# XEV22D

## DRIVER FOR STEPPER ELECTRONIC EXPANSION VALVES

***--- MANUAL FOR RELEASE 1.5 ---***



## 1. GENERAL WARNING

### 1.1 PLEASE READ BEFORE USING THIS MANUAL

- This manual is part of the product and should be kept near the instrument for easy and quick reference.
- The instrument shall not be used for purposes different from those described hereunder. It cannot be used as a safety device.
- Check the application limits before proceeding.
- Dixell Srl reserves the right to change the composition of its products, even without notice, ensuring the same and unchanged functionality.

### 1.2 ⚠ SAFETY PRECAUTIONS

- Check the supply voltage is correct before connecting the instrument.
- Do not expose to water or moisture: use the controller only within the operating limits avoiding sudden temperature changes with high atmospheric humidity to prevent formation of condensation
- **Warning:** disconnect all electrical connections before any kind of maintenance.
- Fit the probe where it is not accessible by the End User. The instrument must not be opened.
- In case of failure or faulty operation send the instrument back to the distributor or to "Dixell S.r.l." (see address) with a detailed description of the fault.
- Consider the maximum current which can be applied to each relay (see Technical Data).
- Ensure that the wires for probes, loads and the power supply are separated and far enough from each other, without crossing or intertwining.
- In case of applications in industrial environments, the use of mains filters (our mod. FT1) in parallel with inductive loads could be useful.

## 2. GENERAL DESCRIPTION

The **XEV22D** module is able to drive a large variety of **stepper electronic expansion valves**. XEV22D permits to regulate the superheat (SH) of the fluid that runs into refrigerating unit in order to obtain optimized performance and a functioning of the evaporator independent by climatic or load conditions. **XEV22D** modules are equipped with two probe inputs, one for 4 to 20mA or 0 to 5V pressure transducer and another one for NTC-EU, NTC-US or Pt1000 temperature probe.
A LAN connection permits to transmit the pressure signal to others XEV modules in order to use only one pressure transducer in multiplexed cabinet applications.
There are also two configurable digital inputs, the first one is free of voltage and the other ones is at high voltage in order to simplify connections with cooling request signal.
With the useful display it's possible to see the value of superheat (SH), the degree of opening of the valve or the probe values, the local keyboard allows programming the instrument without any other devices.
To complete instrument equipment, a RS485 serial link permits to connect XEV22D to Dixell monitoring and supervising systems.

## 3. PROBES RELATED TO THE XEV22D

### 3.1 PP07, PP11, PP30: 4÷20MA PRESSURE TRANSDUCERS

| NAME | CABLE LENGTH | RANGE | DIXELL CODE |
|---|---|---|---|
| PP07 | 2,0MT | -0,5+7bar rel FE | BE009302 00 |
| PP11 | 2,0MT | -0,5+7bar rel FE | BE009302 07 |
| PP30 | 2,0MT | 0+307bar rel FE | BE009302 04 |

### 3.2 NP4-67 OR PMP4-67 PIPE MOUNTING TEMPERATURE PROBE


**The NP4-67 (NTC** sensor) **or PMP4-67 (PT1000** sensor) temperature probe can be used on the suction line to monitor the evaporator/Heat exchanger outlet temperature.

**NP4-67 - Code BN609001 52 -** 1.5MT NTC probe
Measurement range: -40+110°C, Cable 1,5mt
**PMP4-67 - Code BZ609001 53 -** 1.5MT Pt1000 probe
Measurement range: -70+110°C, Cable 1,5mt

## 4. CONNECTIONS

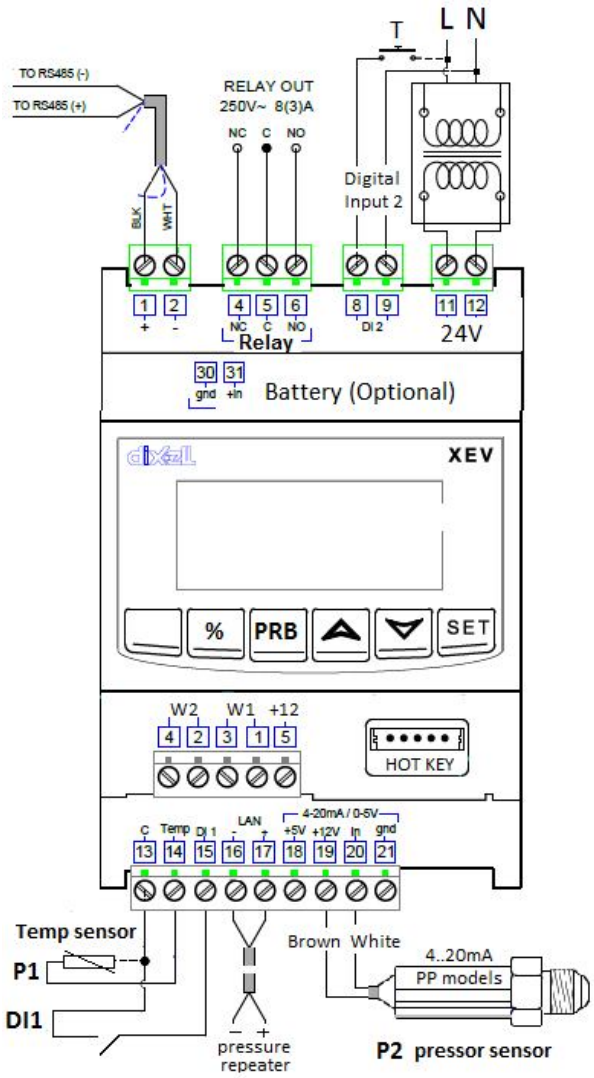
The instrument is provided with pluggable screw terminal block to connect cables with a cross section up to 2.5 mm². Heat-resistant cables have to be used. Before connecting cables make sure the power supply complies with the instrument's requirements. Separate the probe cables from the power supply cables, from the outputs and the power connections. Do not exceed the maximum current allowed on each relay, in case of heavier loads use a suitable external relay.

