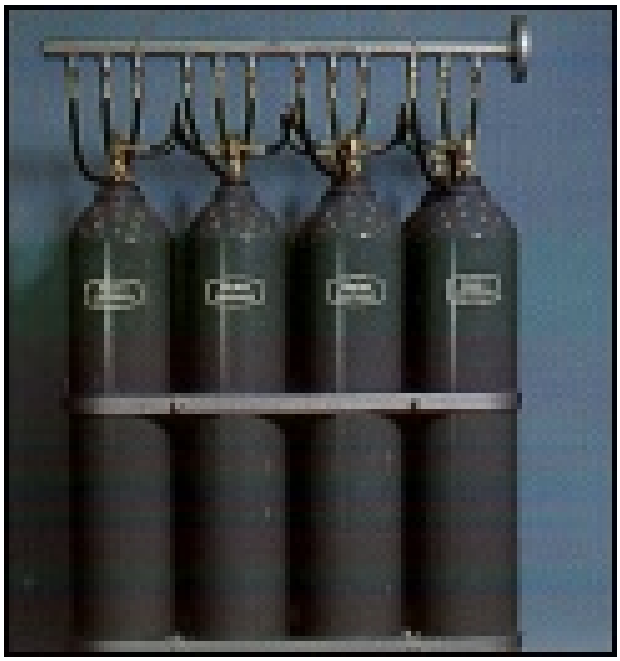
FIRE AND SECURITY

CO2 High Pressure
Fire Suppression System



Single area, pneumatic
Installation Instruction

Protecting life, environment and property...

Amendments

AMENDMENT INCORPORATION RECORD		
Amendment Number	**Brief Description of Content**	**Name of Person Incorporating Amendment**
1 2005-10-06	Updated to AFS standard	L. Elsrud
2 2009-09-10	Updated, split users manual into separate booklets.	L. Elsrud
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1 FOREWORD

This manual is written for those who design, install and maintain Heien-Larssen CO2 high pressure fire suppression systems.

IMPORTANT

Autronica Fire and Security AS assumes no responsibility for application of any system other than those addressed in this manual. The technical data Autronica Fire and Security AS believes this data to be accurate, but it is published and presented without any guarantee or warranty whatsoever. Autronica Fire and Security AS disclaims any liability for any use that may be made of the data and information contained herein by any and all other parties.

The Heien-Larssen CO2 high pressure fire suppression systems are to be designed, installed, inspected, tested and recharged by qualified and trained personnel in accordance with the following.

- All instructions, limitations, etc. contained in this manual.
- Storage, handling, transportation, service, maintenance, recharge and test of agent storage containers shall be performed only by qualified and trained personnel in accordance with the information in this manual and the relevant compressed gas standard.
- Regulations imposed by the class, flag state or Authorities Having Jurisdiction for the hazard to be protected.

Any questions concerning the information presented in this manual should be addressed to:

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2 INSTALLATION INSTRUCTION.

2.1 The main equipment installed in the CO_2 - room.

The following equipment is normally installed in the CO_2 - room.

- CO_2 - cylinders.
- CO_2 - master valves.
- CO_2 - manifold with check valves.
- CO_2 - discharge hose.
- CO_2 - pilot hose.
- CO_2 - cylinder fastening assembly.
- CO_2 - manifold pressure gauge.
- CO_2 - manifold relief valve.
- CO_2 - shore connection / Air blowing through valve.
- CO_2 - cylinder weighing device.

Before starting the installation this procedure shall be read carefully.

Please pay attention to the following:

The CO_2 - gas is extremely dangerous to human life. Due to this make sure that the cap on the CO_2 - valve outlet is fitted and that the protective cap on the CO_2 - cylinder is properly installed before any handling of the CO_2 - cylinder's take place.

Always leave the CO_2 - room door in open position while present. Keep the CO_2 - cylinders properly secured by the cylinder clamps or provisional fastening assembly to avoid CO_2 - cylinders falling. A breathing apparatus for each person in the CO_2 - room should be available at any time.

2.1.1 CO_2 - Cylinder fastening assembly.

The CO_2 - cylinders shall be installed in accordance with the CO_2 - room arrangement drawings submitted by Autronica Fire and Security AS.

The CO_2 - cylinders shall be properly fastened using the supplied cylinder clamps and in accordance with the drawings referred to herein.

The CO_2 - cylinders shall be installed on a wooden bed (48mm x 148 mm) bolted to the deck structure. The wooden bed is supplied by the yard.

Autronica Fire and Security AS supply the following equipment.

- Wooden bars.
- M16 Bolts.
- M16 Nuts.
- 16 mm Washer.

The following equipment shall be supplied by yard.

- 48 mm x 148 mm Wooden bed.
- 50 mm x 75 mm x 5 mm Angel for Rear support.

The following drawings shall be used during installation.

Description

CO_2 - cylinder bank, one row.	Attachment 1.
CO_2 - cylinder bank, two rows.	Attachment 2.
CO_2 - cylinder bank, three rows.	Attachment 3.

During installation the centre distance between the cylinders should be checked. Make sure that the distance is 300 mm. If this distance is incorrect the manifold will not fit.

2.1.2 CO_2 - Manifold.

The manifold shall be installed in accordance with the system drawing for the project.

The manifold is supplied with the manifold check valve installedand it is pressure tested in accordance with class requirements.

The height from the bottom of the cylinders to the check valve shall be 1750 mm. If the cylinders are installed on a 48 mm wooden bed the height from deck level to the check valve shall be 1800 mm.

Three main types of manifolds are supplied.

- One row.	Ref. Attachment 1.
- Two rows.	Ref. Attachment 2.
- Three rows.	Ref. Attachment 3.

2.1.3 CO_2 - Discharge hose.

When the installation of the manifold is finalised, install the DN (1/2'') discharge hose into the manifold check valve. The hose shall be tightened up to avoid leakage's.

Do not connect the discharge hose to the CO_2 - valve outlet before the commissioning is finalised.

When the commissioning is finalised, remove the CO_2 - cylinder valve outlet cap and connect the discharge hose. Tighten up.

Reference is also made to attachment 4.

2.1.4 CO_2 - Pilot hose.

Remove the CO_2 - cylinder cap. Check that the CO_2 - valves are properly secured.

Connect the flexible hose between the pneumatic actuators on the actual cylinders and tighten up.

The flexible pilot hose is supplied in tree lengths.

The flexible pilot hose, which shall be installed between the CO2 - cylinders on the same row, is 303 mm long.

The flexible hose, which is used as interconnection between two rows, is 500 mm long.

The flexible hose, which is used as interconnection between ø8mm pilot line and cylinder bank, is 350mm long.

Reference is also made to attachment 5.

Connect the flexible hose with ø8mm cutting ring connection to pilot line and the other end to the first CO_2 – cylinder according to CO_2 room arrangement drawing.

2.1.5 Master valve.

The master valve shall be installed in accordance with the CO_2 - room arrangement drawing or the system drawing.

The master valves are supplied from Autronica Fire and Security AS in the following types.

DN 25 - DN 50 High pressure side.

On the high-pressure side the end connection is BSP female threads. The collector pipe from the CO_2 - manifold to the master valves are to be manufactured by the yard. The end connection on the collector pipe for the dimensions mentioned above need to be BSP Male threads. Install the master valve to the pipe. PTFE Tape to be used on the threads.

DN 25 - DN 50 Low pressure side.

On the low-pressure side the valve is supplied with a plain pipe end. The yard connection can either be by welding or the pipe end can be threaded. Make sure that the valve handle is pointing downwards.

DN 65 - DN 100 High pressure side.

On the high-pressure side the end connection is flanged, PN 160, DIN Std. The collector pipe from the CO_2 - manifold to the master valves are to be manufactured by the yard. The end connection on the collector pipe for the dimensions mentioned above need to be flanged, PN 160, DIN 2638 Std. Install the master valve to the pipe.

DN 65 - DN 100 Low pressure side.

On the low-pressure side the valve is supplied with a plain pipe end. The yard connection can either be by welding or flanged.. Make sure that the valve handle is pointing downwards.

Pneumatic piston.

The valves supplied is fitted with a pneumatic piston for remote operation.

The piston is supplied with a flexible hose. This hose shall be connected to the tube coming from the valve release cabinet. The end connection on the flexible hose is 3/8'' BSP male swivel coupling. Length of hose is 303 mm.

The pneumatic piston is also supplied with two limit switches, one for start of alarm sirens and one for ventilation shut down. The limit switches accept cable with outside diameter max. 11 mm. The connection of the switches has to be in accordance with the wiring diagrams.

Reference is also made to Attachment no. 13 / 14 / 15.

Make sure that no obstruction is causing the valve handle or the piston not to open fully.

2.1.6 CO_2 - Manifold pressure gauge.

The pressure gauge shall be installed on the collector pipe between the CO_2 - manifold and the CO_2 - master valves.

A 1/2'' BSP coupling shall be welded to the collector pipe. Add PTFE tape or Loctite 577 to the pressure gauge process connection and tighten up.

Make sure that the pressure gauge is easily visible.

Reference is also made to attachment 6.

