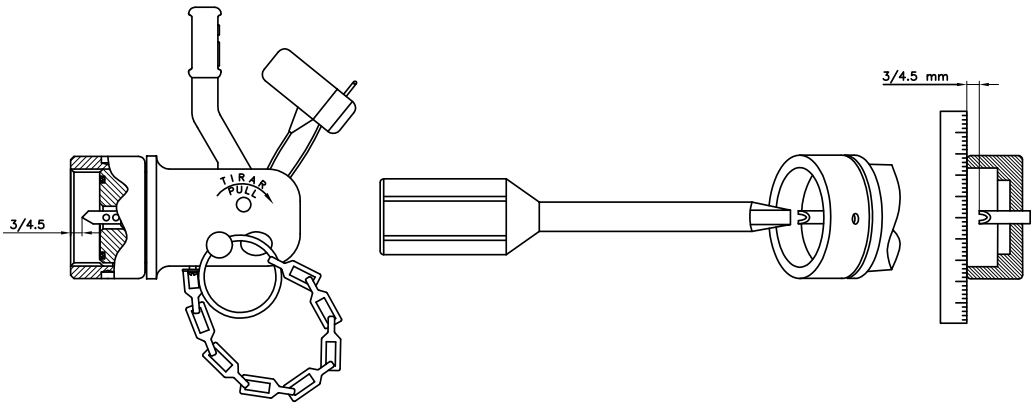


FIG. 4-9 CHECKING MANUAL ACTUATOR PISTON IS PROPERLY SEATED

PRESSURE SWITCH WITH INTERLOCK

The pressure switch has two sets of contacts, normally open and normally closed. The pressure switch may be used to provide an electrical indication of the release of IG-541 or to perform ventilation shutdowns or other interlock functions. For iFLOW systems using a manifold it is mounted on the manifold. For iFLOW systems not requiring manifolds it is mounted on the coupling union used to connect the container bank to the discharge pipe work.

i) Apply a suitable pipe sealant to the threaded connection. Do not apply pipe sealant to the two first threads.

ii) Tighten union with a suitable spanner.

iii) Electrical connections are detailed in the electrical instlation section of the manual (see page 4-14).

Note:

The pressure switch is reset after discharge by pulling the knob on the side of the unit.

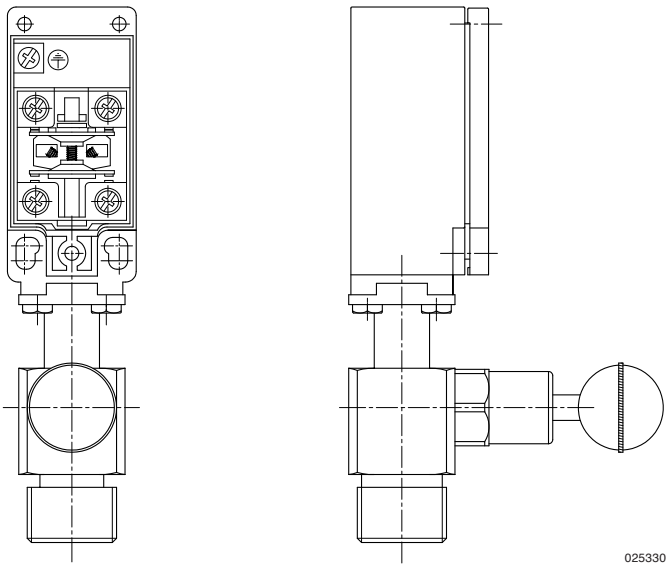


Fig. 4-10 Pressure Switch with Interlock

SELECTOR VALVE

Selector valves have threaded connections. They are connected between the end of the discharge manifold and the discharge pipe system for a particular hazard.

Selector valve manifolds designed for use with the selector valve are available. Alternatively manifolds can be fabricated using special weldolets as specified in this manual.

i) First fit the selector valve manifold to the end of the discharge manifold then fit the selector valve to the selector valve manifold.

ii) Apply Teflon tape (PTFE) to the male thread on the selector valve manifold outlet. Do not apply Teflon (PTFE) tape to the first two threads.

iii) Then attach the 6mm pneumatic actuation tubing to the inlet of the selector valve pneumatic piston.

iv) Finally connect the 6 mm pneumatic actuation tubing to the outlet port of the pneumatic piston and run the 6 mm pneumatic actuation line to the container bank to operate the appropriate number of iFLOW container(s) for the hazard.

⚠ CAUTION

The selector valve pneumatic piston pivots on its top mounting during actuation and the 6mm pneumatic actuation line needs to be able to flex to accommodate this movement. Typically a “pigtail” (coil) in the pneumatic actuation line is sufficient. Alternatively a suitable flexible hose may be used

SELECTOR VALVE SOLENOID AND MANUAL ACTUATOR

Electrical and manual activation device to control the opening of the selector valves. Brackets are available to mount 2, 3 or 4 selector valve solenoids. The inlet pressure to the selector valve solenoid comes from the operation of the pilot container. The outlet pressure then opens the appropriate selector valve once the solenoid on the selector valve solenoid is activated.

This component is supplied with the selector valve and does not need to be ordered separately.

i) Secure the bracket to the wall at an appropriate height to enable easy manual actuation.

ii) 6mm actuation piping is used to connect the outlet of the pilot container to the inlet(s) of the selector valve solenoid(s).

iii) 6mm actuation piping is then fitted between the outlet of the selector valve solenoid and the inlet of the appropriate selector valve pneumatic piston.

⚠ CAUTION

It is essential to ensure that the pressure from the pilot container goes to the inlet part of the selector valve solenoid. If accidentally fitted to the outlet the wrong selector valve could operate when the pilot container discharges. The inlet is marked “1”, and the outlet is marked “2”.

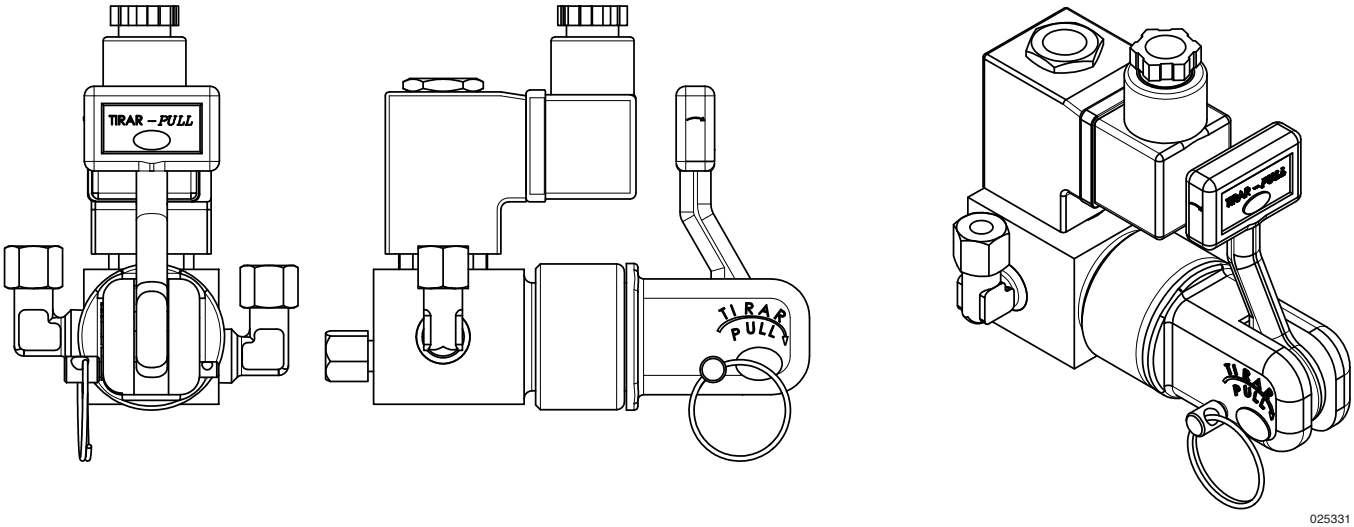


FIG. 4-11 SOLENOID VALVE AND MANUAL ACTUATOR

RELEASE SYSTEMS FOR SELECTOR VALVES

The fitting of selector valves to an iFLOW system allows multiple hazards to be protected from a single bank of containers. Figure 4-12 shows a system where four containers can be discharged into either one of two hazards. If there is a fire in Area 1 the selector valve needs to be operated and then the four containers in the container bank need to be released. A typical operating sequence is as follows:

i)The fire detection system in area 1 activates and sends a signal to the solenoid mounted on the pilot container. At the same time an electrical signal is also sent to open the selector valve solenoid for Area 1.

ii)The pilot container operates and sends pressure into the 6 mm actuation line and through the open selector valve solenoid for Area 1.

iii)Pilot container pressure from the outlet of the open selector valve solenoid then flows to the inlet of the selector valve actuation piston.

iv)This pressure operates the selector valve actuation piston and opens the selector valve.

v)When the selector valve is fully open pilot line pressure flows from the exhaust port of the selector valve pneumatic piston and operates the containers in the container bank.

NOTICE

Only the configurations shown in this manual as the permitted variations to fit a non-return valve can be used. Failure to use the specified fittings may result in the pilot line non-return valve malfunctioning and therefore causing the suppression system to fail to operate.

If the fire is in Area 2, the fire detection system in that area sends a signal to operate the Area 2 selector valve solenoid. In this case the actuation pressure is supplied to containers 1, 2 and 3 but prevented from being supplied to container 4 by the actuation line non-return valve. This results in only 3 containers being discharged to Area 2.

Both the pilot container and the selector valve solenoid are fitted with manual actuators to operate the system in the event of an electrical failure. Figure 4-12 shows an installation where an unequal number of containers are required for each hazard. The system can be designed to operate any number of iFLOW containers to enable the protection of hazards of equal or unequal size. In these installations pilot line non-return valves are used to control the number of containers discharged into a particular hazard.

The pilot line non-return valve is normally installed with its outlet fitted directly to the pneumatic actuator. It is therefore supplied with an adaptor fitted to its outlet with the correct male thread to fit directly to the pneumatic actuator. No pipe sealant is required when fitted to the pneumatic actuator in this manner. This is the preferred method of installing a pilot line non-return valve and the designer should always try to configure the system in this manner.