### 4.1 GENERAL WARNINGS

Before connecting cables make sure the power supply complies with the instrument's requirements.

Separate the probe cables from the power supply cables, from the outputs and the power connections.

### 4.2 WIRING CONNECTIONS

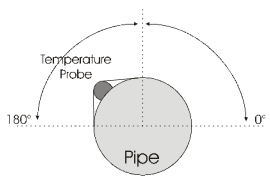



### 4.3 WIRING GUIDELINE

| DEVICE TYPE | SUGGESTED CABLE |
|---|---|
| Analog temp sensor and Digital input | AWG 22-2 SHIELDED, **E.I.** BELDEN #8761 |
| Rs-485 network | AWG 22-2 SHIELDED, **E.I.** BELDEN #8761 |
| Pressure transducer | AWG 22-2 SHIELDED, **E.I.** BELDEN #8761 |
| Stepper valve | Use valve manufacturer's harness with a maximum length, **not exceed 10 meters (30 feet).** |
| Power loads and valve | Allow a maximum wire size of 14 AWG (2 mm²) |

### 4.4 TEMPERATURE PROBE MOUNTING

Advised temperature probe placement is illustrated in figure nearby. Between 0 and 180 inclination degrees respect to horizontal pipe section.




### 4.5 PROBE CONNECTION

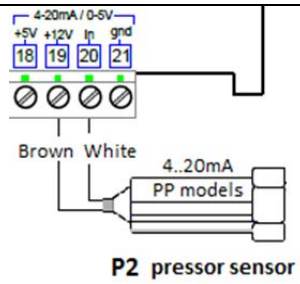
#### 4.5.1 General warnings

**Pressure probe (4 - 20mA or ratiometric)**: respect the polarity. If using terminal ends be sure there are no bear parts which could cause short circuiting or introduce noise disturbance at high frequencies. To minimize the induced disturbances use shielded cables with the shield connected to earth.
**Temperature probe:** it is recommended to mount the temperature probe on the outlet of the evaporator heat/exchanger and to isolate it properly to detect the gas outlet temperature.

**PP07 PP11, PP30, 4÷20mA pressure transducers:**

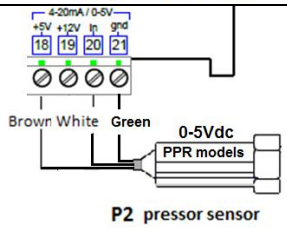
Set parameter **tPP = 420.**

**Connect:**
Brown wire (+) to terminal 19;
White wire (-) to terminal 20



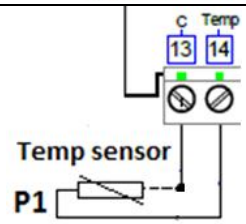

**PPR15 PPR30 Ratiometric transducers (0.5÷4.5Vdc)**
Set parameter **tPP = 5U**

**Connect:**
Brown wire (+) to terminal 18;
White wire (in) to terminal 20;
Green wire (gnd) to terminal 21




**Temperature probe:**
Set parameter
**ttE = NTC: (NTC 10K) or**
**ttE = Pt1: (Pt1000) or**
**ttE = nCP: (NTC-US 10K)**

**Connect to** terminals 13-14



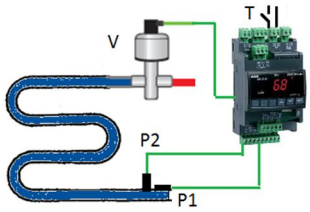

## 4.6 CONFIGURABLE DIGITAL INPUT CONNECTION

The superheat regulation is performed only when the **cooling digital input** is enabled.
It's possible to enable the SH regulation via:

- **Digital input 1, free voltage contact:**
  Use the **terminals (14-15),** set the parameter **i1F = CCL,** its polarity it's set by par. **i1P**.

- **Digital input 2 (8-9), main voltage contact**
  Use the **terminals (8-9),** set the parameter **i2F = CCL**, its polarity it's set by par. **i1P**

Usually the digital input is connected to a thermostat or an activation contact




**T**= Thermostat ( or activation contact)
**V**= Stepper valve (mono or bipolar)
**P1**= Temperature sensor (PT1000 o NTC or NTC-US)
**P2**= Pressure transducer 4..20mA or ratiometric (0-5Vdc).

## 4.7 SUPPLY CONNECTION

**Power supply: XEV22D is powered at 24Vac/dc.**
Use Class 2 transformer at list 20VA as the **TF20D**
Connect transformer to terminals 11-12.

