# Designing For Safe Ammonia Cold Storage

**Why Ammonia Refrigeration Safety?**

Ammonia Refrigerant Leaks -Issues

- Toxicity
- Flammability

**Ammonia Leaks**

- Ammonia LiquidLeaks-Density @400C-579.4 kg/m3
- Ammonia VapourLeaks-Density@ 400C-12 kg/m3
- Liquid Density 48.22Times more
- Liquid Ammonia Leaks are More Dangerous Than Vapour

**Common Errors -Leading To Leakages**

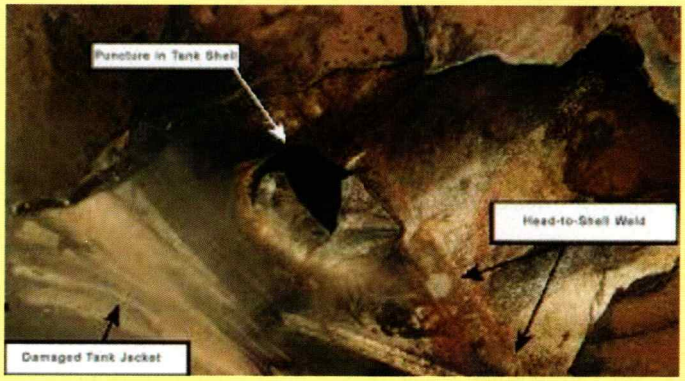
- Incorrect Selection of Equipment
- Incorrect Design of pressure vessels
- Incorrect fabrication-Welding Methods
- Incorrect Installation-piping/Valves
- Incorrect safety/ controls connections-wiring
- Incorrect peration/Maintenance practices

**Possibilities of Ammonia Leaks**

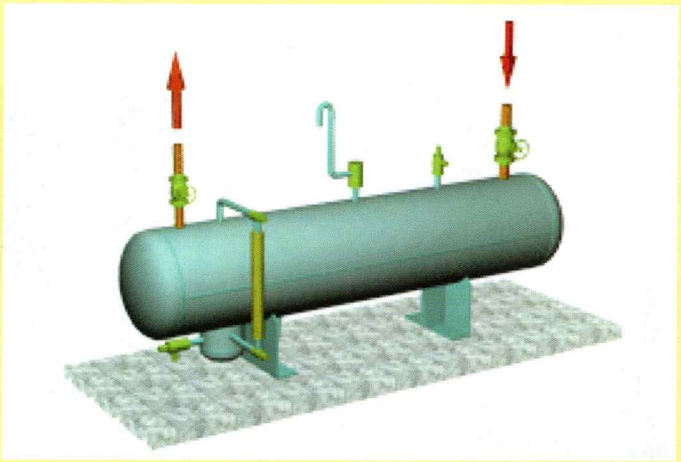
- Storage tanks/vessels/Receivers
- Flanges –Joints
- Pressure Relief Valves
- Piping-Charging methods
- Manually operated valves-Oil drain
- Oil Pots
- Compressors/Pumps
- Sight Glass


**How To Avoid Ammonia Leaks**

- Use Welded Joints instead Flanged
- Use Proper material for pipes/vessels
- Correct Location of Valves
- Avoid Liquid Ammonia Traps
- Use QuickDrain Valves for oil Drain
- Use DuelSafety Valves
- Use Shieldedsight Glass with auto close check valves




**High Pressure Ammonia Receiver**



**Design Precautions-Pressure Vessels**

- Use Boiler Quality plates for Receiver Fabrication-IS2002 Gr2A or SA516/Gr.70 plates& notStructural steel IS-2062
- Use proper Thickness of plate as per TEMA standards
- Consider joint efficiency as 0.7if no radiography
- Add corrosion allowance 0f 1.6mmin calculated thickness
- Fabrication as per IS 2825 or ASME sec. VIII-Div 1.