However various adaptors are available to fit the pilot line non-return valve using pilot line hoses or 6 mm o/d tubing if the preferred method is not suitable.

The permitted variations to fit the pilot line non-return valve are detailed in this manual.(See table 4-1)

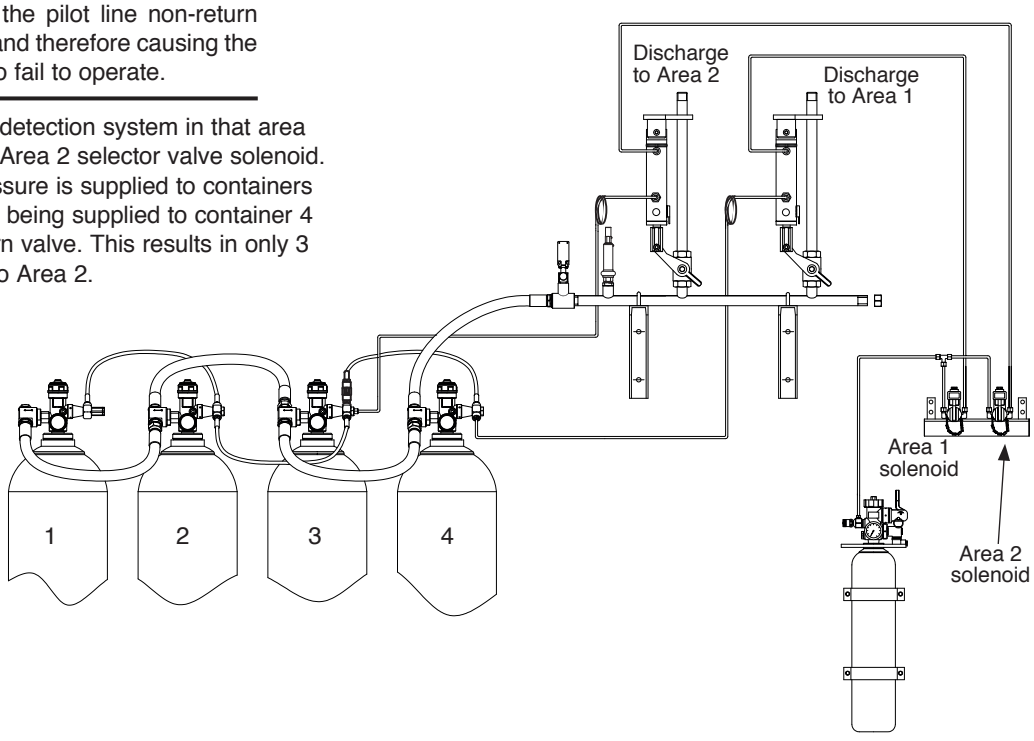


FIG. 4-12 RELEASE SYSTEM FOR SELECTOR VALVES
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RELEASE SYSTEMS FOR SELECTOR VALVES

Pilot Line Non-return Valve Configurations

Configuration	Parts Required	Comments
Inlet to pilot line non-return valve is an actuation hose; outlet fitted directly to a pneumatic actuator	1 x Part No. 20006020 pilot line non-return valve	No additional components required
Inlet to pilot line non-return valve is 6 mm o/d copper tubing; outlet fitted directly to a pneumatic actuator	1 x Part No. 20006020 pilot line non-return valve 1 x Part No. 30880007 6 mm o/d tubing male adaptor	Fit Part No. 3088007 to the inlet of the pilot line non-return valve
Inlet to pilot line non-return valve is an actuation hose; outlet is an actuation hose	1 x Part No. 20006020 pilot line non-return valve 1 x Part No. 30880059 female/female actuation hose coupling	Fit Part No. 30880059 to the outlet of the pilot line non-return valve
Inlet to pilot line non-return valve is 6 mm o/d copper tubing; outlet is 6mm o/d copper tubing	1 x Part No. 20006020 pilot line non-return valve 2 x Part No. 30880007 6 mm o/d tubing male adaptor	Remove adaptor supplied fitted to the pilot non-return valve outlet and fit Part No. 30880007 to both inlet and outlet of the pilot container non-return valve

TABLE 4-1 RELEASE SYSTEM COMPONENTS

SOLENOID VALVE

The solenoid valve is used to electrically operate the pilot container valve. When the coil is energised it opens the solenoid valve and allows the pilot container internal pressure to open the pilot container valve.

The solenoid valve is supplied factory fitted to the pilot container. Do not electrically connect the unit until the system is ready for commissioning.

⚠ WARNING

In the event of a fault with the solenoid valve return the complete pilot container to TYCO. DO NOT ATTEMPT TO REMOVE THE SOLENOID FROM THE PILOT CONTAINER ON SITE.

PNEUMATIC ACTUATOR

The pneumatic actuator comprises an internal piston fitted with firing pin. When the piston is pressurised by the pilot container it moves forward and the firing pin ruptures an actuating disc in the iFLOW valve causing it to operate.

The pneumatic cone has a pneumatic coupling attached to it by a fixing screw. The pneumatic coupling has an inlet and an outlet to which actuation hoses may be attached. It is also supplied with a ¼ in. blind cap to enable the outlet to be plugged.

To assemble the pneumatic actuator to the iFLOW valve carry out the following steps:

i) Loosen the fixing screw so that the pneumatic coupling is still attached to the pneumatic cone but is free to rotate.

ii) Fit the pneumatic cone to the iFLOW valve of each container in turn using the 35-60mm ‘C’ Spanner (Part No. 35017401). Turn the ‘C’ Spanner slowly until resistance is felt and then from this point turn for a further 60°.

iii) Re-attach the pneumatic coupling to the pneumatic cone using the fixing screw and tighten with a torque wrench to 20Nm, ensuring that the coupling ports are correctly oriented for installation of the actuation hoses.

iv) Fit the actuation hoses to the inlet and outlet of the pneumatic coupling.

v) On the last container to be pneumatically operated fit the supplied ¼ in. blind cap to the pneumatic coupling outlet port.

vi) The unit is sealed by its o-ring and no additional sealant is required. By not removing the pneumatic coupling from the pneumatic cone during installation the o-rings should not have been displaced thereby maintaining the seal.

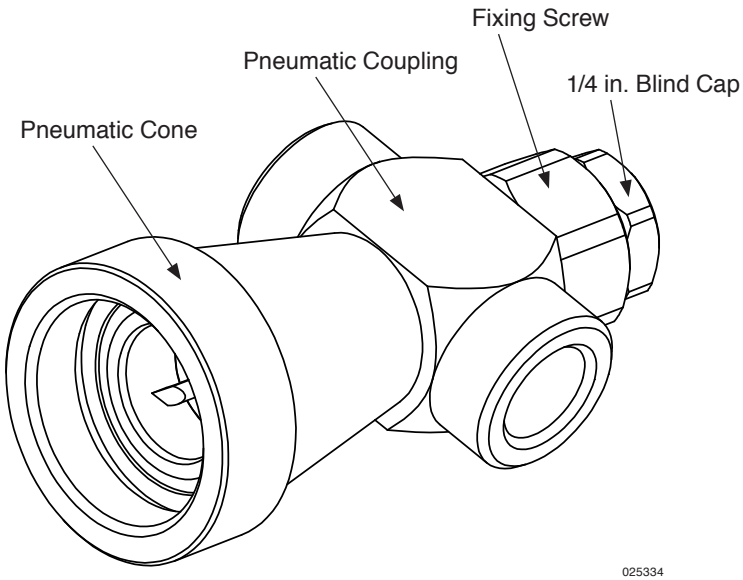

FIG. 4-13 PNEUMATIC ACTUATOR

⚠ CAUTION

Before fitting the pneumatic cone to the iFLOW valve ensure that the operating pin is fully retracted by pushing down with the pneumatic actuator reset tool. The operating pin must not be protruding from the pneumatic cone.

ACTUATION HOSE

The ¼ in. diameter hoses fitted with brass swivel ends are used to connect from the outlet of the pilot container / pneumatic port on the pneumatic manual actuator (opposite the metron actuator) to the inlet of the pneumatic actuator on the first iFLOW container and then to interconnect between the remainder of the pneumatic actuators fitted to the other containers in the container bank. The bending radius is 30 mm. They are available in two different lengths / pressure ratings to suit various configurations of the container bank (see page 3-28).

i) Firstly fit the actuation hoses between the pneumatic actuators fitted to the iFLOW valve. It is recommended not to connect the actuation hose between the pilot container / master pneumatic manual actuator and the first container in the container bank until the system is being commissioned.

ii) For selector valve systems various fittings and non-return valves are available to configure the container bank. For these systems reference must be made to the installation drawings to enable the correct configuration of the pneumatic actuation line.

iii) No sealant is required when fitting hoses to the pneumatic actuators.

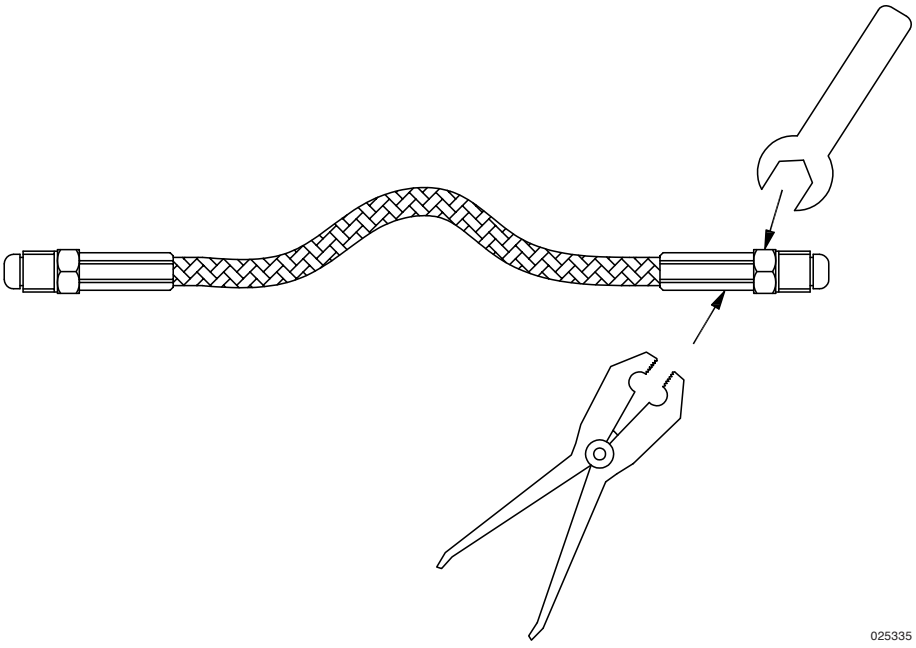

FIG. 4-14 ACTUATION HOSE INSTALLATION

⚠ CAUTION

Avoid twisting the flexible hoses during assembly. Hold the hose fitting with pliers while tightening the swivel end of the hose into the pneumatic actuator.