2.1.7 CO_2 - Manifold relief valve.

The relief valve shall be installed on the collector pipe between the CO_2 - manifold and the CO_2 - master valves.

A 1/4'' NPT coupling shall be welded to the collector pipe. Add PTFE tape or Loctite 577 to the relief valve process connection and tighten up.

Reference is also made to attachment 7

2.1.8 CO_2 - Shore connection / Air blowing through valve.

The CO_2 - shore connection / Air blowing through valve shall be installed on the collector pipe between the CO_2 - manifold and the CO_2 - master valves.

A 3/4'' BSP nipple shall be welded to the collector pipe. Add PTFE tape or Loctite 577 to the valve process connection and tighten up.

Reference is also made to attachment 8

2.1.9 Pressure switch with manual reset.

The pressure switch shall be installed on the collector pipe between the CO_2 - manifold and the CO_2 - master valves or downstream of the CO_2 - master valves if a separate signal from each zone is required. This will be shown on the system drawing.

A 1/2'' BSP coupling shall be welded to the pipe. Add PTFE tape or Loctite 577 to the pressure switch process connection and tighten up.

If the switch has to be installed on the bulk head a 12 mm tube has to be installed between the switch and the CO_2 - pipe.

The switch has a double pole change over contact and one cable entry accepting cable diameter 11 mm.

Reference is also made to attachment 9.

2.1.10 CO_2 - cylinder weighing device.

The weighing device is supplied with a weight including necessary equipment for lifting the CO_2 - cylinders. A steel bar dimensioned for a load of minimum 200 kg. point load has to be welded above each cylinder row.

Reference is also made to Attachment 10.

2.2 Installation inside the protected area.

The following equipment is normally installed inside the protected area.

- Piping.
- CO_2 - nozzles.
- Alarms.

2.2.1 Piping.

The piping has to be installed in accordance with the general arrangement and the isometric piping drawing.

The piping has to be securely supported to avoid any damages upon release of a CO_2 - system. Upon supporting the pipes, the direction of flow should be considered, to avoid any elbows and/or Tee's to be blown off.

All pipes used shall be made from steel and the minimum dimensions have to be in accordance with the below table.

Note! Minimum wall thickness is the thickness in the pipe after threading.

Nominal diameter		External Diameter	Minimum wall thickness		Minimum inside dia.
mm	Inch	mm	From CO_2 - cylinder to main valve	From main valve to nozzles	mm
15	1/2''	21,3	3,2	2,6	13
20	3/4''	26,0	3,2	2,6	19
25	1''	33,7	4,0	3,2	25
32	1 1/4''	42,4	4,0	3,2	32
40	1 1/2''	48,3	4,0	3,2	38
50	2''	60,3	4,5	3,6	50
65	2 1/2''	76,1	5,0	3,6	65
80	3''	88,9	5,6	4,0	76
100	4''	114,3	7,1	4,5	101
125	5''	139,7	8,0	5,0	123
150	6''	168,3	8,8	5,6	150

Table 4.2.1-1

The piping has to be pressure tested when the installation is completed as follows.

Class	From CO_2 -cylinder to main valve/pilot tube.	From main valve to nozzles
Det norske Veritas	150 Bar.	10 Bar. (Air)
Lloyds Register of shipping	190 Bar.	50 Bar. (Hydraulic)
American Bureau of Shipping	150 Bar.	50 Bar. (Hydraulic)
Bureau Veritas	128 Bar.	7 Bar. (Air)
Germanischer Lloyd	150 Bar.	10 Bar. (Air)
Russian Register of Shipping	240 Bar.	50 Bar. (Hydraulic)

Table 4.2.1-2

2.2.2 CO_2 - nozzles.

The CO_2 - nozzles shall be installed in accordance with the general arrangement drawing and the isometric piping drawing.

The nozzles are supplied with BSP Female threads in two dimensions.

- 3/4'' BSP
- 1/2'' BSP

Each branch of the piping has to end with a BSP threaded nipple. Dimension to be the same as for the nozzle.

Please note that the nozzle will have different bore. The actual bore is stamped on each nozzle. The nozzles has to be fitted in accordance with the applicable drawings. All nozzles shall be directed vertically.

Reference is also made to attachment 11.

2.2.3 Alarms.

Two main types of alarms are supplied. These are as follows.

- Air operated typhoons.
- Electric operated sirens.

The alarm sirens should generally be located nearby the entrances to the protected area.

Power supply to the alarm sirens shall be from the Main and Emergency power supply on board.

Air operated typhoons.

The air operated typhoon siren is supplied as one unit including solenoid valve. The air to the typhoon shall be from the starting air receivers. The end connection on the typhoon is 1/2'' BSP female.

The cable for the solenoid valve shall be 1 x 2 x 1,5 mm^2 ship cable. Maximum outside diameter to be 11 mm.

Two standard voltages are supplied, 24 VDC or 220 VAC.

Please refer to wiring diagram or the solenoid name plate for correct voltage, as faulty voltage can destroy the solenoid.

Note that maximum operating air pressure is 12 Bar. If the starting air pressure is higher a pressure reducing valve has to be fitted.

The typhoon siren is supplied with a steel bracket with two holes each 12 mm. The bracket shall be securely supported to the bulkhead using minimum 10 mm bolts.

Some of the authorities are requiring additional air receivers located outside the protected area if the starting air receiver is located inside.

Electric alarm sirens.

The electric alarm sirens is generally of the electronic type, with adjustable sound and frequency. The sirens are normally supplied pre- adjusted. At site adjustment may be necessary to achieve a sufficient volume of the sound.

The cable for the siren shall be 1 x 2 x 1,5 mm^2 ship cable. Maximum outside diameter to be 11 mm.

Two standard voltages are supplied, 24 VDC or 220 VAC.

Please refer to wiring diagram or the siren name plate for correct voltage, as faulty voltage can destroy the solenoid.

The siren is supplied with two holes for supporting, each 6,5 mm dia. Minimum 5 mm bolts to be used for supporting the siren to the bulkhead.

Electric alarm siren for Hazardous area.

The electric alarm siren for Hazardous area is supplied 2 pcs M20 cable inlets where one is plugged.

Two standard voltages are supplied, 24 VDC or 220 VAC.

Please refer to wiring diagram or the siren name plate for correct voltage, as faulty voltage can destroy the solenoid.

The siren is supplied with three holes for supporting, each 7 mm dia. Minimum 4 mm bolts to be used for supporting the siren to the bulkhead.

2.3 Release station.

The control station consist of a release cabinet. It shall be located in accordance with the general arrangement drawings and the CO_2 - room arrangement drawing.

2.3.1 Release cabinet.

The supply cabinet shall be supported to the bulkhead using the 4 holes drilled in the back plate of the cabinet. M8 bolts to be used.

It shall be connected to the CO_2 - cylinders and the master valve using 8 x 1 mm instrument tube. (Ref. 4.3.2). The 8 mm compression coupling for the pilot pressure is located at the bottom of the cabinet.

The release cabinet has two limit switches, one for start of alarm siren and one for ventilation shut down. Two cable glands PG 16, bottom entry are fitted.

Reference is also made to Attachment 12/13/14/15.

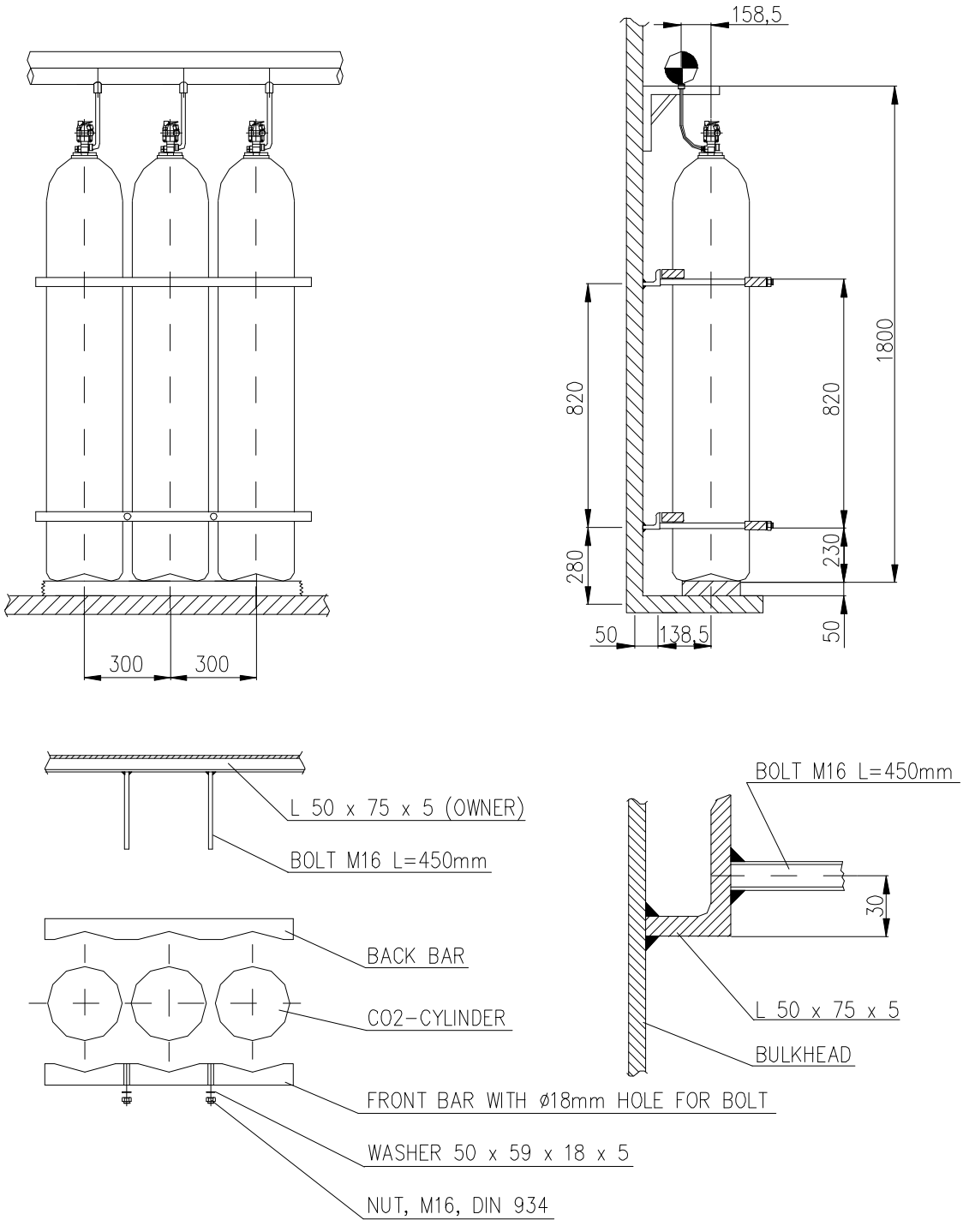
2.3.2 Pilot tube.