**Pressure Vessels**

- **Use backing strip for shell to end cap joints**
- **Use minimum shell sections-Preferred up to 24" standard Sch. 20 pipes**

- Do not use valve below safety valve
- Use Duel safety valve for vessels having 10 cu.ft. & above volume
- Sight Glass shielded with check valves

**Pressure Vessels**

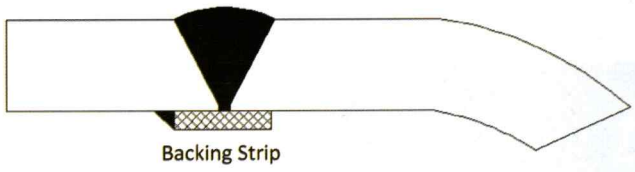
- Pressure Test-Hydraulic 1.5 Times Design pressure (20 Bar)
- Leak Test -1.25Times Design Pressure
- Set Safety Relief valve 25% higher than max. operating pressure but never more than design pressure
- Periodic testing of receiver & calibration of safety relief valve required once in a year

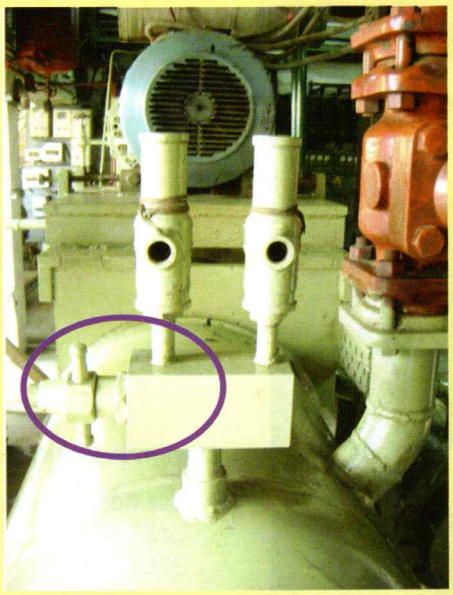
**Shell to Dish End Welding**

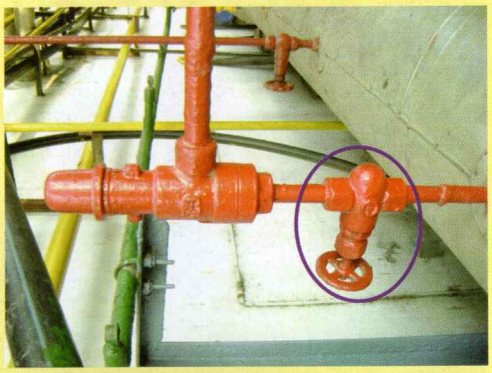
**Double Stop Valve -type DSV and Double Safety Valve -type SFV**

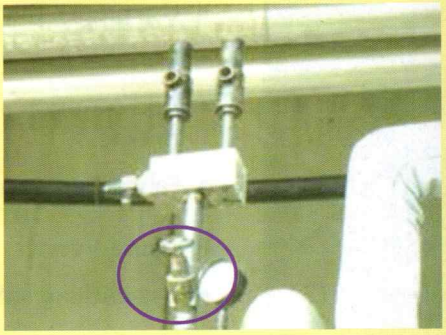
**Piping**

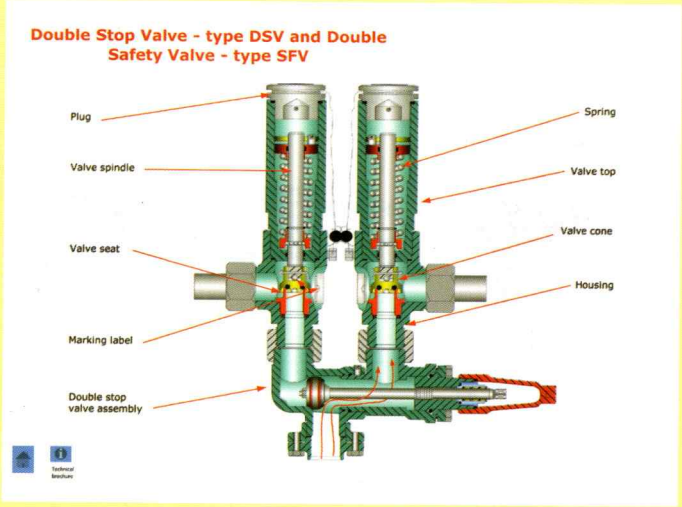
- Piping/fittings as per ANSI B31.5-2006
- Carbon Steel A53 Grade A or B ERW or A106 grade A/B seamless