ELECTRICAL INSTALLATION

Once the pneumatic actuation line is completed the various electrical components can be electrically connected. It is recommended that the top cap on the pilot container valve is removed while carrying out the electrical installation as then if there is an accidental operation of the electrical solenoid the pilot container will not operate. The electrical connections for the various components are described in this section.

PRESSURE SWITCH

For a normally closed circuit connect to the top two terminals (as shown in figure 4-15). For a normally open circuit connect to the bottom two terminals.

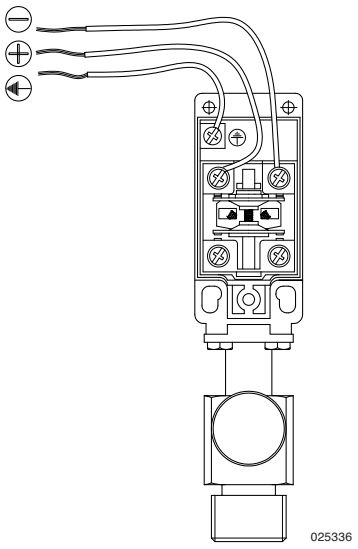

FIG. 4-15 PRESSURE SWITCH ELECTRICAL INSTALLATION

SOLENOID VALVE

Make sure that the electrical power supply is disconnected during electrical connections that the top cap is removed. Connect solenoid valve as shown below:

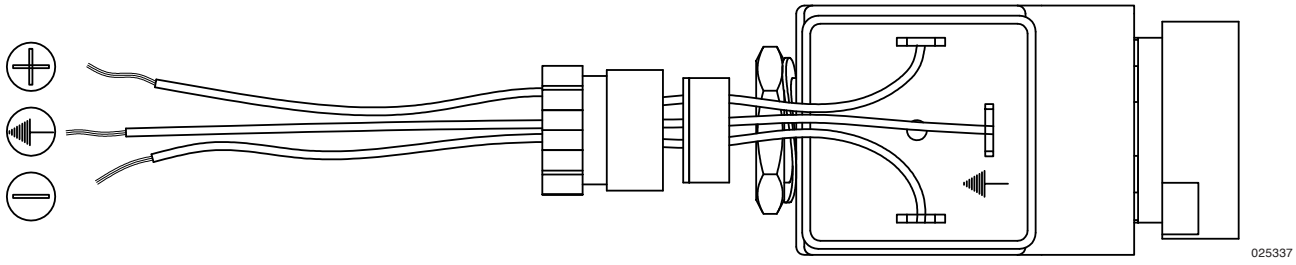

FIG. 4-16 SOLENOID VALVE ELECTRICAL INSTALLATION

Once connected, place back the top cap of the pilot valve.

PRESSURE GAUGE (CONTACTED TYPE)

The pressure gauges with electrical contacts are NORMALLY OPEN under zero pressure (container empty) and should be wired as below: **(Voltage input can be applied to either terminal).**

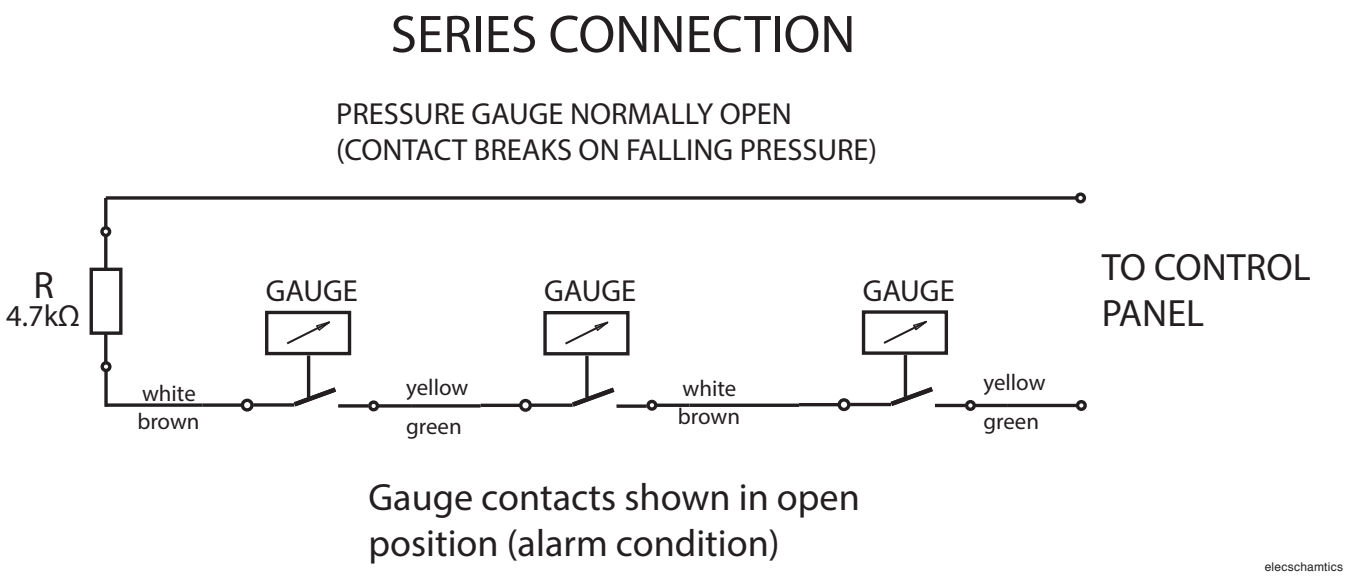

FIG. 4-17 CONTACTED PRESSURE GAUGE ELECTRICAL INSTALLATION

Technical Specification

Voltage:	4.5 - 24V dc
Current:	5 - 50 mA
Max. Consumption:	3 W

PIPE DISTRIBUTION SYSTEM

The discharge pipe system must be installed as indicated on the installation drawings.

Maximum distance between two pipe fixings on the installed pipe shall not exceed the following values:

Nominal Diameter (mm)	Nominal Diameter (inches)	Maximum Distance Between Supports (m)
10	3/8	1.0
15	1/2	1.5
20	3/4	1.8
25	1	2.1
32	1 1/4	2.4
40	1 1/2	2.7
50	2	3.4
▸ 65	2 1/2	3.5
80	3	3.7
100	4	4.3

TABLE 4-2 MAXIMUM PIPE SUPPORT SPACINGS

If the pipe is more than 2 inches nominal bore (DN 50) and the above distances cannot be adhered to the distance between pipe fixings can be extended to up to 6 metres. However the pipe fixing at each end of the pipe must then be doubled up.

Pipe fixings should be placed closely to elbows, tees, etc where a change of the direction of the pipe takes place.

Pipe fixings should connect the pipe system directly to building structure. Other pipes and services should not be supported the system's extinguishing pipe work. Care should be taken to ensure that the area to which the pipe support is fixed to is strong enough to take the load.

The distance between the nozzle and its pipe fixing shall be as short as possible.

-For nozzle sizes 25 mm and below the maximum distance from the pipe fixing to the nozzle shall be 0.1 m.

-For nozzle sizes above 25 mm the maximum distance from the pipe fixing to the nozzle shall be 0.25 m.

For pipe sizes up to 2 in. (DN50) support by 10 mm steel studding is recommended.

For pipe sizes above 2 in. (DN50) support by 12 mm studding is recommended.

After installation of the pipe work and nozzles carry out a purge of the pipework to remove any cutting oil or swarf in the pipe system. Disconnect the containers from the manifold fit any plugs as necessary and purge the pipe work with a nitrogen container fitted with a suitable pressure regulator.

In order to minimise discharge of oil and swarf it is recommended to put bags over the nozzles to collect debris

If a purge of the pipework is not required or possible at this stage, ensure that this is reported to the commissioning engineer so that arrangements can be made for this to be done at the commissioning stage.

DISCHARGE NOZZLE INSTALLATION

Nozzles consist of a diffuser body and an orifice. The orifice is drilled to the size required by the iFLOW system design flow program. The diffuser body is supplied with this drill size (orifice) stamped in its body. The installation drawing will indicate both the position of the nozzle and its drill size (orifice).Each nozzle must be installed in the position indicated in the installation drawing and must have the drill (orifice) size indicated on the installation drawing.

⚠ CAUTION

It is very important that nozzles are fastened securely that they never point directly at ceiling tiles. Nozzles must never be attached directly to the outlet of a container valve

To fit the nozzle apply pipe sealing compound to the male thread on a pipe or fitting ensuring that the first two threads have no sealant. Then screw the nozzle on to the male thread and tighten using a suitable wrench.

Note:

Some typical installation drawings are show in Section 7 (Appendix) of the manual

COMMISSIONING

This section provides guidance on the commissioning of iFLOW Fire Extinguishing Systems and is in the form of a check list to be completed by the person carrying out the commissioning. The commissioning schedule (document 14A-06-1, an example is shown on pages 5-7 to 5-10) is intended to cover the majority of the equipment and configurations likely to be encountered, however, where appropriate it may be necessary to carry out additional checks to those listed.

All sections must be completed, or if not applicable, write N/A in the appropriate space.

It is essential that persons carrying out commissioning of iFLOW systems are experienced in the commissioning of this type of equipment.

Container pressures adjusted for temperature are to be checked for compliance using Chart 5-1 on Page 5-6.

The schedule is to be completed by the responsible person, during the commissioning of all new systems and those that have been modified.

PIPEWORK INTEGRITY

Pressure test the discharge pipework in accordance with requirements of the applicable design standard.