## 4.8 VALVE CONFIGURATION

### 4.8.1 BEFORE CONNETTING THE VALVE

- **ALWAYS CONNECT OR DISCONNET THE VALVE WHEN THE CONTROLLER IS NOT POWERED**
- **CONFIGURE THE VALVE ON THE XEV22D BEFORE CONNECTING THE VALVE**

1. **BEFORE CONNECTING** the valve, to avoid possible problems, configure the driver by making the right changes on the parameters.
2. The max distance between an XM controller and a valve **must not exceed 10 m**. To avoid any problems, use only **shielded cables** with section greater than or equal to 0.325 mm² (AWG22).
3. Select the kind of motor (**tEU parameter**) and check if the valve is present in **tEP parameter table** reported here below.

| | tEP | LSt (steps*10) | uSt (steps*10) | CPP (mA*10) | CHd (mA*10) | Sr (step/s) | tEu (bip/unip) | HSF (Half/full) |
|---|---|---|---|---|---|---|---|---|
| 1 | Danfoss ETS-25/50 | 7 | 262 | 10 | 10 | 300 | bP | FUL |
| 2 | Danfoss ETS-100 | 10 | 353 | 10 | 10 | 300 | bP | FUL |
| 3 | Danfoss ETS-250/400 | 11 | 381 | 10 | 10 | 300 | bP | FUL |
| 4 | Sporlan SEI 0.5-11 | 0 | 159 | 16 | 5 | 200 | bP | FUL |
| 5 | Sporlan SER 1.5-20 | 0 | 159 | 12 | 5 | 200 | bP | FUL |
| 6 | Sporlan SEI 30 | 0 | 319 | 16 | 5 | 200 | bP | FUL |
| 7 | Sporlan SER(I) G,J,K | 0 | 250 | 12 | 5 | 200 | bP | FUL |
| 8 | Sporlan SEI 50 | 0 | 638 | 16 | 5 | 200 | bP | FUL |
| 9 | Sporlan SEH(I) 100 | 0 | 638 | 16 | 5 | 200 | bP | FUL |
| 10 | Sporlan SEH(I) 175 | 0 | 638 | 16 | 5 | 200 | bP | FUL |
| 11 | Emerson EX4-EX5-EX6 | 5 | 75 | 50 | 10 | 500 | bP | FUL |
| 12 | Emerson EX7 | 10 | 160 | 75 | 25 | 500 | bP | FUL |
| 13 | Emerson EX8 500 | 10 | 260 | 80 | 50 | 500 | bP | FUL |
| 14 | Emerson EX3 | 4 | 33 | 0 | 0 | 50 | uP | HAF |

**Liability Limitation**
All the pre-sets have been done according to the documentation available when the XEV22D has been released, see below reference:
**Danfoss**:
- DKRCC.PD.VD1.C6.02 / 520H8021 @ Danfoss A/S (AC-MCI / sw), 2014-07

**Sporlan:**
- 92008 / Bulletin 100-20
- RACE Catalogue 100-20-3 EDEV-2/UK - 02/2013

**Emerson**
- FC-TD/ EX4-8 July 2008

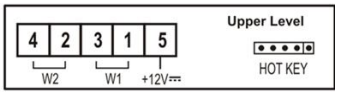
In any case for each valve the only reference is given by the manual released by the manufacture together with the valve.
Dixell can't be considered responsible for any change made by the manufacturer and reported on the manufacturer manual.

### 4.8.2 Manual setting of valve

To set the valve manually, act the according to the following procedure:
a. Set **tEP=0**
b. Then set following parameters: **LSt**, **USt**, **Sr**, **CPP**, **CHd** according to the valve manual

## 4.9 VALVE CONNECTION

### 4.9.1 TERMINALS FOR VALVE CONNECTION




**4 WIRES VALVES (BIPOLAR)**

| Connection numbering | ALCO EX | SPORLAN SEI-SEH | DANFOSS ETS |
|---|---|---|---|
| 4 | BLUE | WHITE | BLACK |
| 2 | BROWN | BLACK | WHITE |
| 3 | BLACK | RED | RED |
| 1 | WHITE | GREEN | GREEN |

**5-6 WIRES VALVES (UNIPOLAR)**

| Connection numbering | EMERSON EX3 | SPORLAN | SAGINOMIYA |
|---|---|---|---|
| 4 | WHITE | ORANGE | ORANGE |
| 2 | BROWN | RED | RED |
| 3 | BLACK | YELLOW | YELLOW |
| 1 | BLUE | BLACK | BLACK |
| 5 – Common | GRAY | GRAY | GRAY |

**AFTER MAKING THE CONNECTION, PLEASE SWITCH OFF AND ON THE XEV CONTROLLER IN ORDER TO BE SURE OF THE RIGHT POSITIONING OF THE VALVE.**

## 4.10 ABSOLUTE MAXIMUM POWER

**XEV22D** is able to drive a wide range of stepper valves, in the following table are indicated the maximum values of current that the actuator can supply to the stepper wiring. The Dixell transformer to use is the **TF20D**.

**NOTE:** the electrical power absorption of the valve can be unrelated to refrigeration power that valve has. Before using the actuator, please read the technical manual of the valve supplied by the manufacturer and check the maximum current used to drive the valve in order to verify that they are lower than those indicated below.

| VALVE TYPE | | |
|---|---|---|
| | BIPOLAR VALVES (4 wires) | Maximum Current 0.9A |
| | UNIPOLAR VALVES (5-6 wires) | Maximum Current 0.33A |

### 4.11 RS485 SERIAL LINE

All models can be connected to the monitoring and supervising system XWEB3000. If **Mod=Std** standard ModBUS-RTU protocol is used, if **Mod=AdU custom XWEB library is required**. This last configuration makes possible to use the same serial address of the thermostat that gives the cooling request to XEV. In this way, it's possible to reduce the number of addresses used.

### 4.12 CONNECTION OF XEC SUPERCAP (BACK UP BATTERY)

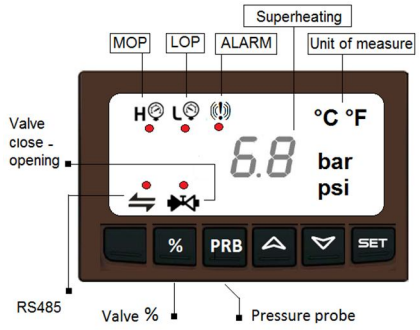
XEC Supercap is designed to be used with Dixell products (XM678D, XEV, IEV and others); to close the stepper valve in case of power failure.