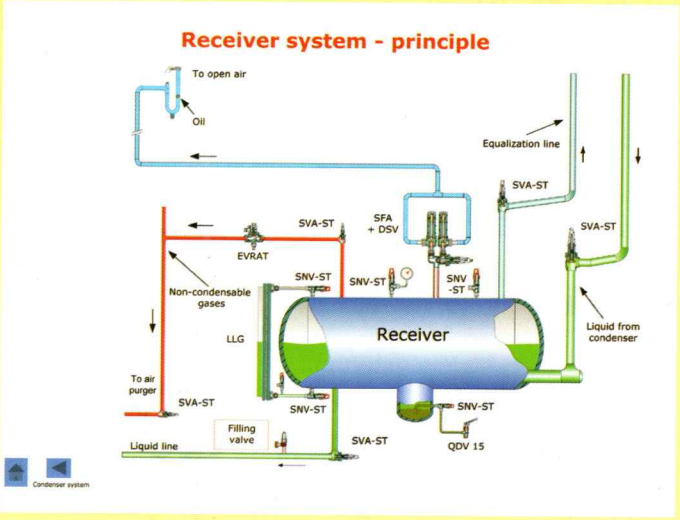


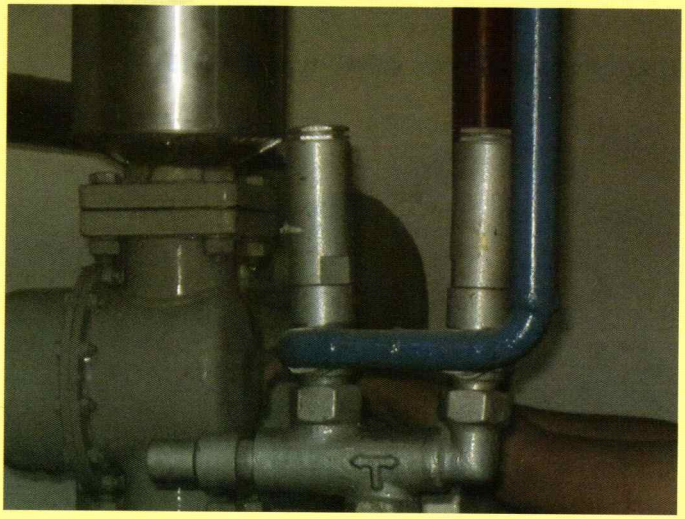









3.1 ½" and smaller –Sch. 80

4.2" to 6' Sch. 40

5.8" to 12" sch20

6.Sch80 ≥ Sch40 ≥ sch20

**Welding**

- Root run with TIG(Argon)for piping
- Root run with TIG( Argon) or MIG for vessels
- Welding by qualified welder certification level 3
- Welding rods-Argon-High side-AWS-A5.18 ER70S-G, Low side –AWS –A5.28 ER70S-G
- Electric Welding –AWS –A5.1 E7016, Do not use structural welding rods 6013

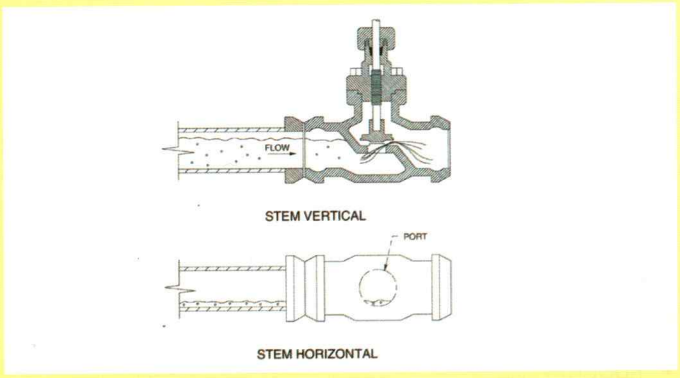
| | | |
|---|---|---|
| Dimension | : | DN 15 -DN 150 |
| Pressure | : | PS 25 bar |
| Connection | : | DIN, ANSI, Metric |
| Types | : | Cap / HandwheelAngel / Straight |
| Material | : | Steel |
| Approvals | : | Non |
| Market | : | China + APAC |

STC full fill the same high quality and safety requirements as all other Danfoss products.

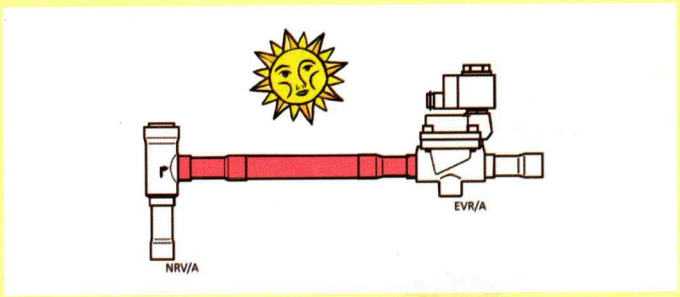
The test procedures for strength pressure test and internal / external leakage tests are