DISCHARGE PRESSURE SWITCH TEST

To test the electrical operation of the Discharge Pressure Switch carry out the following procedure (Refer to Figure 5-1):

i) Remove the cover of the discharge pressure switch exposing the wiring connections.

ii) With the wiring to the unit still connected remove the top body of the discharge pressure switch which contains the wiring terminals and the units micro switch. When this is done the bottom of the piston that operates the internal micro switch is exposed.

iii) With a screwdriver push the exposed piston upwards to operate the micro switch.

iv) Check that the appropriate signal is received at the extinguishing Releasing Panel.

v) Re-assemble the discharge pressure switch and reset it by pulling out the knob set in its side.

PNEUMATIC ACTUATION LINE TEST FOR SINGLE RISK AREA SYSTEMS

i) Remove the top caps from the iFLOW containers.

ii) Disconnect the actuation hose from the outlet of the pilot container (this is fitted between the pilot container and the first iFLOW container in the container bank).

iii) Remove the pneumatic actuators from all of the iFLOW containers. Then fit the pneumatic actuator test tool (part no. 441564) onto each actuator hand tight. Refit the pneumatic actuators to the iFLOW container valves.

iv) Attach a nitrogen container which is fitted with a suitable pressure regulator and pressure relief valve (see Figure 5-2) to the actuation hose that has been disconnected from the pilot container. Adjust the outlet pressure of the nitrogen pressure regulator to 8 bar - 10 bar and then open the valve on the nitrogen container to apply pressure to the pneumatic actuation line.

v) Check for leaks by applying a suitable leak detection spray to all of the joints in the pneumatic actuation line.

⚠ CAUTION

Before refitting the pneumatic actuators to the iFLOW valves, ensure that the piston is fully retracted within the actuator with a 3.0 mm - 4.5 mm clearance as shown in Figure 5-1.

vi) Close the valve on the nitrogen container and vent the pressure from the pneumatic actuation line.

vii) Inspect each actuator and check that they have operated by inserting a small screw driver into the inspection holes provided in the pneumatic actuator test tool and confirming the puncture pin is in the actuated position. Dis-assemble the pneumatic actuator and pneumatic actuator test tool from the valve

viii) Reset the pistons in the pneumatic actuator by pushing them fully into the actuator body using the pneumatic actuator reset tool (441566) (see Figure 5-1)

ix) Refit actuation hose to the outlet of the pilot container.

x) Refit top caps to the iFLOW and pilot container valves at a torque of 33.9 Nm to 40.7 Nm.

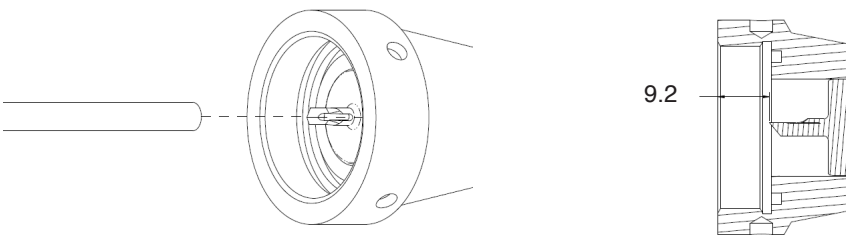

FIG. 5-1 RESETTING THE PISTON IN THE PNEUMATIC ACTUATOR

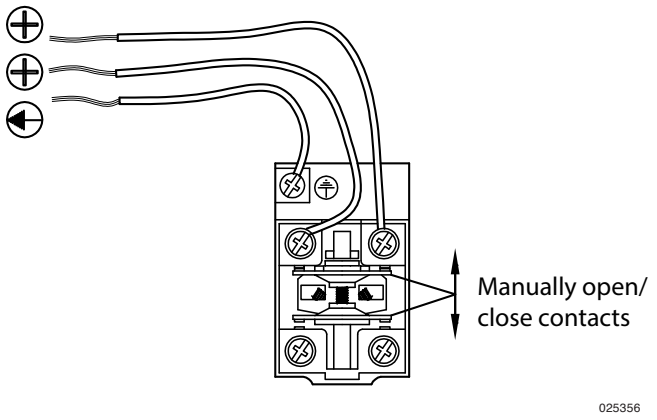

FIG. 5-2 DISCHARGE PRESSURE SWITCH TEST

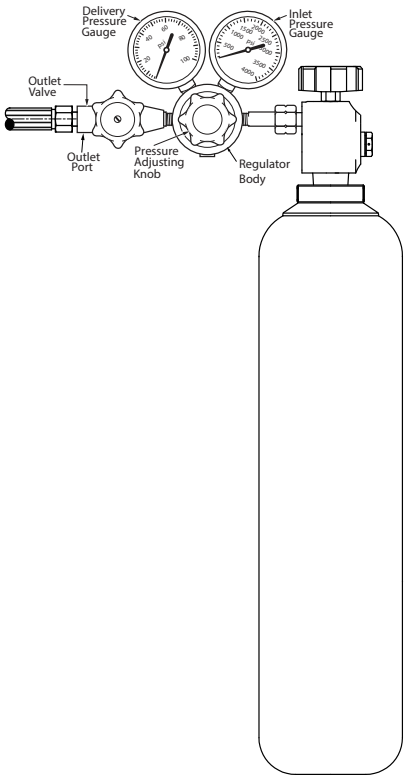

FIG. 5-3 CONNECTING NITROGEN CONTAINER TO PILOT LINE

PNEUMATIC ACTUATION LINE TEST FOR MULTI HAZARD AREA SYSTEMS

i. Remove all caps from the bank auxiliary iFLOW containers including pilot containers.

ii. Disconnect the actuation hose (or copper tube) from the outlet of the pilot container.

iii. Remove the coil from the solenoid on the pilot container. (see Figure 5-3)

iv. As follows in turn test the operation of each area's selector valve together with the pneumatic actuation line for the number of iFLOW containers designed to discharge into this area.

v. Remove the pneumatic actuators from all of the iFLOW containers. Then fit pneumatic actuator test tools (441564) onto each actuator, hand tight. Refit the pneumatic actuators to the iFLOW container valves.

vi. Attach a nitrogen container which is fitted with a suitable pressure regulator and pressure relief valve to the actuation hose that has been disconnected from the pilot container. Adjust the outlet pressure of the nitrogen pressure regulator to 8 bar - 10 bar and then open the valve on the nitrogen container to apply pressure to the pneumatic actuation line.

vii. Pressure from the nitrogen container will pressurise the actuation control piping up to the selector valve solenoids.

viii. Check for leaks by applying a suitable leak detection solution to all of the joints in the pneumatic actuation line from the pilot container to the selector valve solenoids.

ix. At the Fire Suppression System Releasing Control Panel simulate a fire in a particular hazard area. This will send a signal to both the solenoid for the pilot container and also to the selector valve solenoid for this area.

x. Check that the pilot container solenoid's coil is energised by placing the end of a screw driver inside the coil. There should be a magnetic force felt on the screw driver to signify that the coil is energised.

xi. Check that the correct selector valve solenoid has operated causing the correct selector valve to open.

xii. Check for leaks by applying a suitable leak detection solution to all of the joints in the pneumatic actuation line from the selector valve solenoid through the selector valve and up through the pneumatic actuation line to the pneumatic actuators.

xiii. Close the valve on the nitrogen container and vent the pressure from the pneumatic actuation line.

xiv. Inspect the pneumatic actuators on all of the iFLOW container valves and check that only the pistons on the correct number of containers for the hazard area being tested have operated by inserting a small screw driver into the inspection holes provided in the pneumatic actuator test tool and confirming the puncture pin is in the actuated position.

xv. Reset the Suppression Control Panel.

xvi. Close the operated selector valve assembly manually.

xvii. Reset the operated pneumatic actuators.

xviii. Refit pneumatic actuators with the pneumatic actuator test tools fitted, to all iFLOW container valves.

xix. Open the valve on the nitrogen container and repeat steps vii) to xviii) for the next risk area.

xx. When all the risk areas have been tested carry out the following:

xxi. Dis-assemble the pneumatic actuators and pneumatic actuator test tools from all of the iFLOW valves. Reset the pistons in the pneumatic actuators by pushing them fully into the actuator body using the pneumatic cone reset tool (441566) see figure 5-1.

xxii. Refit pneumatic actuators to the iFLOW container valves.

xxiii. Disconnect the nitrogen container and pressure regulator from the pneumatic actuation line.

xxiv. Re fit coil to the solenoid on the pilot container.

xxv. Refit the top caps to the iFLOW and pilot container valves at a torque of 33.9 Nm to 40.7 Nm.

PILOT CONTAINER SOLENOID TEST

i) Remove the pilot container valve top cap (see Figure 5-4).

ii) Undo the solenoid coil retaining nut and remove the solenoid from its location on the centre stem of the housing (if the system has more than one pilot container repeat this step for every pilot container). See Figure 5-5.

iii) Simulate a fire condition at the Extinguishing Control Panel to energise the solenoid coil.

iv) While the solenoid coil is energised insert the end of a small screwdriver into the centre of the coil (see Figure 5-6). Correct operation is confirmed by a magnetic field generating a force which retains the screw driver within the coil. Time the duration of the activation of the solenoid coil to ensure that it remains energised for a minimum of three minutes.
Please note that the solenoid coil will gradually heat up during this activation period.

v) Reset the Fire Extinguishing System Releasing Control Panel and check with a screwdriver that no residual magnetism is present.

vi) Slowly replace the solenoid coil onto its stem. If the pilot container valve starts to leak through the pilot port in the top of the valve immediately remove the solenoid coil. If leakage occurs check that the Extinguishing Releasing Panel is correctly reset. If the panel is found to be reset and the problem persists contact the OEM's Technical Department for assistance.

vii) Once the solenoid coil is in position on its stem fit the holding nut and tighten with a suitable spanner.

viii) Finally re-fit the top cap onto the pilot container valve.

⚠ CAUTION

The Pilot Container is charged at 100 bar. The pilot container is supplied with the solenoid factory fitted. Under no circumstances attempt to remove the pilot container solenoid from the valve. In the event of a fault with the solenoid valve return the complete pilot container with release solenoid to TYCO.