**!!!!! IMPORTANT !!!!!**
XEC Supercap and XEV22D **must be powered by two different transformers**; the failure of the observance of this rule may result in damage to the XEC Supercap and / or the connected XEV22D.

**Wiring connection**

| XEV22D | XEC |
|---|---|
| Terminal 31 (+) | Terminal 4 (12Vdc) |
| Terminal 30 (gnd) | Terminal 3 (gnd) |

## 5. FRONT PANEL




| | |
|---|---|
| SET | To display and to modify the set point. In programming mode it selects a parameter or it confirms a value. |
| % | Push to display pressione per visualizzare il valore apertura valvola 0..100% per qualche secondo. |
| PRB | Una pressione per visualizzare il valore di pressione per qualche secondo. |
| ^ | By pressing and releasing this key, it's possible to see the values of the probes. In programming mode it slides the codes of the parameters or it increases their values. |
| v | In programming mode it slides the codes of parameters or it decreases their values. |

**KEYS COMBINATIONS**

| | |
|---|---|
| v + ^ | To lock or to unlock the keyboard |
| SET + v | To enter programming mode. |

### 5.1 XEV22D LEDS

On display there are some luminous dots. Their meaning is described in the following table:

| LED | MODE | Function |
|---|---|---|
| L | ON | Low pressure alarm |
| H | ON | Maximum Operating Pressure alarm |
| | OFF | Valve is completely closed |
| | BLINKING | Valve is moving |
| | ON | Valve is completely opened |
| | BLINKING | Serial communication present |
| | OFF | Serial communication absent |
| | ON | Superheat alarm |

## 6. USER INTERFACE

### 6.1 FAST ACCESS MENU (DURING REGULATION)

2) Press and release **UP** button.
3) The variable available in the Fast access menu are:
   a. **CLP** Cooling demand percentage
   b. **tP1** Temperature from Probe 1
   c. **PPr** Pressure value from Probe 2 transducer.
   d. **tP2** Suction temperature obtained from pressure temperature table .
   e. **SH** Value of superheat.;
   f. **StH** Superheat set point
   g. **oPP** Percentage of valve opening.
   h. **d1S** Free voltage digital input status
   i. **d2S** Main Voltage digital input status VAC
4) Brows parameter labels with **UP** or **DOWN** buttons.
5) Press **SET** to see read-only value. To change parameter, press **SET**.
6) To leave the fast access menu, press and release **SET+UP** or wait for time-out to expire (about 3 minutes).

**NOTE: IF THE REGULATION IS NOT ENABLED THE CONTROLLER DISPLAYS "PMP".**

### 6.2 HOW TO: SEE THE SET POINT

1) Press the **SET** buttons until the set point will be showed.
2) To come back to see temperature, wait about 5s or press newly **SET** key.

### 6.3 HOW TO: MODIFY THE SET POINT

To change the set point value operate as follows:
1) Press the **SET** button until the set point will be showed.
2) Use **UP** or **DOWN** buttons to change its value.
3) Press **SET** button to store the new value.

### 6.4 HOW TO: ENTERING "PR1" PARAMETER MENU


To enter in "Pr1" level menu:
1) Pressing **SET+ DOWN** buttons for about 3 seconds.
2) Instruments shows first parameter in Pr1 menu

### 6.5 HOW TO: ENTERING "PR2" PARAMETER MENU

To enter to "Pr2" parameters list:
1. Enter to "Pr1".
2. Select "Pr2" parameter and press **SET**.
3. The "**PAS**" label will be shown, then "**0--**" with 0 blinking.
4. Insert "**321**" password through **UP** and **DOWN** buttons**,** then press **SET** to confirm.

### 6.6 HOW TO: CHANGE A PARAMETERS VALUE


To change the parameter's value operate as follows:
1. Enter the Programming mode by pressing the **SET** and **DOWN** button for about 3s.
2. Select the required parameter.
3. Press the **SET** button to display the value.
4. Use **UP** or **DOWN** to change the value.
5. Press **SET** to store the new value and move to the following parameter.

To exit: Press **SET + UP** or wait 30s without pressing any button.
**NOTE**: the set value is stored even when the procedure is exited by waiting the time-out to expire.

## 7. PARAMETER LIST

**NOTE: All pressure parameters are relatives or absolutes depending on the PrM parameter.**

**REGULATION**

**FtY** — **Kind of gas:** type of gas used by plant. This is a fundamental parameter for correct functioning of all system.
The table below contains the refrigerant gases managed by the XEV22D and their operating temperature

| LABEL | REFRIGERANT | OPERATING RANGE |
|---|---|---|
| **R22** | r22 | -50-60°C/-58÷120°F |
| **134** | r134A | -70-60°C/-94÷120°F |
| **404** | r404A | -50-60°C/-58÷120°F |
| **47A** | r407A | -50-60°C/-58÷120°F |
| **410** | r410 | -50-60°C/-58÷120°F |
| **507** | r507 | -70-60°C/-94÷120°F |
| **47C** | r407C | -50-60°C/-58÷120°F |
| **47F** | r407F | -50-60°C/-58÷120°F |
| **290** | r290 – Propane | -50-60°C/-58÷120°F |
| **CO2** | r744 - Co2 | -50-60°C/-58÷120°F |
| **450** | r450A | -45-60°C/-69÷120°F |
| **513** | r513 | -45-60°C/-69÷120°F |
| **448** | r448A | -45-60°C/-69÷120°F |
| **449** | r449A | -45-60°C/-69÷120°F |