The pilot tube shall as a minimum be ø 8 x 1 mm high pressure steel instrument tube. It is recommended to use steel tube.

Upon completion the installation shall be pressure tested in accordance with table 4.2.1-2

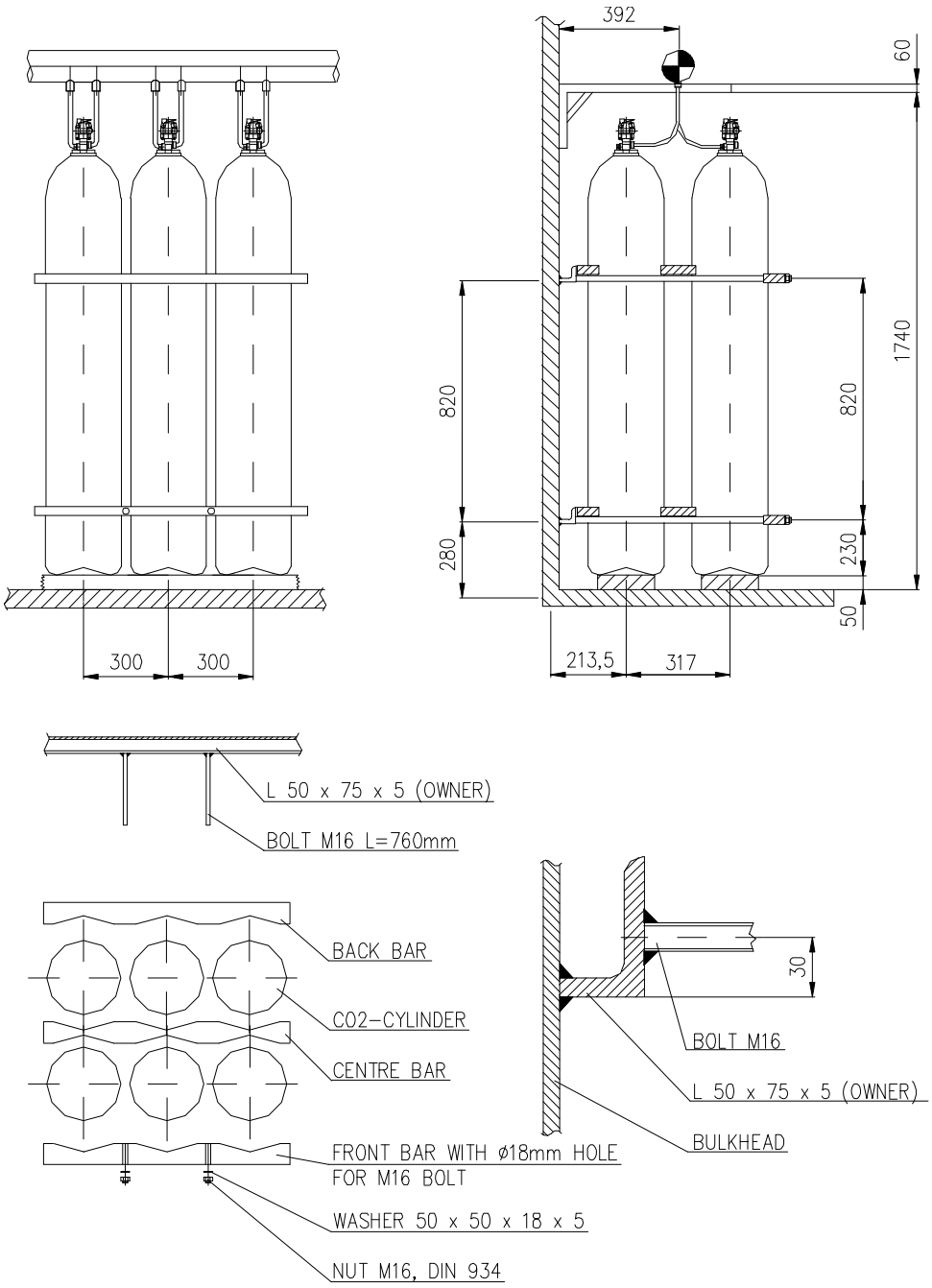
3 ATTACHEMENTS

3.1 CO_2 - Cylinder battery, 1 Row