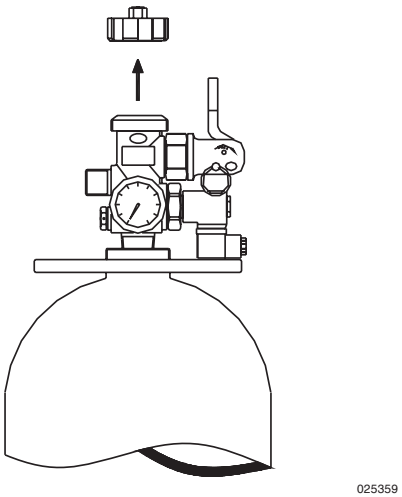

FIG. 5-4 REMOVING PILOT VALVE TOP CAP

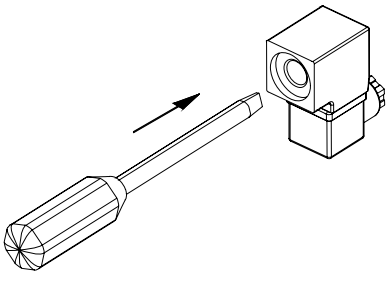

FIG. 5-6 CHECKING SOLENOID OPERATION WITH A SCREWDRIVER

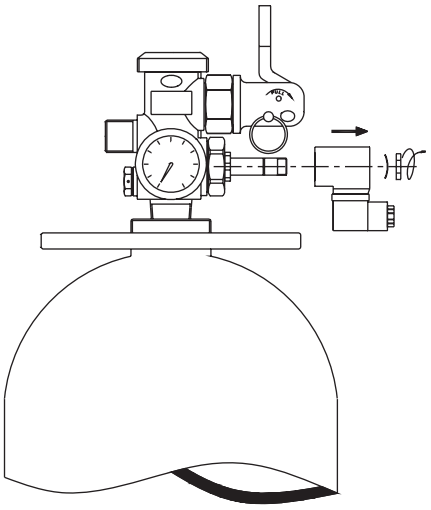

FIG. 5-5 REMOVING PILOT VALVE SOLENOID

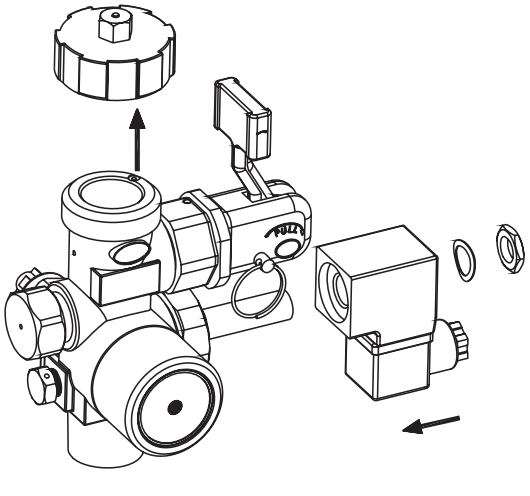

FIG. 5-7 RE-ASSEMBLING THE SOLENOID ONTO THE PILOT VALVE

ROOM INTEGRITY TESTING

The successful performance of a Gaseous Total Flooding system is largely dependent on the integrity of the protected enclosure. It is a requirement that a room integrity test is performed on any protected enclosure to establish the total equivalent leakage area and enable a prediction to be made of the enclosure's ability to retain agent. The required retention time will vary depending on the particulars of the hazard but will not normally be less than 10 minutes. Longer retention times may sometimes be necessary if enclosures contain hazards that may readily become deep seated. The procedure provided in ISO 14520 and EN 15004 should be used for performing the Integrity Test.

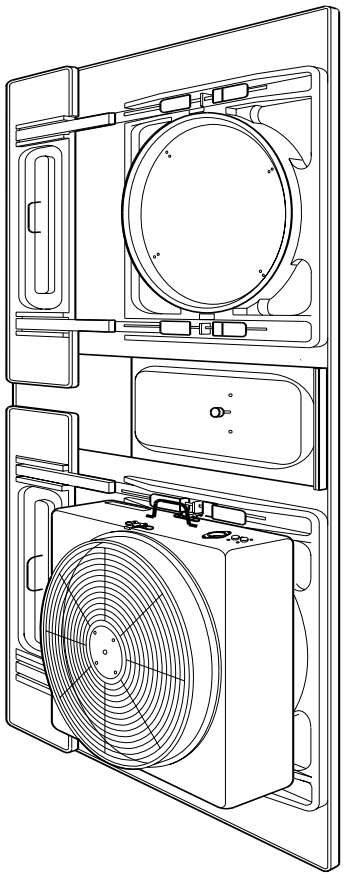

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FIG. 5-8 EXAMPLE ROOM INTEGRITY TEST EQUIPMENT

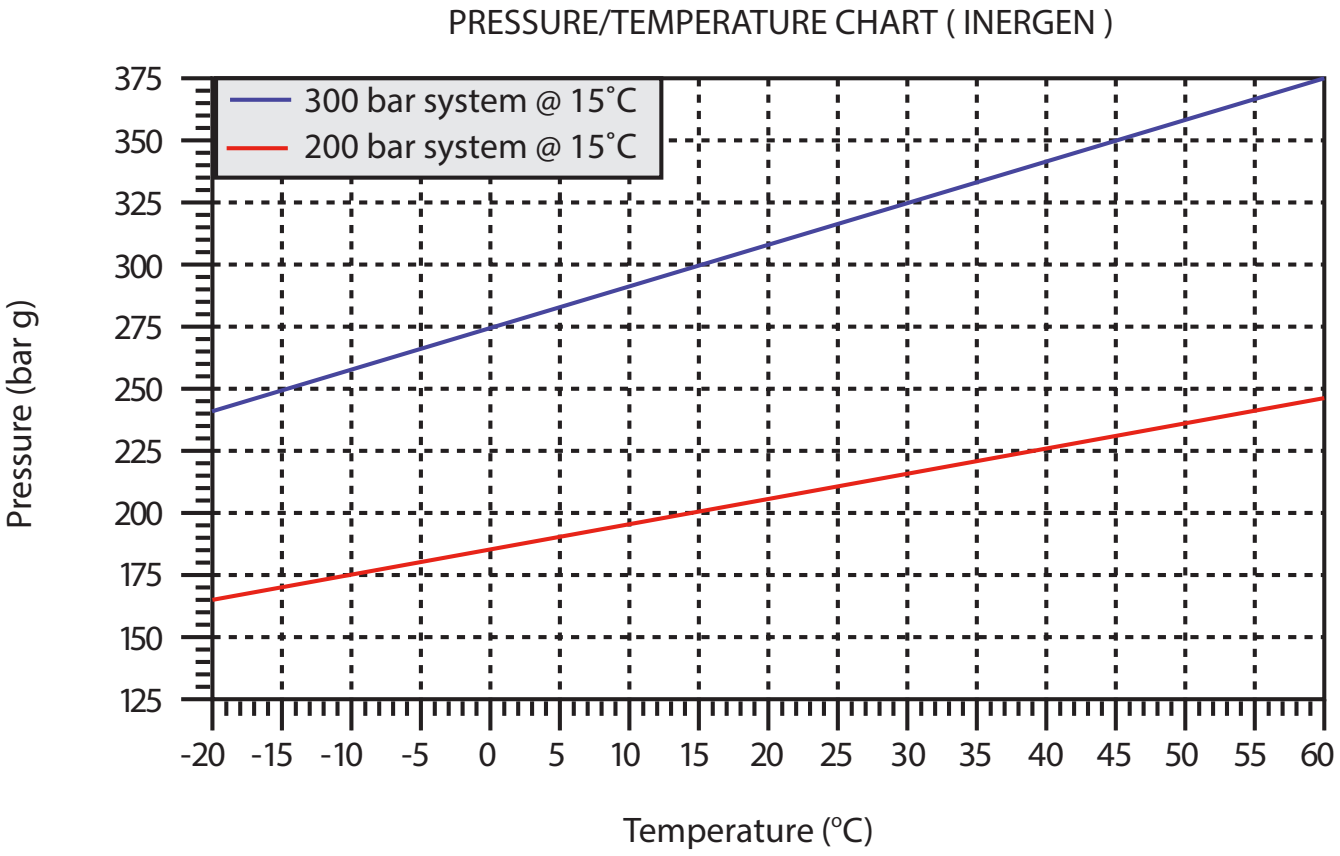


CHART 5-1 PRESSURE/TEMPERATURE CHART FOR 200/300 BAR FILLING AND INSPECTION

COMMISSIONING SCHEDULE (EXAMPLE)

CLIENT.....
ADDRESS.....

COMMISSIONED BY.....
DATE .....

PROJECT.....
ADDRESS.....
.....

PROJECT REF .....

PROTECTED AREA .....

5.1 GENERAL INSTRUCTIONS

		check completed	remarks
a)	Advise all personnel working in or near to the protected area of possible audible or visual alarms.		
b)	Advise client of any equipment which will be switched off during the tests.		
c)	Re-measure the protected area and confirm that the quantity of agent supplied is adequate for the measured volume.		
d)	Check that the system has been installed in accordance with the drawings or note any changes to the system against the drawings.		
e)	Before carrying out any further checks ensure the Extinguishing system is isolated electrically and mechanically, remove all pneumatic actuators if fitted.		

5.2 ELECTRICAL CHECK LIST

5.2.1 Systems with main and reserve containers

a)	Carry out checks described in sections:- 5.2.2, 5.2.3 or 5.2.4 with the changeover switch in 'main' position.		
b)	Repeat above checks with changeover switch in 'reserve' position.		

5.2.2 Systems with automatic electrical detection (coincidence operation)

a)	Place the system in automatic mode and check lamps are amber on control panel and all status units.		
b)	Operate one detection zone.		
c)	Check fire alarm sounds.		
d)	Check extinguishant release solenoid does not operate.		
e)	Switch system to manual mode and check lamps are green on control panel and all status/ indicator units.		
f)	Operate second detection zone.		
g)	Check extinguishant release solenoid does not operate.		
h)	Switch system to automatic mode with two detection zones still in alarm.		
i)	Check evacuation alarm sounds.		
j)	Check A/C shutdowns etc.		
k)	Check extinguishant release solenoid operates after preset time delay.		
l)	Check operation of 'extinguishant released' pressure switch. Upon operation check red lamps are lit on control panel and all status units		
m)	Reset the pressure switch and then reset the fire alarm system.		
n)	Check operation of each electrical manual release unit in turn.		
o)	Check fire alarm and evacuation alarm sounds.		
p)	Check extinguishant release solenoid operates after preset time delay.		
q)	Reset system. Ensure frangible washers are refitted to manual release units.		
r)	If system is in compliance with EN 15004, fire detection components shall be approved in accordance with the relevant part of EN 54 or EN 12094, whichever applies.		
s)	If system is in compliance with EN 15004, manual operating devices shall be approved in accordance with EN 12094-3.		
t)	If system is in compliance with EN15004, electrical automatic control and delay devices shall be approved in accordance with EN 12094-1.		