**rEt** — **Reaction time** (1÷100s; 0 = automatic time adjustment) time delay between valve position adjustments.
It's the time between the valve adjustment command and when the valve is moved.
**EI**
With **rEt = 1** the valve is moved continuously,
with **rEt = 10** the valve is moved every 10s,
with **rEt = 0** the reaction time is calculated automatically by the system, according the SH variation. The range is between 6÷60s,

**PEo** — **Probe Error opening percentage:** (0 to 100%) if a temporary probe error occurs, valve opening percentage is **PEo** until **PEd** time is elapsed.
If **PEO** is different from 0 it assures cooling also with probe error, because even if the device cannot calculate superheat the valve can work at **PEo** percentage.

**PEd** — **Probe Error delay before stopping regulation:** (0 to 239sec; 240=On=unlimited) if probe error duration is higher than **PEd,** valve will close completely and "**Pf**" message will be showed. With **PEd=on**, valve opening is **PEo** until probe error finishes.

**tEU** — **Type of Stepper motor:** (UP; bP) it permits to select the kind of valve.
**UP** = Unipolar valves;
**bP** = Bipolar valves.
**!!!!! WARNING !!!!!**
**This parameter has to be adjusted before connecting the valve.**

**tEP** **Predefined valve selection:** (0 to 14)

| | MODEL | LSt (steps*10) | uSt (steps*10) | CPP (mA*10) | CHd (mA*10) | Sr (step/s) | tEu (bip/unip) | HSF (Half/full) |
|---|---|---|---|---|---|---|---|---|
| 1 | Danfoss ETS-25/50 | 7 | 262 | 10 | 10 | 300 | bP | FUL |
| 2 | Danfoss ETS-100 | 10 | 353 | 10 | 10 | 300 | bP | FUL |
| 3 | Danfoss ETS-250/400 | 11 | 381 | 10 | 10 | 300 | bP | FUL |
| 4 | Sporlan SEI 0.5-11 | 0 | 159 | 16 | 5 | 200 | bP | FUL |
| 5 | Sporlan SER 1.5-20 | 0 | 159 | 12 | 5 | 200 | bP | FUL |
| 6 | Sporlan SEI 30 | 0 | 319 | 16 | 5 | 200 | bP | FUL |
| 7 | Sporlan SER(I) G,J,K | 0 | 250 | 12 | 5 | 200 | bP | FUL |
| 8 | Sporlan SEI 50 | 0 | 638 | 16 | 5 | 200 | bP | FUL |
| 9 | Sporlan SEH(I) 100 | 0 | 638 | 16 | 5 | 200 | bP | FUL |
| 10 | Sporlan SEH(I) 175 | 0 | 638 | 16 | 5 | 200 | bP | FUL |
| 11 | Emerson EX4-EX5-EX6 | 5 | 75 | 50 | 10 | 500 | bP | FUL |
| 12 | Emerson EX7 | 10 | 160 | 75 | 25 | 500 | bP | FUL |
| 13 | Emerson EX8 500 | 10 | 260 | 80 | 50 | 500 | bP | FUL |
| 14 | Emerson EX3 | 4 | 33 | 0 | 0 | 50 | uP | HAF |

**Liability Limitation**
All the pre-sets have been done according to the documentation available when the XEV22D has been released, see below reference:
**Danfoss**:
- DKRCC.PD.VD1.C6.02 / 520H8021 @ Danfoss A/S (AC-MCI / sw), 2014-07

**Sporlan:**
- 92008 / Bulletin 100-20
- RACE Catalogue 100-20-3 EDEV-2/UK - 02/2013

**Emerson**
- FC-TD/ EX4-8 July 2008

In any case for each valve the only reference is given by the manual released by the manufacture together with the valve.
Dixell can't be considered responsible for any change made by the manufacturer and reported on the manufacturer manual.

**Manual valve setting**
To set the valve manually, act the according to the following procedure:
a. Set **tEP=0**
b. Then set following parameters: **LSt**, **USt**, **Sr**, **CPP**, **CHd** according to the valve manual

**HFS** **Kind of motor movement:** (HAF; FUL)
- **HAF** = half step. Use this setting for the unipolar valve.
- **FUL** = full step. Use this setting for the bipolar valve.

**LSt** **Minimum number of steps:** (0 to USt (*10)) it permits to select the minimum number of steps. At this number of steps the valve should be closed. So it's necessary the reading of manufacturer datasheet to set correctly this parameter. It's the minimum number of steps to stay in advised range of functioning.
**!!!!! WARNING !!!!! after changing this parameter the valve will have to be reinitialized. The device performs this procedure automatically and restarts its normal functioning when the programming mode ends.**

**USt** **Maximum number of steps:** (LSt to 800 (*10)) it permits to select the maximum number of steps. At this number of steps the valve should be completely opened. Read the datasheet provided by manufacturer of the valve to set correctly this parameter. It's the maximum number of steps to stay in advised range of functioning. **!!!!! WARNING !!!!! after changing this parameter the valve will have to be reinitialized. The device performs this procedure automatically and restarts its normal functioning when the programming mode ends.**

**ESt** **Extra step in closing phase:** (0 to 255 (*10)) it sets the number of extra steps the controller performs, when the valve is closed at start up, to force the closure of the valve.

**Sr** **Step rate:** (10 to 600 step/sec) it is the maximum speed to change step without losing precision (=losing steps). It's advised to stay under the maximum speed.