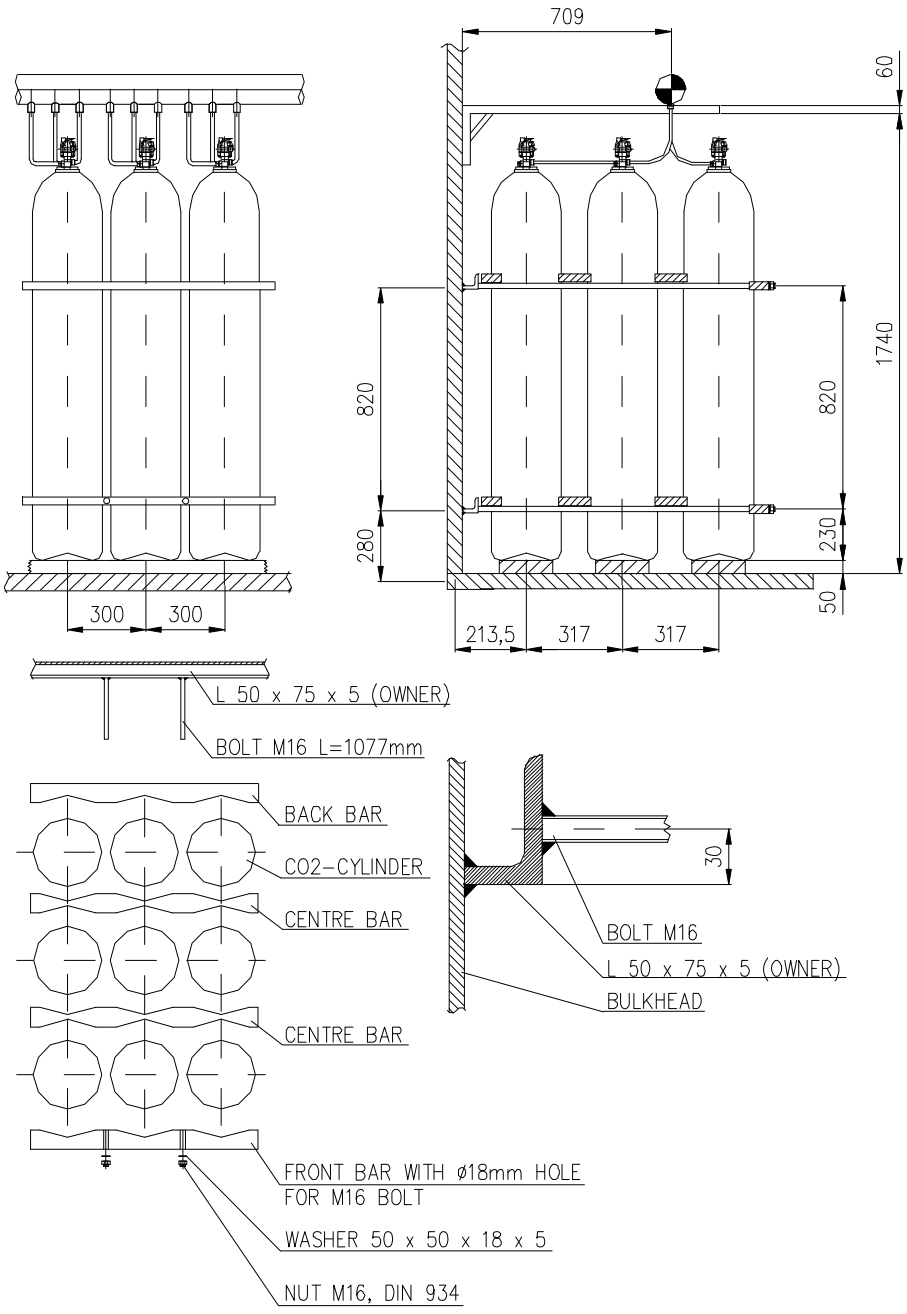


Attachment 1

3.2 CO_2 - Cylinder battery, 2 Row's

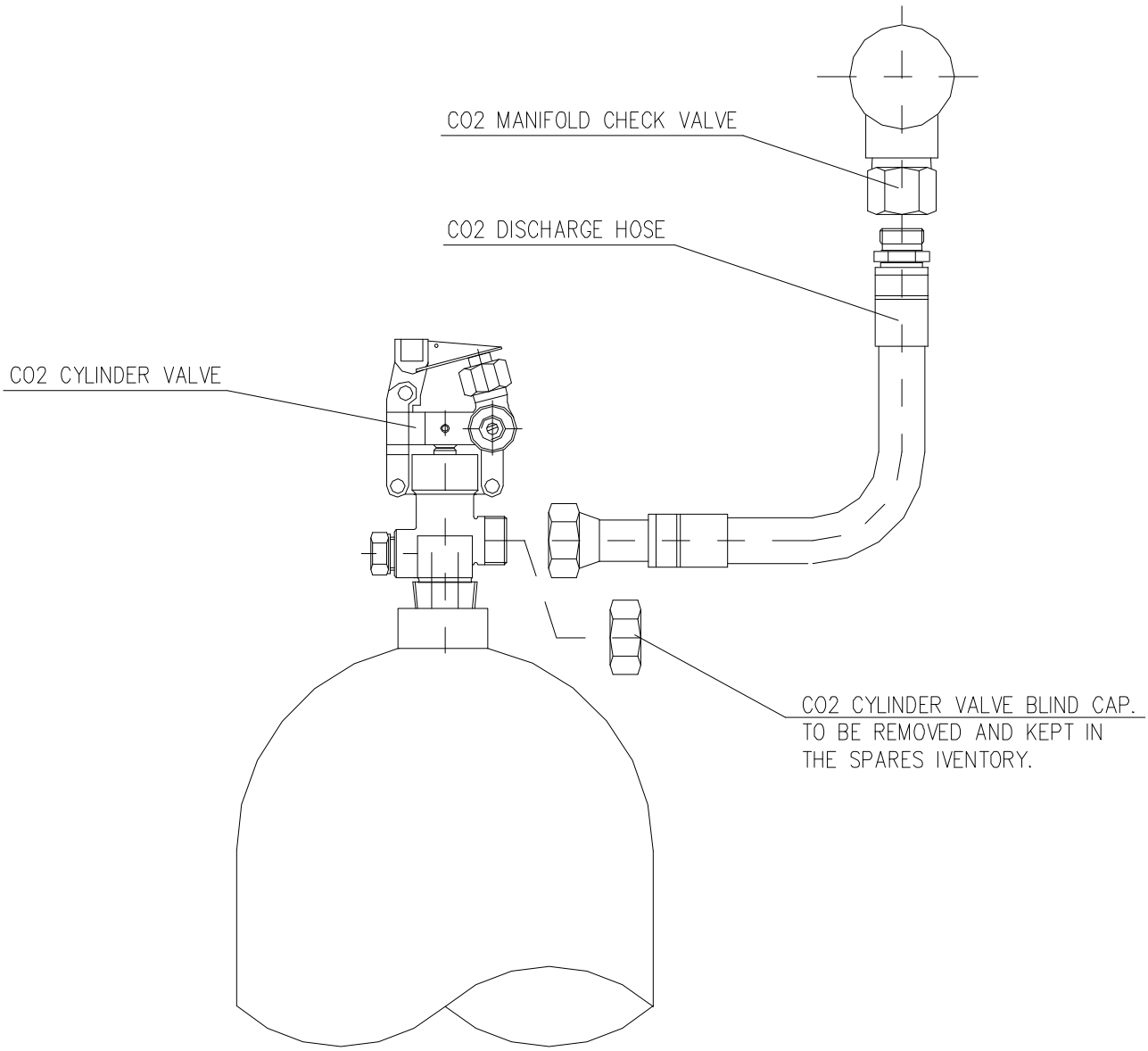


3.3 CO_2 - Cylinder battery, 3 Row's



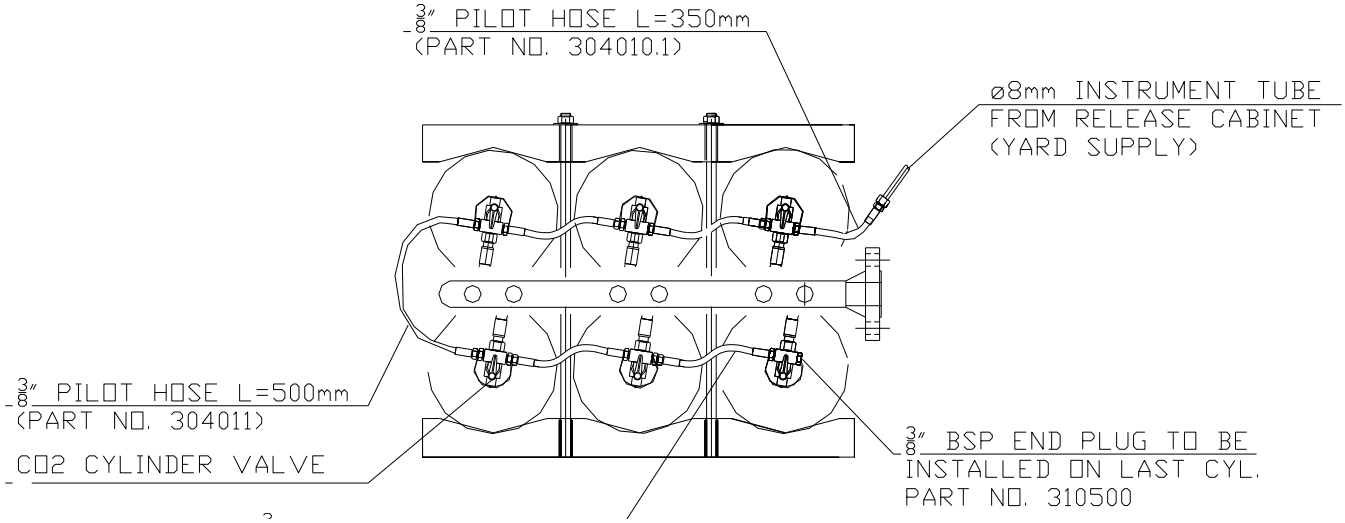
Attachment 3

3.4 CO_2 - Discharge hose



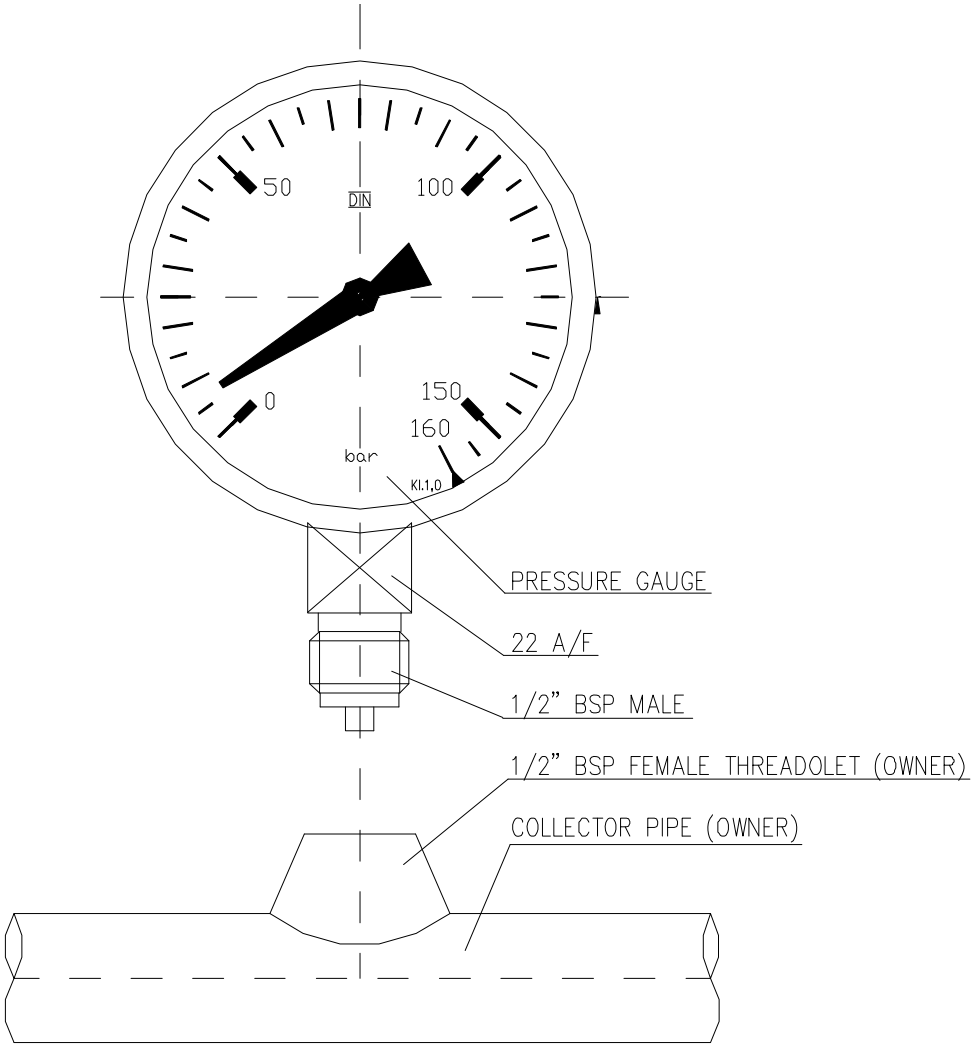
Attachment 4

3.5 Pilot manifold