5.2.3 Systems with automatic electrical detection (single zone operation)

	check completed	remarks
a) Place the system in manual mode and check lamps are green on control panel and all status units.		
b) Operate detection system.		
c) Check fire alarm sounds.		
d) Check extinguishant release solenoid does not operate.		
e) Switch system to automatic mode with detection system still in alarm and check lamps are amber on control panel and all status units.		
f) Check evacuation alarm sounds.		
g) Check A/C shutdowns etc.		
h) Check extinguishant release solenoid operates after preset time delay.		
i) Check operation of 'extinguishant released' pressure switch. Upon operation check red lamps are lit on control panel and all status/indicator units.		
j) Reset the pressure switch and then reset the fire alarm system		
k) Check operation of each electrical manual release unit in turn.		
l) Check fire alarm and evacuation alarm sounds.		
m) Check extinguishant release solenoid operates after preset time delay.		
n) Reset system.		

5.2.4 Systems with electrical manual release only.

a) Operate each electrical manual release unit in turn.		
b) Check fire alarm and evacuation alarm sounds.		
c) Check all A/C shutdowns etc.		
d) Check extinguishant release solenoid operates after preset time delay.		
e) Check operation of 'extinguishant released' pressure switch. Upon operation check red lamps are lit on control panel (if applicable) and all status/indicator units.		
f) Reset the pressure switch and then reset the fire alarm system. Ensure frangible washers are refitted to manual release units.		

5.2.5 Systems with hold switches.

a) With systems in quiescent state depress hold switch. Check system fault is generated.		
b) Initiate extinguishant release sequence and during delay period depress hold switch check release sequence is interrupted and solenoid does not operate.		
c) Release hold switch and check preset time delay restarts from zero and after preset time delay solenoid operates.		
d) If system is in compliance with EN15004, electrical automatic control and delay devices shall be approved in accordance with EN 12094-1.		

5.2.6 Systems with abort switches.

a) With system in quiescent state depress abort switch. Check system fault is generated.		
b) With system in automatic mode initiate extinguishant release sequence and during delay period depress abort switch. Check release sequence is interrupted and solenoid does not operate.		
c) Check system status reverts to manual mode after operation of abort switch.		
t) If system is in compliance with EN15004, stop devices shall be approved in accordance with EN 12094-3.		

5.2.7 Other items.

	check completed	remarks
a) Detach solenoid flexible lead and check system fault is generated.		
b) Check adequate and appropriate visual and audible warning devices are incorporated into the system.		
c) Record time delay. This should not normally exceed 30 seconds but must be adequate for safe egress from protected area.		
d) Confirm all A/C systems are linked into the extinguishing system to shutdown prior to or upon release of gas and these have been checked.		

5.3 Mechanical Check List

5.3.1 Pipework/Nozzles

a) Check pipes and fittings are to correct standard.		
b) Check pipework supports have been fitted at the correct intervals and are adequate for the purpose		
c) Check all nozzles are fitted in accordance with the design requirements and are aimed in the correct alignment away from obstructions or barriers that could prevent adequate distribution/ mixing of the gas.		
d) Check all pipes and nozzles are adequately braced against the reaction to discharge.		
e) Check pipework has been painted and/or properly identified.		
f) Purge the pipework to confirm it is continuous and free from debris.		
g) Remove nozzles to check they are free of debris following the purge.		
h) Carry out pressure test of the pipework in accordance with the requirements of the applicable design standard.		
i) Steps f), g) and h) may be omitted from the commissioning procedure if written evidence is available that the pipework was purged and pressure tested at an appropriate stage during installation.		
j) Check dust caps are fitted if required.		
k) If nozzle drill size is 3mm or less ensure that the nozzle filter is included.		

5.3.2 Containers

a) Check containers are safe from mechanical damage corrosion or unauthorised interference.		
b) Check container brackets are fitted and all bolts tightened.		
c) Check all containers are fitted with instruction plates properly completed.		

Record iFLOW Container Details Below

Area Protected	Containers		Pressure (bar)	Temp °C	Corrections Required YES/NO
	Size (litres)	Serial No.			

Record Pilot Container Details Below

Area Protected	Containers		Pilot Gas	Pressure (bar)	Temp °C	Corrections Required YES/NO
	Size	Serial No.				

5.3.3 Ancillary Equipment

		Check Complete	Remark
a)	Check all 'extinguishant released' pressure switches are fitted and are securely fixed to wall.		
b)	Check all pressure trips are fitted in the correct plane and are securely fixed.		
c)	Check pneumatic actuation tubing is firmly fixed.		
d)	Check all pneumatic actuation tubing connections are tight.		
e)	Check all pneumatic actuation lines, pressure switches and pressure trips operate at 10 bar a Nitrogen container fitted with a suitable pressure regulator.		
f)	Check the integrity of all pneumatic actuation lines by pressurising to 100bar using a Nitrogen container fitted with a suitable pressure regulator and check all joints for leaks with a suitable leak detection spray.		
g)	Check any dampers close and/or fibreglass curtains drop correctly to fully cover openings.		
h)	Check that contacted pressure gauges are fitted to the INERGEN containers if required.		
i)	Check supervisory pressure switches are fitted to any pilot containers.		
j)	Check solenoid flexible lead is correctly fitted and secured using fixing screw.		
k)	Upon completion of all checks ensure that the solenoid coil is not energised and then refit to the pilot container solenoid.		
l)	On systems utilising local manual actuator, check safety pin is fitted.		
m)	Ensure local manual actuator is reset and fit to master container and ensure it is correctly tightened.		
n)	On systems utilising remote mechanical manual release, check satisfactory operation of unit. After checking ensure seals are replaced and upon completion ensure safety pin is removed and a shear strap fitted in mechanical manual release device.		
o)	On systems utilising remote pneumatic manual release units check safety pin is fitted.		
p)	Ensure pneumatic actuators are reset and fit to containers as required and ensure are correctly tightened.		
q)	Check door caution plates are fitted at all doors into protected areas.		
r)	Check manual release caution plates are fitted at all manual control points.		

5.3.4 Enclosure Integrity

a)	Record whether a Room Integrity Test has been performed on the protected area.		
b)	If not, visually inspect the perimeter of the area and record any leakage areas.		
c)	If so, record whether a satisfactory retention time was obtained.		

5.3.5 Completion

a)	On completion ensure client is informed of any outstanding actions on his part and confirm these in writing.		
b)	Obtain the signature of the client's representative on the handover certificate and leave a copy for the client.		

SERVICING AND MAINTENANCE

This section provides general guidance on the maintenance of iFLOW Fire Extinguishing Systems. Maintenance as detailed should be carried out at least every six months, although local conditions may indicate a need for more frequent visits. However, it is of paramount importance that persons involved in the maintenance of this equipment have had previous experience in the maintenance of this or similar equipment.

- Document 14A-06-S1 (example provided on pages 6-2 to 6-5) is to be completed during each visit and a copy held in the relevant project file for future reference.

Before carrying out any checks, ensure the extinguishing system is isolated electrically and mechanically. Remove all electrical and pneumatic actuators if fitted.

Upon completion of all checks ensure all electrical/mechanical and pneumatic actuators are reset and refitted.

Chart 5-1 from Section 5 is to be used to determine compliance with the relevant section of the Maintenance Schedule.

Pneumatic actuation tubing is to be tested in accordance with the procedure detailed in Section 5.

Operation and resetting of electrical, pneumatic and manual actuators is to be checked as detailed in section 5.

On completion of the work, obtain the signature of the customer's representative on the visit record and leave a copy with the customer. If any part of the system is left inoperable note this clearly on the visit record and point it out to the customer's representative when signing.

- Note: The Gas Metron is to be replaced by the expiry date marked on the hex. body.

SERVICING AND MAINTENANCE SCHEDULE (EXAMPLE)

CLIENT.....
ADDRESS.....
.....
PROJECT.....
ADDRESS.....
.....
PROTECTED AREA .....

SERVICED BY .....
DATE .....

PROJECT REF.....

6.1 GENERAL INSTRUCTIONS

		Check Complete	Remark
a)	Advise all personnel working in or near to the protected area of possible audible or visual alarms.		
b)	Advise client of any equipment which will be switched off during the tests.		
c)	Check that the character of the hazard has not altered. If any doubt exists refer to the Extinguishing Design Engineer.		
d)	Before carrying out any further checks ensure the Extinguishing system is isolated electrically and mechanically, remove all electrical or pneumatic actuators if fitted.		

ELECTRICAL CHECK LIST

6.1.1 Systems with main and reserve containers.

a)	Carry out checks described in sections:- 6.1.2, 6.1.3 or 6.1.4 with the changeover switch in 'main' position.		
b)	Repeat above checks with the changeover switch in 'reserve' position.		

6.1.2 Systems with automatic electrical detection (coincidence operation)

a)	Place the system in automatic mode and check lamps are amber on control panel and all status units.		
b)	Operate one detection zone.		
c)	Check fire alarm sounds.		
d)	Check extinguishant release solenoid does not operate.		
e)	Switch system to manual mode and check lamps are green on control panel and all status units.		
f)	Operate second detection zone.		
g)	Check extinguishant release solenoid does not operate.		
h)	Switch system to automatic mode with two detection zones still in alarm.		
i)	Check evacuation alarm sounds.		
j)	Check A/C shutdowns etc.		
k)	Check extinguishant release solenoid operates after preset time delay.		
l)	Check operation of 'extinguishant released' pressure switch. Upon operation check red lamps are lit on control panel and all status units		
m)	Reset the pressure switch and then reset the fire alarm system.		
n)	Check operation of each electrical manual release unit in turn.		
o)	Check fire alarm and evacuation alarm sounds.		
p)	Check extinguishant release solenoid operates after preset time delay.		
q)	Reset system. Ensure seals are refitted to manual release units.		