identical for SVA and STC valves

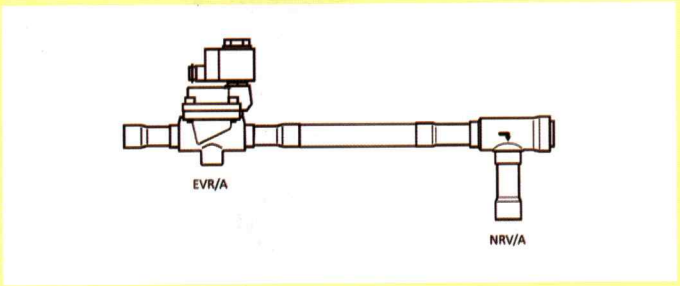
## Liquid Hold-up Valve Position

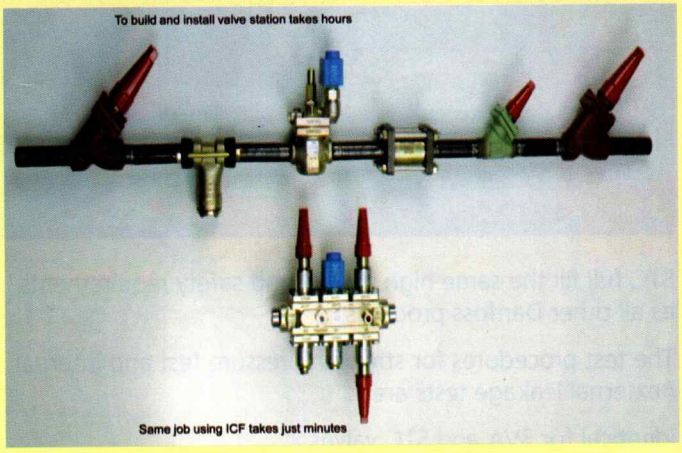



## Locked refrigerant

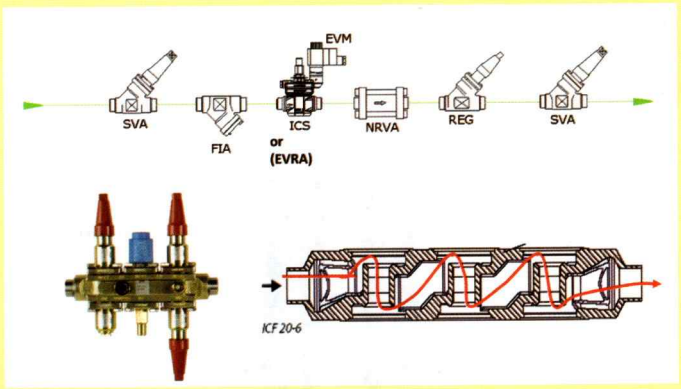


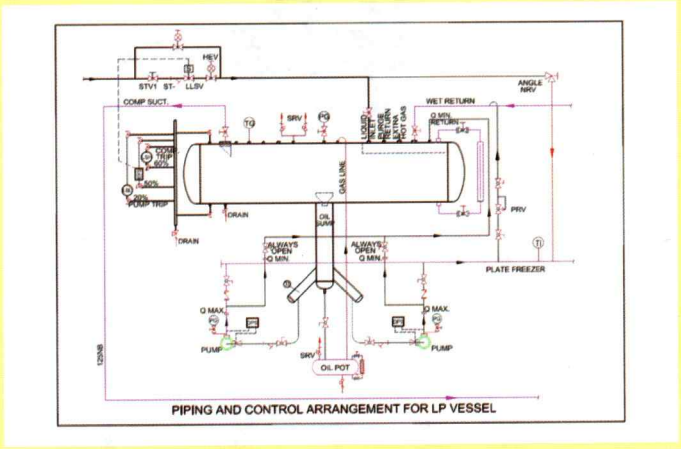

## How to place solenoid and check valve



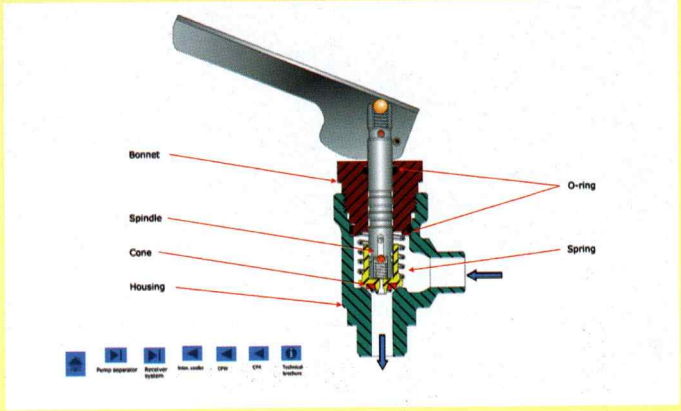

## The ICF Control Solution

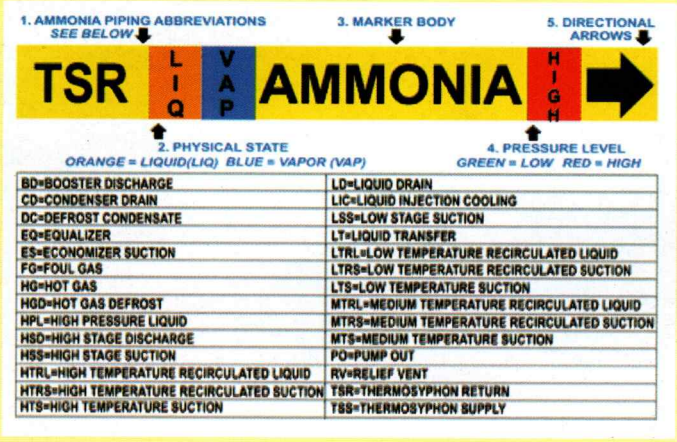



## KP switches

## Quick closing oil drain valve –type QDV 15



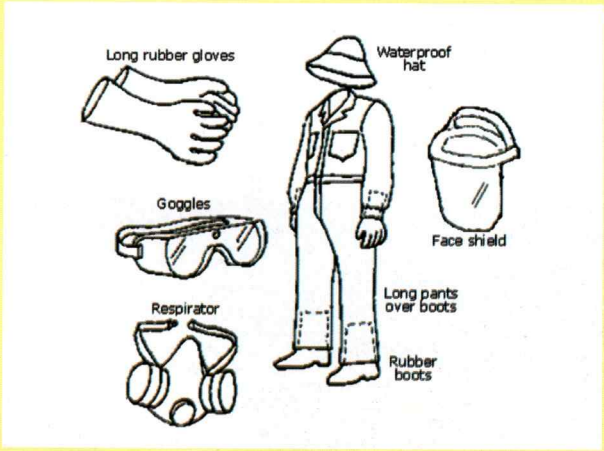




| | |
|---|---|
| BD=BOOSTER DISCHARGE | LD=LIQUID DRAIN |
| CD=CONDENSER DRAIN | LIC=LIQUID INJECTION COOLING |
| DC=DEFROST CONDENSATE | LSS=LOW STAGE SUCTION |
| EQ=EQUALIZER | LT=LIQUID TRANSFER |
| ES=ECONOMIZER SUCTION | LTRL=LOW TEMPERATURE RECIRCULATED LIQUID |
| FG=FOUL GAS | LTRS=LOW TEMPERATURE RECIRCULATED SUCTION |
| HG=HOT GAS | LTS=LOW TEMPERATURE SUCTION |
| HGD=HOT GAS DEFROST | MTRL=MEDIUM TEMPERATURE RECIRCULATED LIQUID |
| HPL=HIGH PRESSURE LIQUID | MTRS=MEDIUM TEMPERATURE RECIRCULATED SUCTION |
| HSD=HIGH STAGE DISCHARGE | MTS=MEDIUM TEMPERATURE SUCTION |
| HSS=HIGH STAGE SUCTION | PO=PUMP OUT |
| HTRL=HIGH TEMPERATURE RECIRCULATED LIQUID | RV=RELIEF VENT |
| HTRS=HIGH TEMPERATURE RECIRCULATED SUCTION | TSR=THERMOSYPHON RETURN |
| HTS=HIGH TEMPERATURE SUCTION | TSS=THERMOSYPHON SUPPLY |

## Ammonia Leak Detector & Alarm


- Detects Leakage of Ammonia from 30 PPM
  Multi Level Alarm
- Single and Multi Channel Detection Unit
- 16 X 2 Line LCD display shows continuous ammonia level
- Inbuilt Hooter, And Relay to Operate Ventilation System
- Easy to Install
- Three Core Cable connection for Sensor
- Area Covered by one sensor is @ 2000 Sq. ft.

## Safety Accessories

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