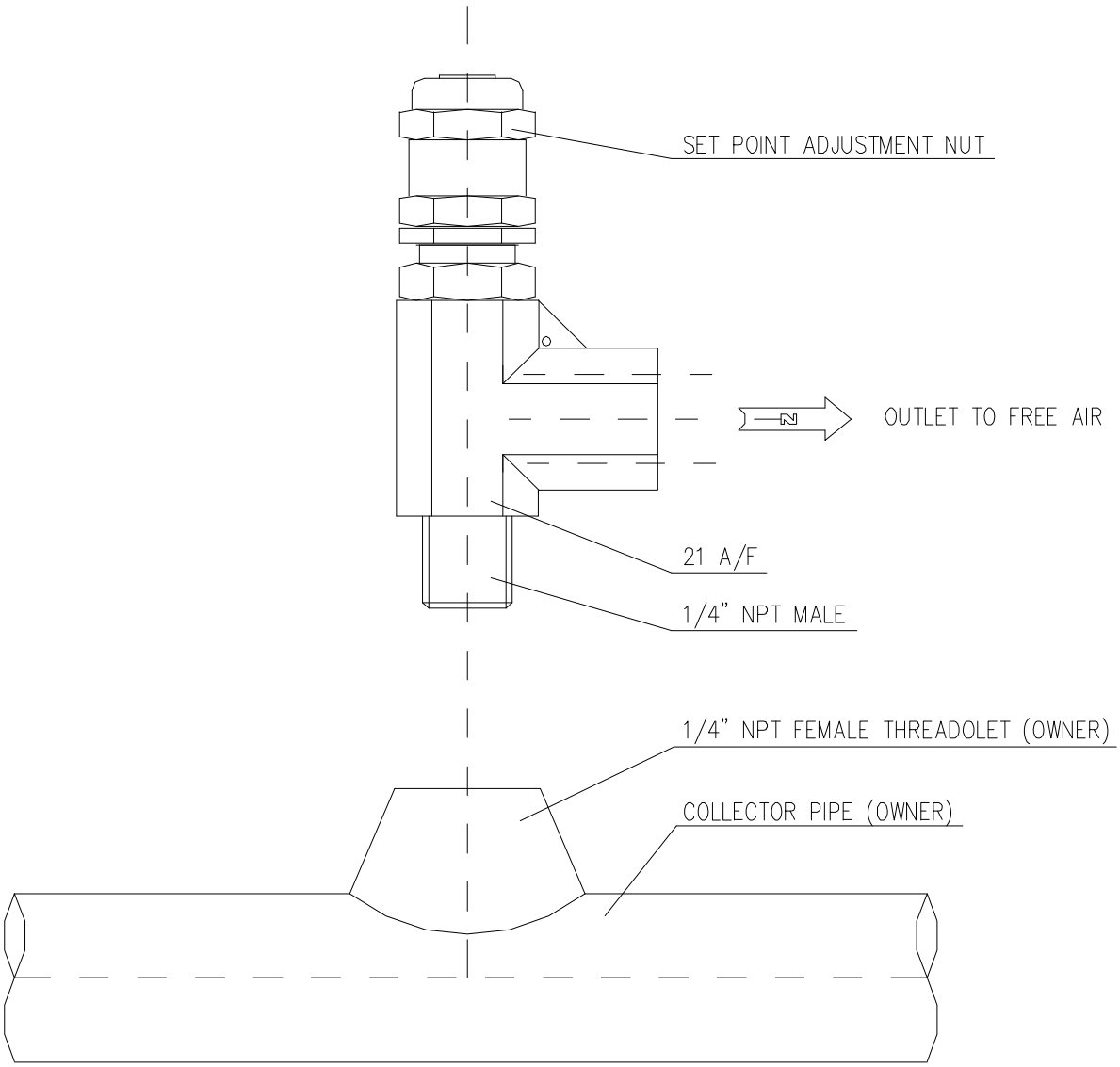
Attachment 5

3.6 Pressure gauge



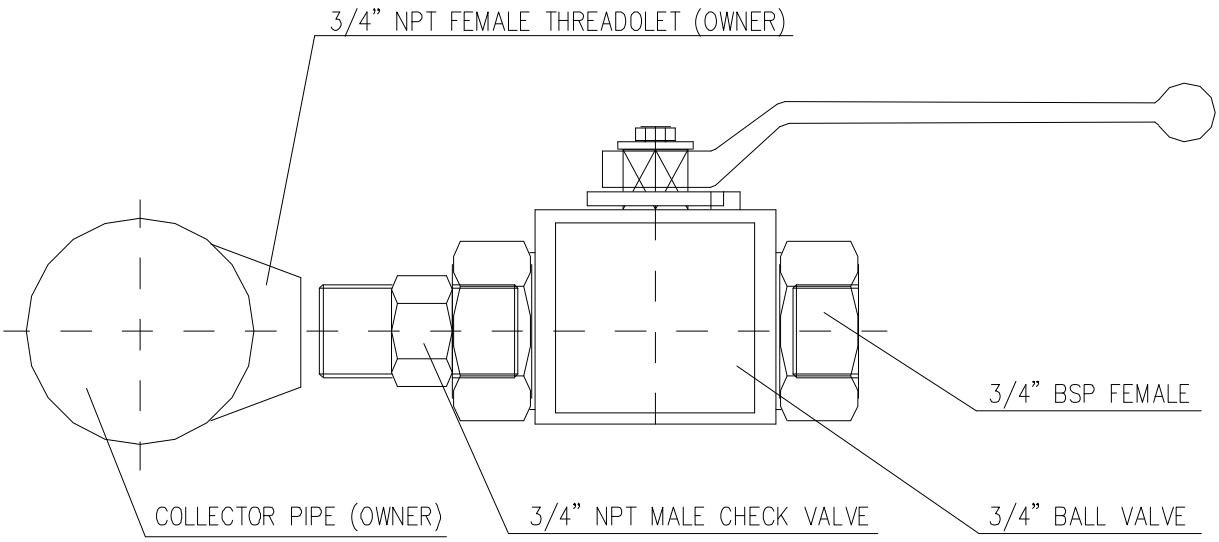
Attachment 6

3.7 CO_2 - Manifold relief valve



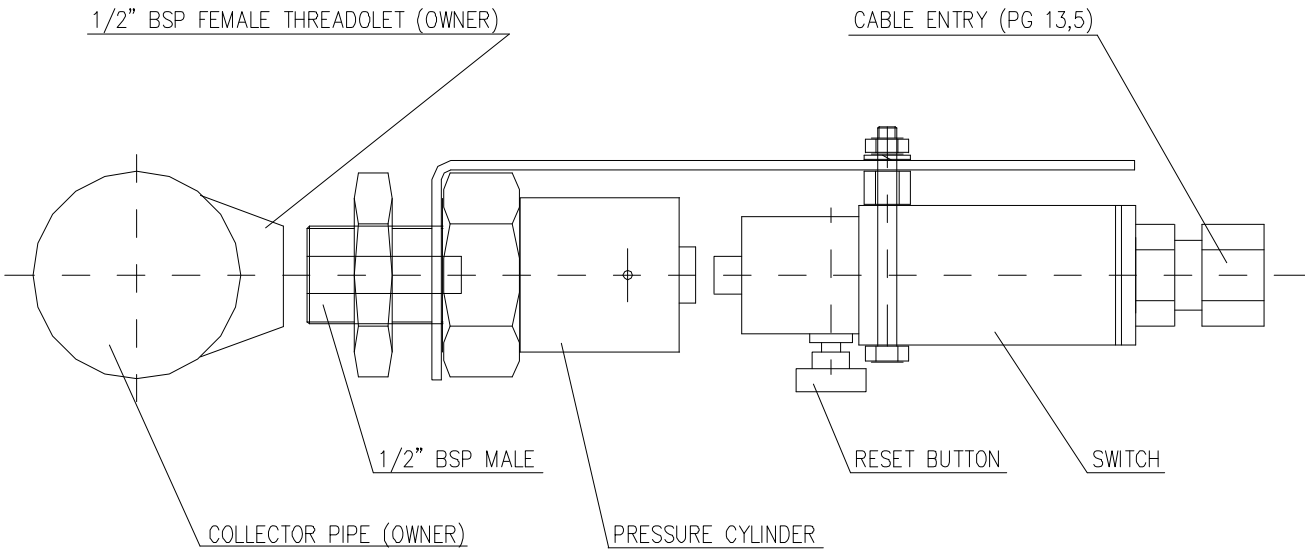
Attachment 7

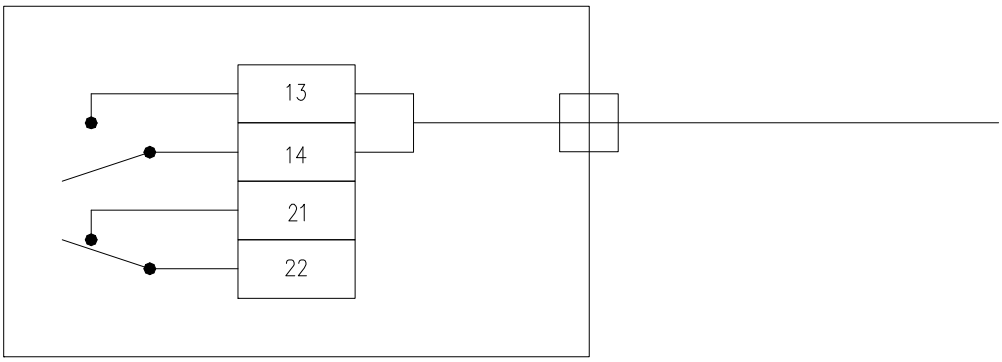
3.8 CO_2 - Shore connection / Air blowing through valve