6.1.3 Systems with automatic electrical detection (single zone operation)

	Check Complete	Remark
a) Place the system in manual mode and check lamps are green on control panel and all status units.		
b) Operate detection system.		
c) Check fire alarm sounds.		
d) Check extinguishant release solenoid does not operate.		
e) Switch system to automatic mode with detection system still in alarm and check lamps are amber on control panel and all status units.		
f) Check evacuation alarm sounds.		
g) Check A/C shutdowns etc.		
h) Check extinguishant release solenoid operates after preset time delay.		
i) Check operation of 'extinguishant released' pressure switch. Upon operation check red lamps are lit on control panel and all status/indicator units.		
j) Reset the pressure switch and then reset the fire alarm system.		
k) Check operation of each electrical manual release unit in turn.		
l) Check fire alarm and evacuation alarm sounds.		
m) Check extinguishant release solenoid operates after preset time delay.		
n) Reset system. Ensure seals are refitted to manual release units.		

6.1.4 Systems with electrical manual release only.

a) Operate each electrical manual release unit in turn.		
b) Check fire alarm and evacuation alarm sounds.		
c) Check all A/C shutdowns etc.		
d) Check extinguishant release solenoid operates after preset time delay.		
e) Check operation of extinguishant released pressure switch. Upon operation check red lamps are lit on control panel (if applicable) and all status units.		
f) Reset the pressure switch and then reset the fire alarm system. Ensure frangible washers are refitted to manual release units.		

6.1.5 Systems with hold switches.

a) With systems in quiescent state, depress hold switch. Check system fault is generated.		
b) Initiate extinguishant release sequence and during delay period depress hold switch, check release sequence is interrupted and solenoid does not operate.		
c) Release hold switch and check preset time delay restarts from zero and after preset time delay, solenoid operates.		

6.1.6 Systems with abort switches.

a) With system in quiescent state depress abort switch. Check system fault is generated.		
b) With system in automatic mode initiate extinguishant release sequence and during delay period depress abort switch. Check release sequence is interrupted and solenoid does not operate.		
c) Check system status reverts to manual mode after operation of abort switch.		

6.1.7 Other items.

	Check Complete	Remark
a) Detach solenoid flexible lead and check system fault is generated.		
b) Check adequate and appropriate visual and audible warning devices are incorporated into the system.		
c) Record time delay. This should not normally exceed 30 seconds but must be adequate for safe egress from protected area.		
d) Confirm all A/C systems are linked into the extinguishing system to shutdown prior to, or upon release of gas and these have been checked.		

6.2 Mechanical Check List

6.2.1 Pipework/Nozzles

a) Check that the pipework has not been altered or tampered with since the last visit.		
b) Check pipework supports have been fitted at the correct intervals and are adequate for the purpose		
c) Check all nozzles are fitted in accordance with the design requirements and are aimed in the correct alignment away from obstructions or barriers that could prevent adequate distribution/ mixing of the gas.		
d) Check all pipes and nozzles are adequately braced against the reaction to discharge.		
e) Check pipework has been painted and/or properly identified.		
f) If any doubt exists concerning the integrity of the pipework, arrange for it to be purged. Remove nozzles to check they are free of debris following the purge.		
g) Check dust caps are fitted if required. If not, check nozzles for signs of blockage and if any doubt exists, purge the system.		

6.2.2 Containers

a) Check containers are safe from mechanical damage, corrosion or unauthorised interference.		
b) Check container brackets are fitted and all bolts tightened.		
c) Check all containers are fitted with instruction plates properly completed.		
d) Note any containers requiring hydrostatic test.		

Record iFLOW Container Details Below

Area Protected	Containers		Pressure (bar)	Temp °C	Corrections Required YES/NO
	Size (litres)	Serial No.			

Record Pilot Container Details Below

Area Protected	Container		Pilot Gas	Pressure (bar)	Temp °C	Corrections Required YES/NO
	Size	Serial No.				

6.2.3 Ancillary Equipment

	Check Complete	Remark
a) Check all 'extinguishant released' pressure switches are fitted and are securely fixed to wall.		
b) Check all pressure trips are fitted in the correct plane and are securely fixed.		
c) Check pneumatic actuation tubing is firmly fixed.		
d) Check all pneumatic actuation tubing connections are tight.		
e) Check all pneumatic actuation lines, pressure switches and pressure trips operate at 10bar using a Nitrogen container fitted with a suitable pressure regulator.		
f) Check any dampers close and/or fibreglass curtains drop correctly to fully cover openings.		
g) Check solenoid flexible lead is correctly fitted and secured using fixing screw.		
h) Upon completion of all checks ensure solenoid is reset and correctly re-fitted/tightened.		
i) Check safety pin is fitted to local manual actuator.		
j) Ensure local manual actuator is reset and fit to master container and ensure it is correctly tightened.		
k) On systems utilising local manual actuator, check safety pin is fitted.		
l) Ensure pneumatic actuators are reset and fit to containers as required and ensure they are correctly tightened.		
m) On systems utilising remote mechanical manual release, check satisfactory operation of the unit. After checking, ensure frangible washers are replaced and upon completion ensure a shear strap is fitted in mechanical manual release device.		
n) On systems utilising remote pneumatic manual release units check safety pin is fitted.		
o) Check door caution plates are fitted at all doors into protected areas.		
p) Check manual release caution plates are fitted at all manual control points.		

6.2.4 Enclosure Integrity

a) Record whether a Room Integrity Test has been performed on the protected area.		
b) If not, visually inspect the perimeter of the area and record any leakage areas.		
c) If so, record whether a satisfactory retention time was obtained.		