**CPP** **Current per phase (only bipolar valves):** (0 to 100 (*10mA)) it is the maximum current per phase used to drive valve. It's used **only with bipolar valves.**

**CHd** **Holding current per phase (only bipolar valves):** (0 to 100 (*10mA)) it is the current per phase when the valve is stopped for more than 4 minutes. It's used **only with bipolar valves.**

**oPE** **Start opening Percentage:** (0 to 100%) opening valve percentage when start function is active and during post defrost phase. This phase duration is **SFd time**.

**SFd** **Start Function duration:** (0.0 to 42min 00s, res. 10s) it sets start function duration and post-defrost duration. **During this phase the alarms are not enabled.**

**dty** **Pilot duty:** (2-10dec/sec) To reach the final position the valve moves for Ton sec and stops for Tof sec, where Ton and Tof are defined as in the following:.
Ton= dty/10s
Toff= (1-dty/10)s
**Note**: with dty=10 the Pilot duty function is disabled.
With bipolar valve, during the Toff time the maintenance current is used.

**MnF** **Maximum opening percentage at normal Functioning:** (0 to 100%) during regulation it sets the maximum valve opening percentage.

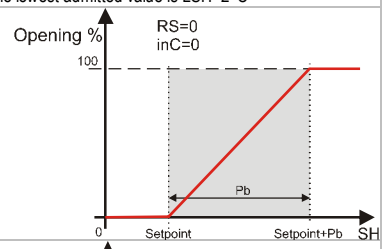
**FoP** **Forced Opening percentage:** (0 to 100; nU) if **FoP=nU** valve works with regulation algorithm. If **FoP is different from nU** the valve stays at **FoP** opening percentage. This function could be useful during plant starting or during service operations.

## PI PARAMETERS (trained staff)

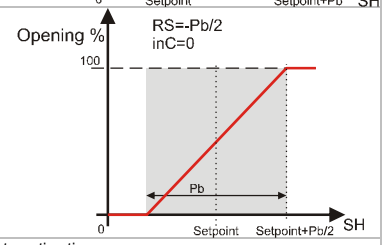
**AMS** **Self self adaptive SH regulation enabling:** parameter enables the self adaptive regulation of the superheat
**no** = standard regulation using the PID parameters (Pb, rS, inC, dFC)
**yES** = self-adaptive regulation, controller regulates SH automatically, setting the PID parameter

**Atu** **Minimum STABLE superheat search (**No; yES) This parameter enables the search of the minimum stable superheat. The lowest admitted value is LSH+2°C

**Pb** **Proportional band:**
(0.1 to 50.0°C; 1 to 90°F)
**PI** proportional band. A value bigger than 5°C is advised.




**rS** **Band Offset:**
(-12.0 to 12.0°C; -21 to 21°F)
**PI** band offset. It permits to move the proportional band of the PI. With **rS=0** the band is between **[SEt to SEt+Pb]**.




**inC** **Integration time:** (0 to 255s) PI integration time.

**dFc** **Derivative time** (0 to 255s) PID derivative time.

## PROBE PARAMETERS

**tPP** **Type of Pressure transducer:** (420; 5V; LAn) it sets type of pressure transducer to use. **420** = 4 to 20mA pressure transducer; **5V** = 0 to 5V ratiometric transducer; **LAn** = the pressure signal comes from another XEV module.

**LPP** **Enable pressure probe sending in LAN:** (n; Y) if **LPP=Y** the value of pressure read by device is sent in LAN. Only one device of the LAN can have **LPP=Y**.

**PA4** **Probe value at 4mA or at 0V:** (-1.0 to P20 bar; -14 to P20 psi) pressure value measured by probe at 4mA or at 0V (related to **PrM** parameter).

**P20** **Probe value at 20mA or at 5V:** (PA4 to 50.0 bar; PA4 to 725 psi) pressure value measured by probe at 20mA or at 5V (related to **PrM** parameter).

**oPr** **Pressure probe calibration:** -12.0 to 12.0 bar; -174 to 174 psi.

**ttE** **Type of temperature probe for SH calculation ( 13-14)** (PtM; ntC) it allows to set the kind of probe used by the instrument:
**PtM** = PT1000 probe,
**ntC** = NTC 10K probe.
**CtC** = NTC-US.

**otE** **Temperature probe calibration:** -12.0 to 12.0°C; -21 to 21°F.

## DIGITAL INPUTS

**i1P** **Digital Input 1 (Free of voltage) digital input polarity:** (cL, oP) **CL** = activated when closed; **oP** = activated when opened.

**i1F** **Digital Input 1 (Free of voltage) digital input function:** (CCL, rL) **CCL** = cooling call; **rL** = digital input activates relay.

**d1d** **Digital Input 1 (Free of voltage) activation delay:** (0 to 255 min) this activation delay is used only if digital input is configured as **rL**.

**i2P** **Digital Input 2 (High voltage) digital input polarity:** (CL, oP) **CL** = activated when closed; **oP** = activated when opened.

**i2F** **Digital Input 2 (High voltage) digital input function:** (CCL, rL) **CCL** = cooling call; **rL** = digital input activates relay.

**d2d** **Digital Input 2 (High voltage) activation delay:** (0 to 255 min) this activation delay is used only if digital input is configured as **rL**.

## ALARM

**dAo** **Alarm delay after restarting regulation:** (0.0 to 42min 00s, res. 10s) time between digital input activation (configured as **CCL**) and alarm signalling. The **LSH** alarm is always signalled also during this time.