Attachment 8

3.9 Pressure switch

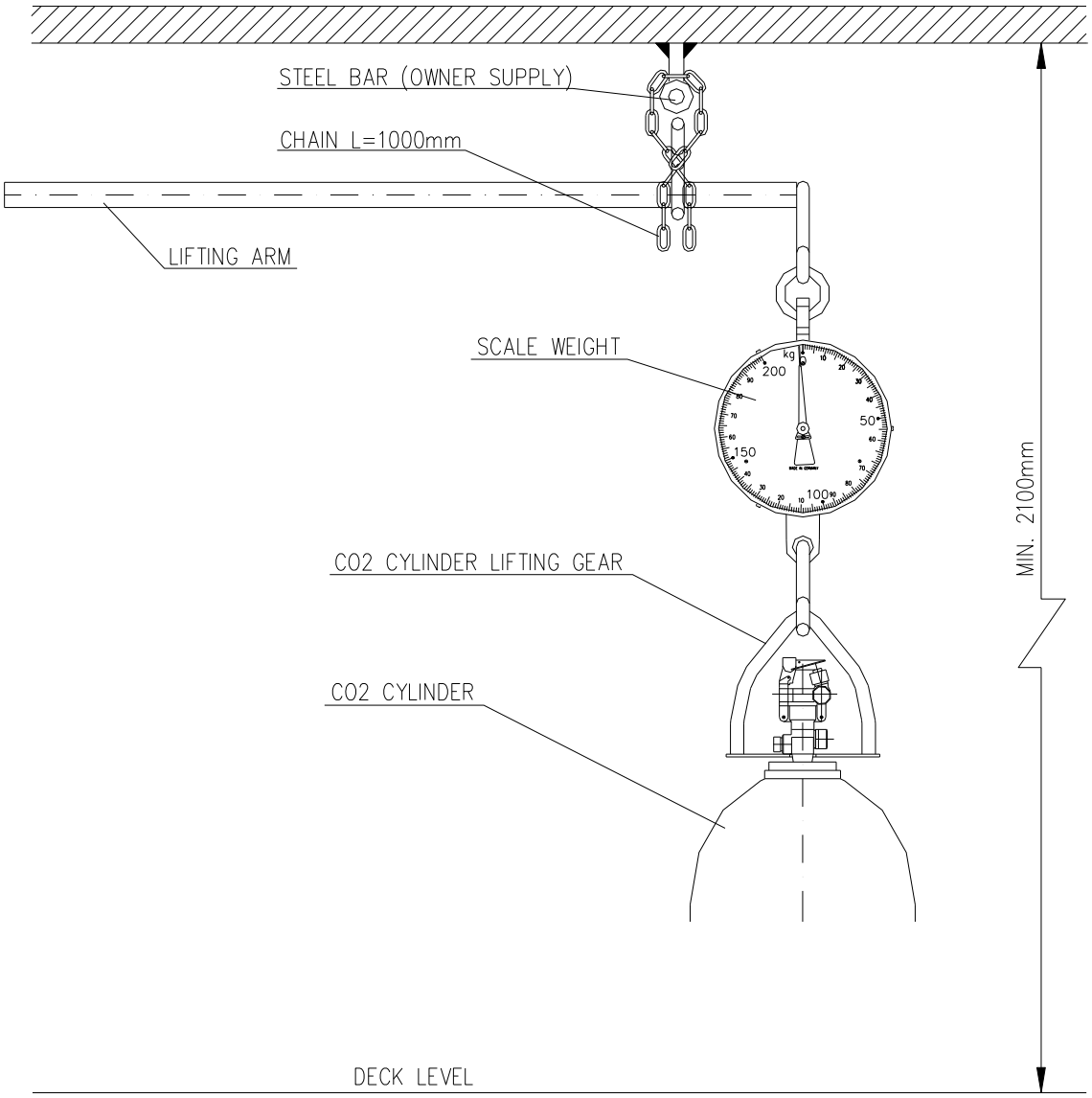




LIMIT SWITCH CONTACT POSITION

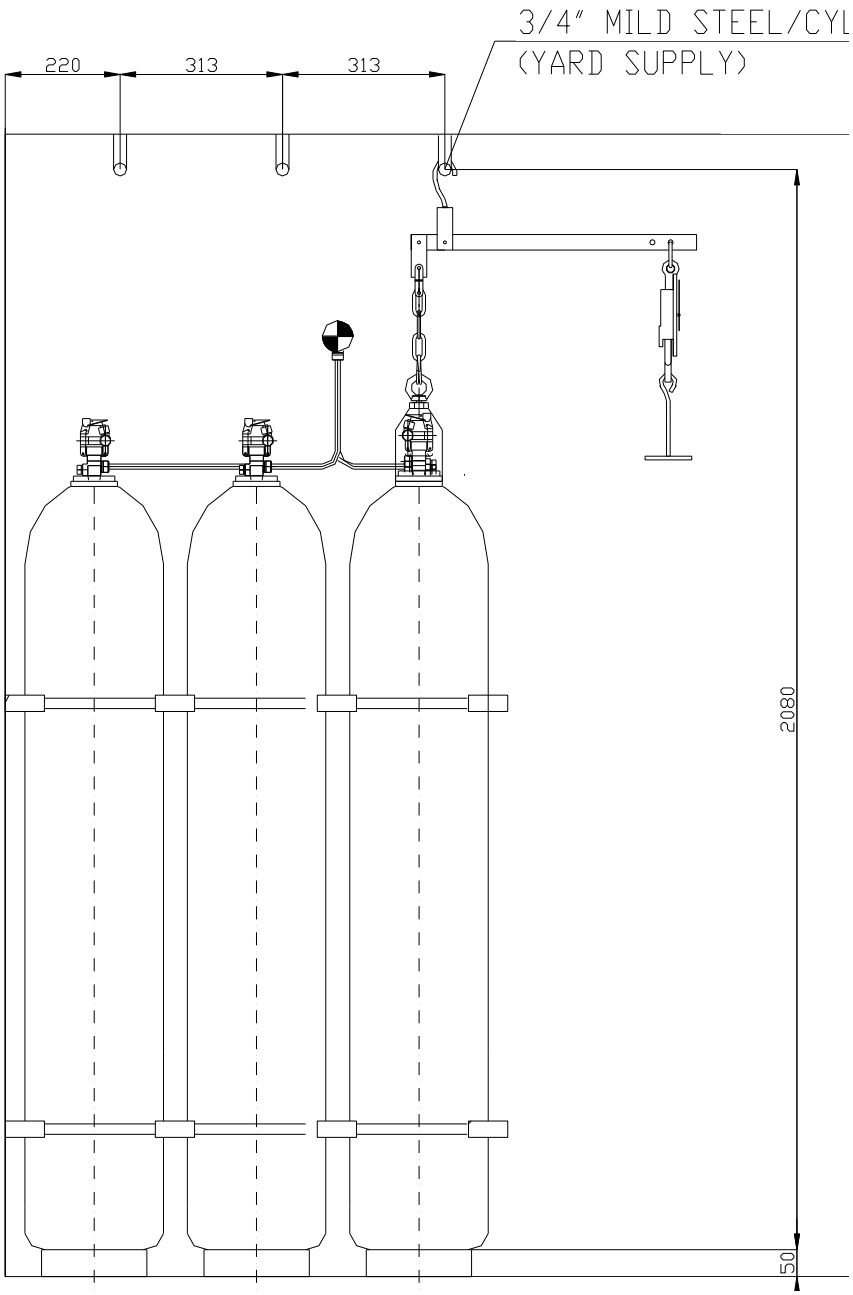
Attachment 9

3.10 Weighing device H-L standard



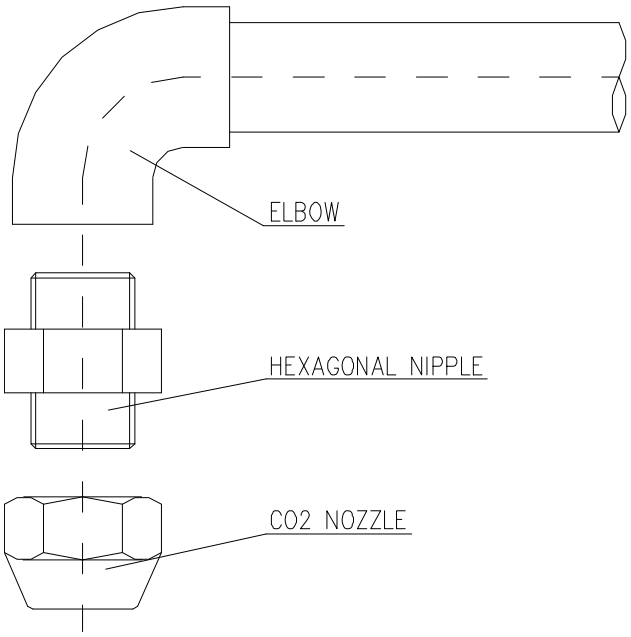
Attachment 10.1

3.11 Weighing device type Kidde Deugra

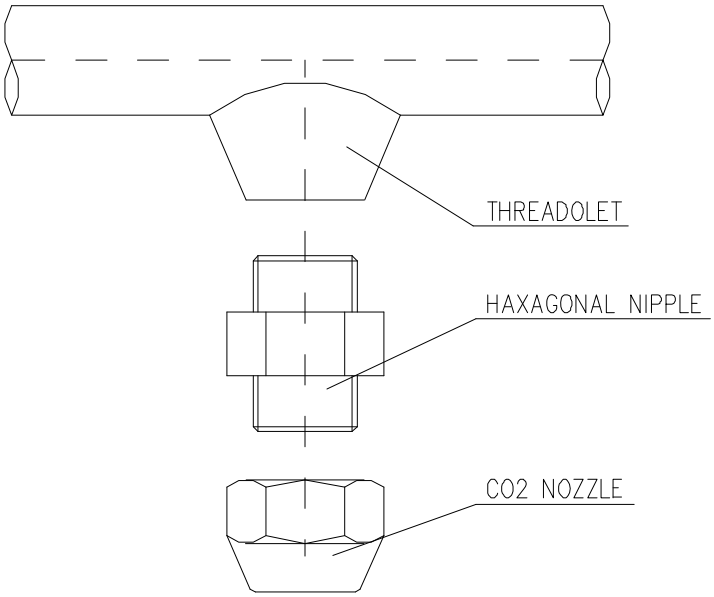


Attachment 10.2

3.12 CO_2 - Nozzles



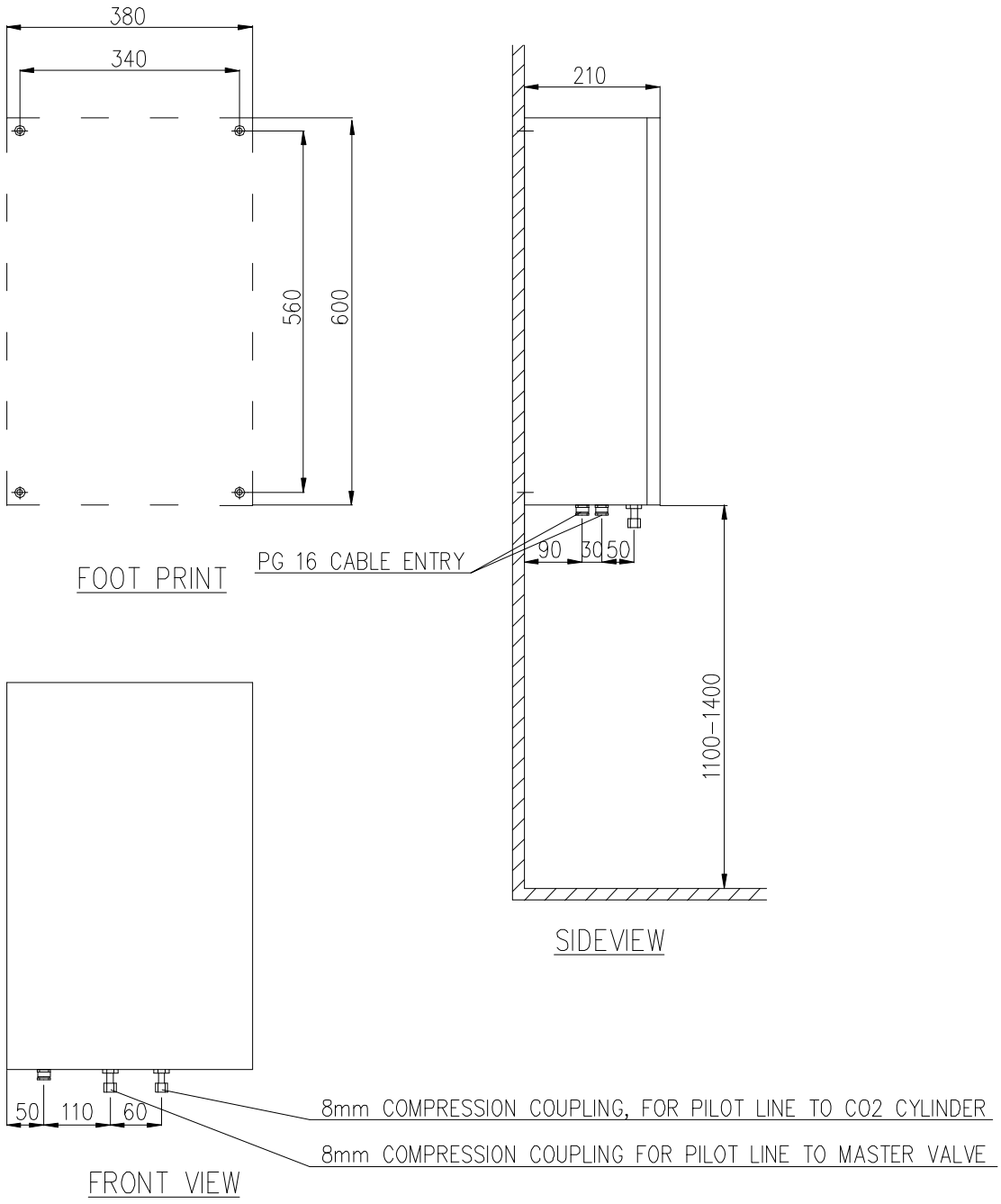