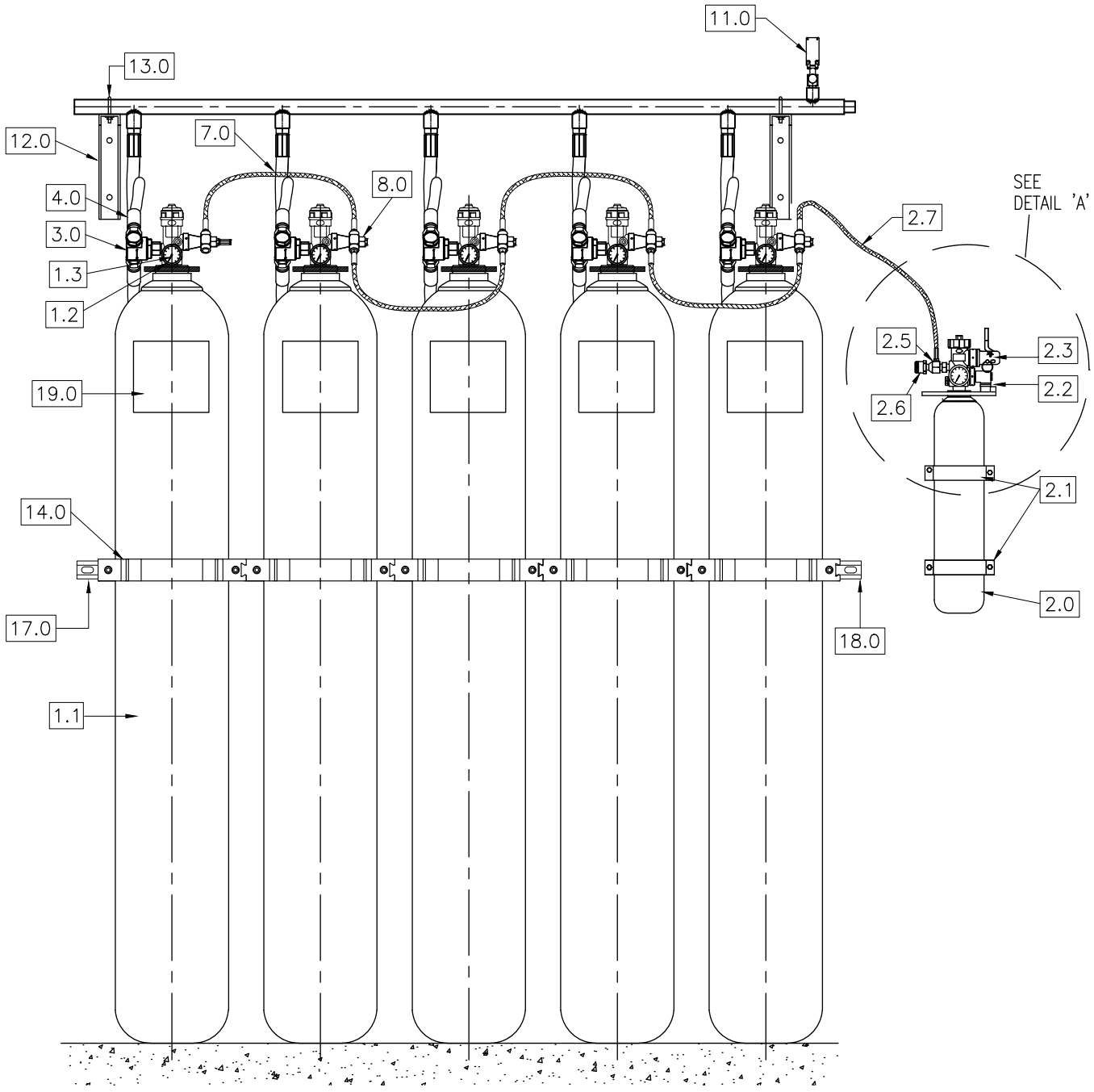
6.2.5 Completion

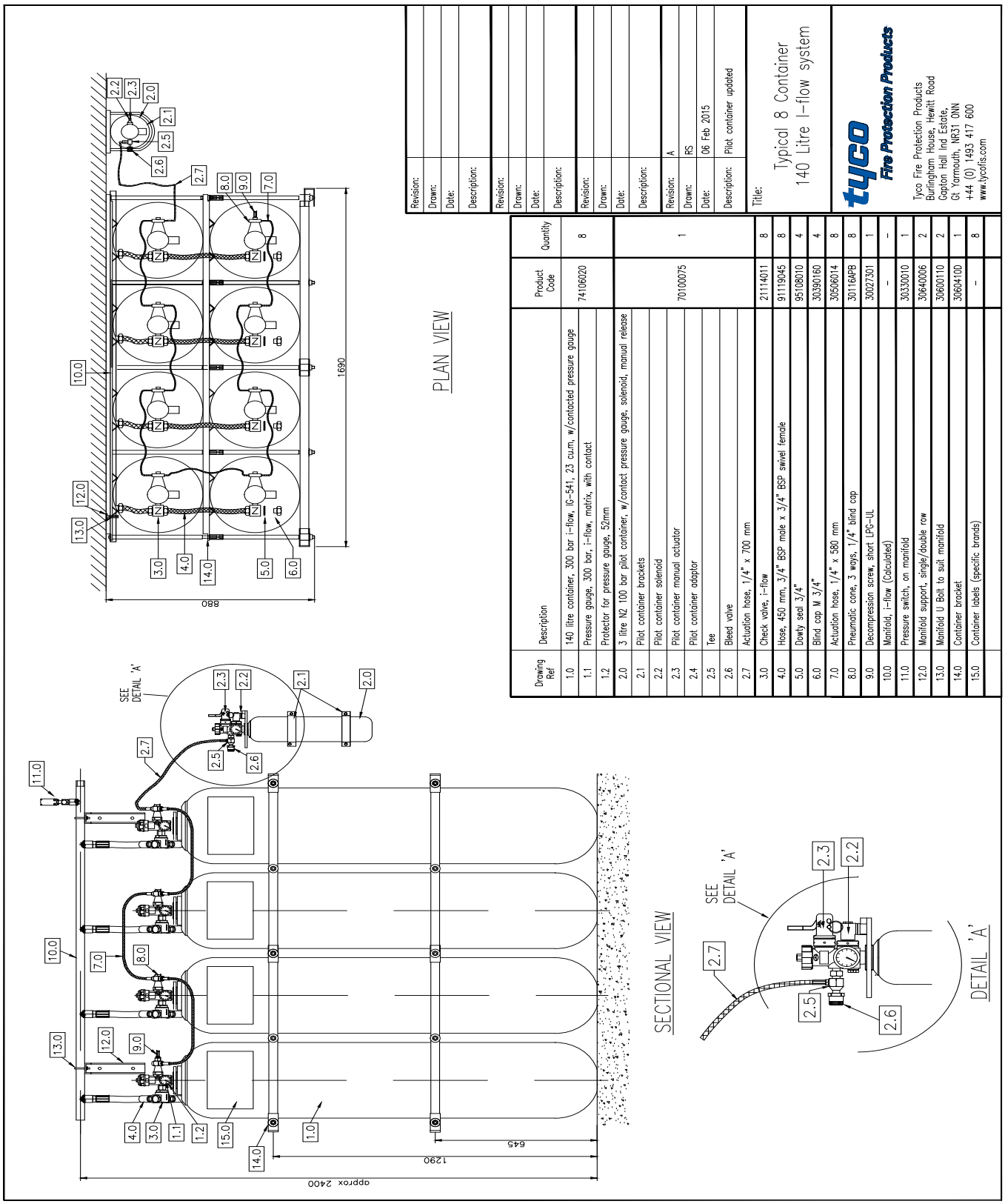
a) On completion of the visit ensure the client is informed of any equipment or deficiencies requiring attention and that details are recorded on the docket.		
b) Obtain the signature of the client's representative on the docket and leave a copy for the client.		

APPENDIX

TYPICAL INSTALLATIONS

This section shows examples of the container bank arrangements for some larger iFLOW systems:





Drawing Ref	Description	Product Code	Quantity
1.0	140 litre container, 300 bar i-flow, IG-541, 23 cu.m, w/contacted pressure gauge	74106020	8
1.1	Pressure gauge, 300 bar, i-flow, matrix, with contact		
1.2	Protector for pressure gauge, 52mm		
2.0	3 litre N2 100 bar pilot container, w/contact pressure gauge, solenoid, manual release	70100075	1
2.1	Pilot container brackets		
2.2	Pilot container solenoid		
2.3	Pilot container manual actuator		
2.4	Pilot container adaptor		
2.5	Tee		
2.6	Bleed valve		
2.7	Actuation hose, 1/4" x 700 mm	21114011	8
3.0	Check valve, i-flow	91119045	8
4.0	Hose, 450 mm, 3/4" BSP male x 3/4" BSP swivel female	95108010	4
5.0	Dowty seal 3/4"	30390160	4
6.0	Blind cap M 3/4"	30506014	8
7.0	Actuation hose, 1/4" x 580 mm	30116APB	8
8.0	Pneumatic cone, 3 ways, 1/4" blind cap	30027301	1
9.0	Decompression screw, short LPG-UL	-	-
10.0	Manifold, i-flow (Calculated)	30330010	1
11.0	Pressure switch, on manifold	30640006	2
12.0	Manifold support, single/double row	30600110	2
13.0	Manifold U Bolt to suit manifold	30604100	1
14.0	Container bracket	-	8
15.0	Container labels (specific brands)		

Revision:	
Drawn:	
Date:	
Description:	
Revision:	
Drawn:	
Date:	
Description:	
Revision:	
Drawn:	
Date:	
Description:	
Revision:	A
Drawn:	RS
Date:	06 Feb 2015
Description:	Pilot container updated

Title: Typical 8 Container 140 Litre i-flow system

tyco Fire Protection Products

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APPENDIX CONTINUED

SAFETY DATA SHEET ACCORDING TO 91/155/EEC

I. IDENTIFICATION OF THE SUBSTANCE / PREPARATION AND THE COMPANY

I.I	Trade name:	IG-541
I.2	Manufacturer/supplier:	Tyco Fire Protection Products Burlingham House Hewett Road Gapton Hall Industrial Estate Great Yarmouth NR31 0NN United Kingdom

II. COMPOSITION / INFORMATION ON INGREDIENTS

II.I	Chemical formula:	52 Vol. % Nitrogen (N_2) 40 Vol. % Argon (Ar) 8 Vol. % Carbon dioxide (CO_2)
II.2	Substances with exposure limits:	

Description	%	MAK-Value	TRK-Value	BAT-Value
Carbon dioxide	> 5 Vol. %	5000 ppm	--	-

III. HAZARD IDENTIFICATION

III.I	For Human:	see paragraph XI and XV.
III.2	For Environment:	- none -

IV. FIRST AID MEASURES

IV.1	Inhalation:	Take the injured person into the open air protecting yourself - if necessary consult a doctor.
IV.2	Eye contact:	- none -
IV.3	Skin contact:	- none -
IV.4	Ingestion:	n.a.

V. FIRE-FIGHTING MEASURES

n.a.

VI. ACCIDENTAL RELEASE MEASURES

VI.1	Personal precautions:	Provide sufficient ventilation. Do not inhale gases/vapours/ mist. If necessary, leave the room.
VI.2	Environmental precautions:	n.a.
VI.3	Clean up methods:	Ventilation of the rooms.

VII. STORAGE AND HANDLING

VII.1	Handling:	Make sure container valve and connections are tight; Use in well ventilated areas. Only trained persons may handle compressed gas containers.
VII.2	Storage:	To be stored only in original containers. Protect containers from heating over 50°C.

VIII. EXPOSURE CONTROLS / PERSONAL PROTECTION

VIII.1	Inhalation:	If oxygen level is below 10 Vol. %, or in case of long exposure, breathing apparatus (independent of circulating air) is necessary.
VIII.2	Hand protection:	Protective gloves.
VIII.3	Eye protection:	n.a.
VIII.4	Body protection:	Protective shoes.

IX. PHYSICAL AND CHEMICAL PROPERTIES

IX.1	Chemical properties:	Form:	compressed gas
		Colour:	colourless
		Odour:	odourless
IX.2	Physical properties:	Relative density:	1,4236 kg/m3 at 15°C
		Vapour pressure:	n.a.
		Viscosity:	n.a.
		Solubility in water:	17,1 ml/l at 0°C
		pH-value:	n.a.
		Flash point:	n.a.
		Ignition temperature:	n.a.
		Explosive properties:	n.a.
		Change of condition:	n.a.
IX.3	Other data:	Not flammable	

X. STABILITY AND REACTIVITY

X.1	Conditions to avoid:	Exposure of compressed gas containers to increased heat. Increased temperature will result in an increase in pressure which may cause the container burst disk to operate or in extreme cases the container to burst.
X.2	Materials to avoid:	n.a.
X.3	Hazardous decomposition products:	n.a.

XI. TOXICOLOGICAL INFORMATION

XI.1	Toxicological Information:	Asphyxiant in high concentrations. In pure IG-541 atmosphere there exists the danger of suffocation (through oxygen displacement).

XII. ECOLOGICAL INFORMATION

XII.1	Degradability:	n.a.
	Environmental impact rating:	n.a.
	Acute aquatic toxicity:	n.a.
	Other indications:	- none -

XIII. DISPOSAL CONSIDERATIONS

XIII.1	Product:	- none -

XIV. TRANSPORT INFORMATION

XIV.1 Country transport:	ADR/RID/GGVS/GGVE-Class 3, Number 2a, gas mixture.
XIV.2 Inland navigation:	ADNR-Class 2, Number 12.
XIV.3 Maritime shipping:	IMDG/GGVSea-Class 2, UN-No.: 1956, Page 2124.
XIV.4 Aviation:	ICAO/IATA-Class 2.2. UN-No.: 1956, Page 220; compressed gases.

XV. REGULATORY INFORMATION

XV.1 EEC-Labelling	
Symbols:	n.a.
R-phrases:	n.a.
S-phrases:	n.a.
Other information:	Identification of the compressed gas containers in conformity with the shipping instructions and ISO 7225. UUV-Gase (VBG 61)

XVI. OTHER INFORMATION

XVI.1 Further information:	For application in fire extinguishing systems, the IG-541 quantity is mainly designed to create oxygen concentrations between 10% and 15% and CO2 concentrations between 2% and 5% and no hazards are known for the healthy human during short exposure in this atmosphere. However the combustion products from the fire itself could be highly toxic, therefore people shall always leave the room when it is flooded with IG-541.