**tdA** **Type of alarm signalled by relay:** (ALL, SH, PrE, di) **ALL** = all alarm; **SH** = superheat alarm; **PrE** = pressure alarm; **di** = activation only when digital input configured as **rL** is active.

**LPL** **Lower Pressure Limit for superheat regulation:** (PA4 to P20 bar; PA4 to P20 psi) when suction pressure comes down to **LPL**, the regulation is performed with a **LPL** fixed value for pressure. When suction pressure comes back to **LPL**, the normal pressure value is used (related to **PrM** parameter).

**MoP** **Maximum Operating Pressure threshold:** (LoP to P20bar; LoP to P20 psi) if suction pressure exceeds maximum operating pressure value, the instrument signals this situation with an alarm LED **H** (related to **PrM** parameter).

**LoP** **Lowest Operating Pressure:** (PA4 to MoP bar; PA4 to MoP psi) if the suction pressure comes down to this value, a low pressure alarm will be signalled with an alarm LED **L** (related to **PrM** parameter).

**PHY** **Pressure alarm Hysteresis:** (0.1 to 5.0 bar, 1 to 72 psi) pressure hysteresis to disable alarm signalling.

**dML** **Delta MoP-LoP:** (0 to 100%) when a **MoP** alarm occurs valve will close of the **dML** percentage every one second until **MoP** alarm is active. When **LoP** occurs, valve will open of the **dML** percentage every one second until **LoP** alarm is active.

| | |
|---|---|
| **MSH** | **Maximum SuperHeat alarm:** (LSH to 80.0°C; LSH to 144°F) when superheat exceeds this value, an high superheat alarm will be signalled after interval **SHd**. |
| **LSH** | **Lowest SuperHeat alarm:** (0.0 to MSH°C; 0 to MSH°F) when superheat goes down to this value a low superheat alarm is signalled after interval **SHd**. |
| **SHY** | **SuperHeat alarm Hysteresis:** (0.0 to 25.5°C; 1 to 77°F) hysteresis for superheat alarm deactivation. |
| **SHd** | **SuperHeat alarm activation delay:** (0 to 255 s) when a superheat alarm occurs, the delay time **SHd** have to expire before signalling this alarm. |
| **tdS** | **Pressure stability index (**0-240s). The value used for the SH calculation is the average value of the pressure in the tdS time.<br>Suggested values:<br>tdS: 5-10 for heat exchanger or condensing unit<br>tdS: 1-6 for supermarkets |
| **tdt** | **Temperature stability index (**0-240s). The value used for the SH calculation is the average value of the temperature in the tdt time.<br>A value between 1-3 his suggested |

**DISPLAY**

| | |
|---|---|
| **Lod** | **Local display:** (SH; PEr; P1; P2) **SH** = superheat; **PEr** = valve opening percentage; **P1** = value of temperature measured; **P2** = pressure measured by P2 probe. |
| **CF** | **Temperature measurement units:** (°C; °F) **°C** = Celsius degree; **°F** = Fahrenheit degree. **NOTE:** by changing measurement unit, the regulation parameters have to be correctly changed. |
| **PMU** | **Pressure Measurement units:** (bAr, PSi) **bAr** = bar; **PSi** = psi. **NOTE:** by changing measurement unit, the regulation parameters have to be correctly changed. |
| **rES** | **Resolution (only °C):** (dE; in) **dE** = decimal format; **in** = integer format. |
| **PrM** | **Pressure visualization Mode:** (rEL; AbS) **rEL** = relative pressure; **AbS** = absolute pressure. **All pressure parameters depend on this parameter.** |
| **CLP** | **Cooling Percentage (read only):** Display the cooling percentage. |
| **tP1** | **Temperature Probe value (read only):** it shows temperature probe value from P1. |
| **PPr** | **Pressure probe value (read only**): it shows pressure probe value. The value depends on **PrM**. |
| **tP2** | **Temperature from P2 (read only**): it shows temperature obtained from conversion of pressure value. |
| **SH** | **Super heat value** |
| **STH** | **Superheat set point value** |
| **oPP** | **Opening Percentage (read only):** it shows the actual opening percentage of the valve. |
| **d1S** | **Free of voltage digital input State (read only):** it shows the free of voltage digital input. |
| **d2S** | **High voltage digital input State (read only):** it shows the high voltage digital input state. |
| **Adr** | **RS485 Serial Address:** (1 to 247) Identifies the instrument address when connected to a ModBUS compatible monitoring system. |
| **Mod** | **ModBus:** (AdU; Std) **AdU** = (Only for XWEB systems) in this case XEV and thermostatic controller are considered an alone instrument (it requires a custom library for XWEB); **Std** = to use XEV in stand-alone mode, in this case normal Modbus-RTU protocol is used. |
| **Ptb** | **Parameters map: (read only)** it identifies parameters map written by factory. |
| **rEL** | **Release Firmware: (read only)** it shows firmware release. |
| **Pr2** | **Second level menu.** |

## 8. FORCED OPENING

If necessary, by changing **FoP** parameter it's possible to force the valve opening. For example, by setting **FoP=50** the valve will be open at half of full scale. **To disable this function it's necessary to set FoP=nU** (default value). The valve opening is enabled only when CCL digital input is enabled.

## 9. HOW TO: USE THE HOT-KEY

### 9.1 PROGRAM A HOT-KEY FROM THE INSTRUMENT (UPLOAD)

1) Program one controller with the front keypad.
2) When the controller is ON, insert the **HOT-KEY** and push **UP** button; the "**uPL**" message appears followed a by flashing "**End**".
3) Push **SET** button and the "**End**" will stop flashing.
4) Turn OFF the instrument, remove the **HOT-KEY** and then turn it ON again.