CO2 NOZZLE AT THE END OF THE PIPE



CO2 NOZZLE FITTED TO THE PIPE LINE

Attachment 11

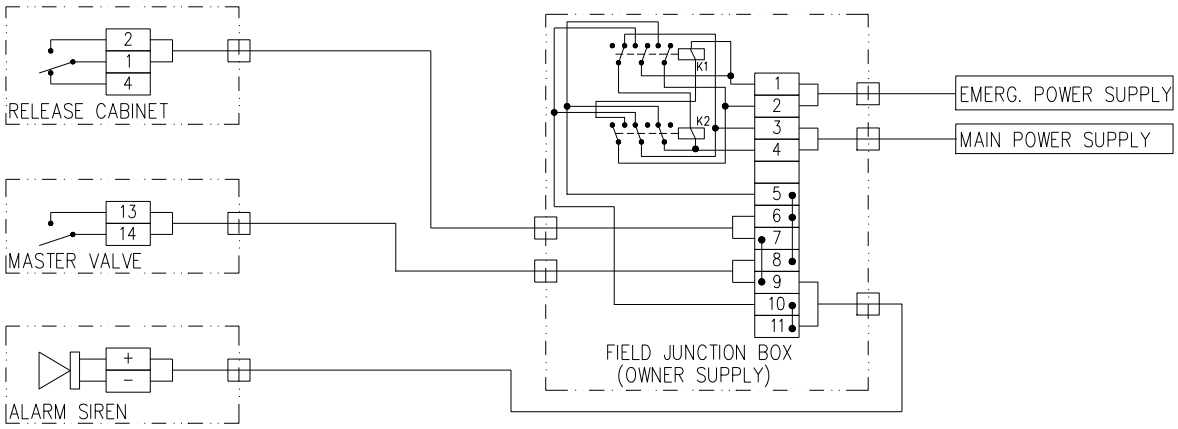
3.13 Release cabinet



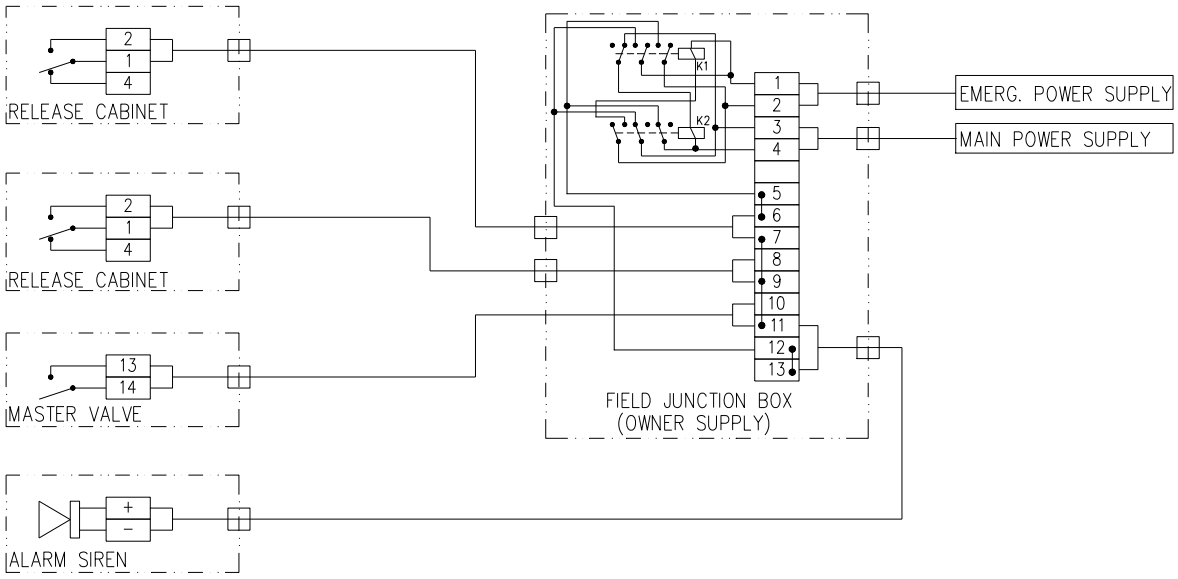
Attachment 12

3.14 Wiring diagram for alarm siren.

ONE RELEASE STATION



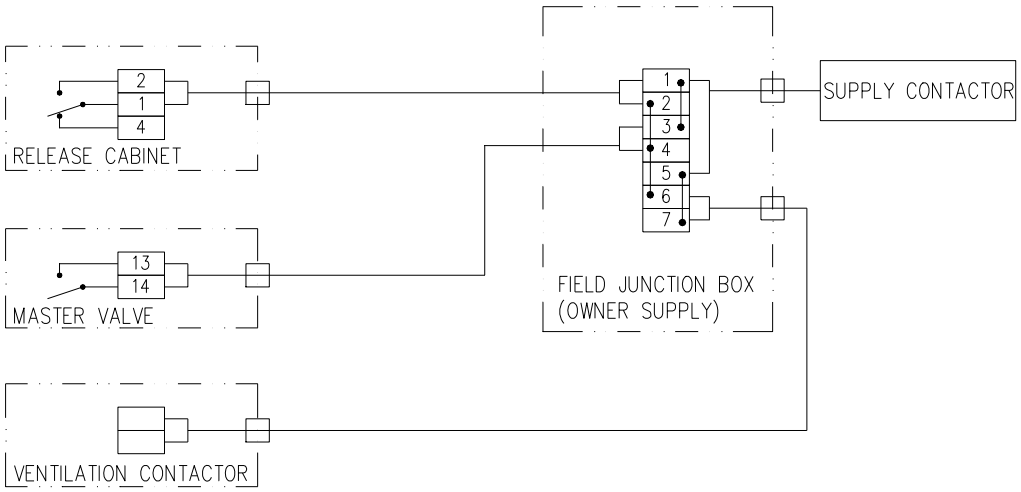
TWO RELEASE STATION'S



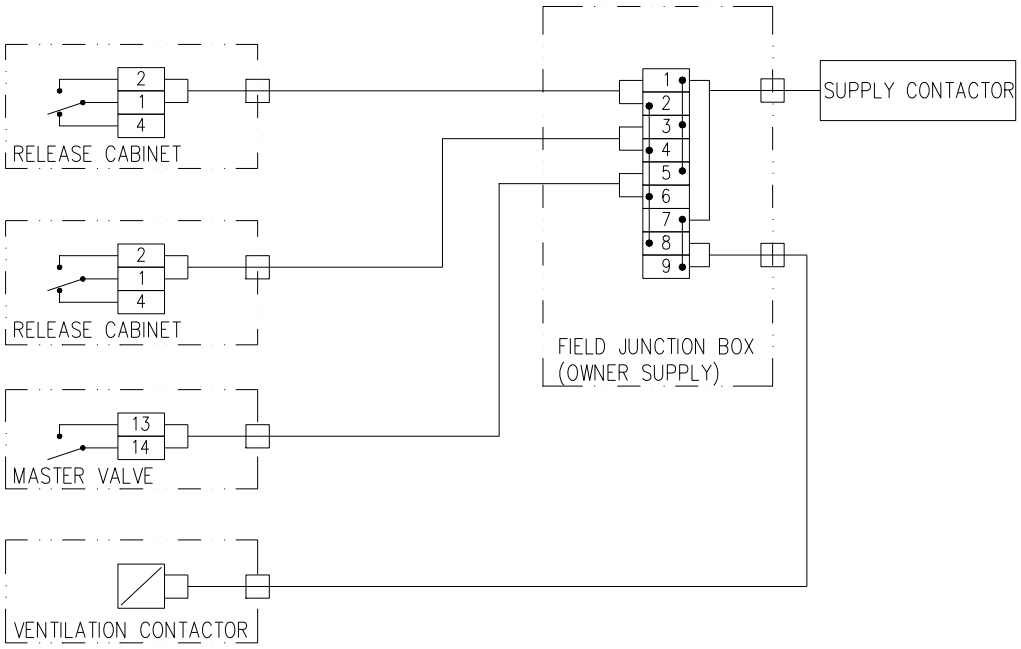
Attachment 13

3.15 Wiring diagram – ventilation stop for DNV classed vessels.

ONE RELEASE STATION



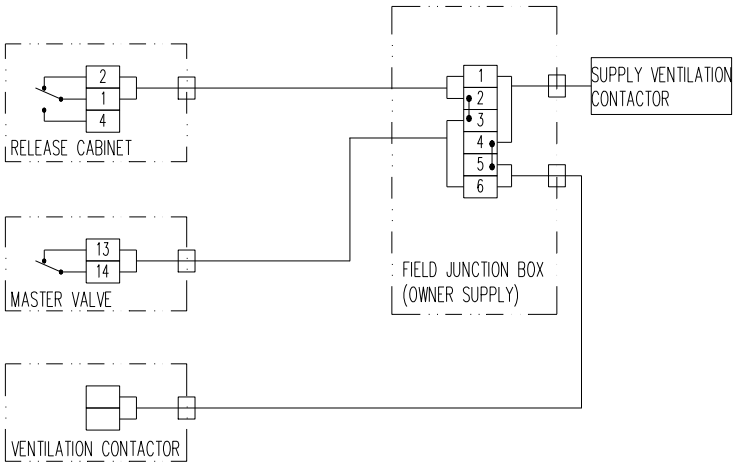
TWO RELEASE STATION'S



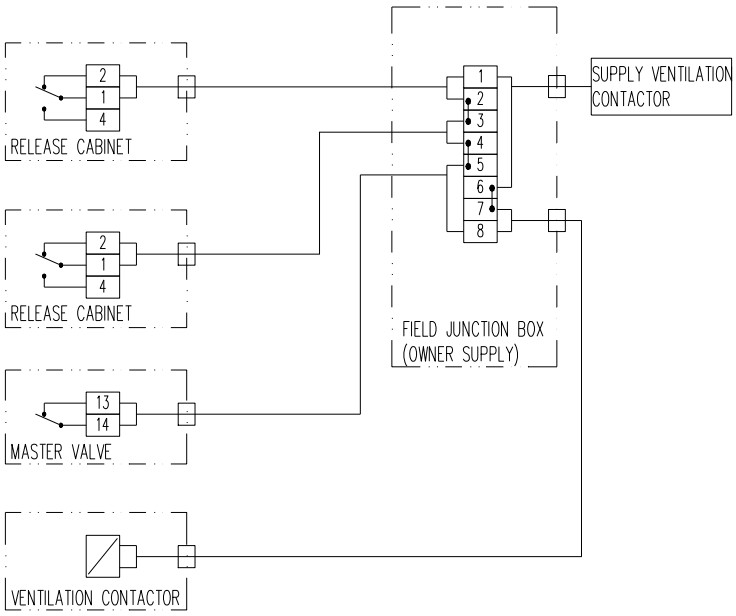
Attachment 14

3.16 Wiring diagram ventilation stop, for ABS, BV, GL and LRS classed vessels.

ONE RELEASE STATION



TWO RELEASE STATION'S



Note! ABS requires 2 release stations (one in CO2 room and one local release).

Attachment 15