**NOTE**: the "**Err**" message is displayed in case of any failed programming operation. In this case, push again **UP** button if you want to restart the upload again or remove the **HOT-KEY** to abort the operation.

### 9.2 PROGRAM AN INSTRUMENT USING A HOT KEY (DOWNLOAD)

1) Turn OFF the instrument.
2) Insert a pre-programmed **HOT-KEY** into the 5-PIN connector and then turn the Controller ON.
3) Automatically the parameter list present into the **HOT-KEY** will be downloaded into the Controller memory. The "**doL**" message will blink during this operation, followed a by a flashing "**End**" label.
4) After 10 seconds the instrument will restart working with the new parameters.
5) Remove the **HOT-KEY**.

**NOTE:** the "**Err**" message is displayed in case of any failed programming operation. In this case, push again **UP** button if you want to restart the upload again or remove the **HOT-KEY** to abort the operation.

## 10. DISPLAY MESSAGES

| Mess. | Cause | Outputs |
|---|---|---|
| "PMP" | None of digital inputs configured as **CCL** are activated | Valve closed |
| "PF" | The Ped time is elapsed and the regulation is stopped | Valve closed after **PEd**. There is a probe error |
| "P1" | Temperature probe fault | According to **PEo** and **PEd**. |
| "P2" | Pressure transducer fault | According to **PEo** and **PEd**. |
| "HSH" | High superheat alarm | By PI |
| "LSH" | Low superheat alarm | Valve Closed |
| "LPL" | Low pressure limit | see **LPL** parameter |
| "MoP" | Maximum Operating Pressure | see **dML** parameter |
| "LoP" | Lowest Operating Pressure | see **dML** parameter |
| "StF" | Start Function enabled | see **SFd** parameter |
| "EE" | Memory error | - |

### 10.1 ALARM RECOVERY

Probe alarms "**P1**", "**P2**" start few seconds after the fault in the probe; they automatically stop few seconds after the probe restarts normal operation. Check connections before replacing the probe. Max. And min. Alarms "**HSH**", "**LSH**", "**MoP**" and "**LoP**" automatically stop as soon as the variable returns to normal values.
The instrument is provided with an internal check verifying memory integrity. Alarm "**EE**" will flash when a failure in the internal memory is detected. In such case call the service.

## 11. TECHNICAL DATA

**Housing:** self extinguishing ABS.
**Case:** 4 DIN modules 70x135mm with male and female connectors; depth 60mm.
**Mounting:** DIN RAIL mounted in an omega (3) din rail.
**Protection**: IP20.
**Connections:** pluggable screw terminal block ≤ 2.5 mm$^2$ wiring.
**Power supply:** 24Vac/dc ±10%.
**Power absorption: depending on connected valve** 20VA max.
**Display**: three digits with icons, red LEDs, height 14.2 mm.
**Inputs**: 1 temperature probe:
**PT1000 probe:** -50 to 110°C (-58 to 230°F).
**NTC probe:** -40 to 110°C (-40 to 230°F).
1 pressure transducer: 4 to 20mA or 0 to 5V.
**Digital inputs:** 1 free of voltage.
1 high voltage.
**Outputs for valve:** bipolar or unipolar valves.
**Data storage:** on the non-volatile memory (EEPROM).
**Kind of action:** 1B.
**Pollution degree:** normal.
**Software Class:** A.
**Operating temperature:** 0 to 55°C (32 to 131°F).
**Storage temperature:** -25 to 60°C (-13 to 140°F).
**Relative humidity:** 20 to 85% (no condensing).
**Resolution:** 0.1°C or 1°F.
**Precision a 25°C (77°F):** ±0.7°C ±1digit.

## 12. STANDARD VALUES

| Label | Description | Range | Default | Level |
|---|---|---|---|---|
| **FtY** | Kind of gas | R22; 134; 404; 407; 410; 507; Co2 | 404 | Pr2 |
| **PEo** | Probe Error opening percentage | 0 to 100 % | 1 | Pr2 |
| **PEd** | Probe Error delay before stopping regulation | 0 to 239 s; on | 50 | Pr2 |
| **tEU** | Type of Stepper motor | uP; bP | On | Pr2 |
| **tEP** | Automatic Valve configuration | 0 to 10 | bP | Pr2 |
| **HFS** | Kind of driving | HAF; FUL | 0 | Pr2 |
| **LSt** | Minimum number of steps | 0; USt (*10) | FUL | Pr2 |
| **USt** | Maximum number of steps | LSt to 800 (*10) | 0 | Pr2 |
| **ESt** | Extra steps in closing phase | 0 to 255 (*10) | 0 | Pr2 |
| **Sr** | Step rate | 10 to 600 step/s | 0 | Pr2 |
| **CPP** | Current per phase (only bipolar valves) | 0 to 100 (*10mA) | 10 | Pr2 |
| **CHd** | Holding current per phase (only bipolar valves) | 0 to 100 (*10mA) | 0 | Pr2 |
| **oPE** | Start opening Percentage | 0 to 100 % | 0 | Pr2 |
| **SFd** | Start Function duration | 0.0 to 42min 00s, res. 10s | 80 | Pr2 |
| **MnF** | Maximum opening percentage | 0 to 100 % | 100 | Pr2 |
| **FoP** | Forced Opening time-out | 0 to 100 %; nU | nu | Pr2 |
| **PI PARAMETERS (trained staff)** | | | | |
| **AMS** | Self self adaptive SH regulation enabling | No; yES | n | Pr2 |
| **SSH** | Superheat set point | No; yES | n | Pr2 |
| **Pb** | Proportional band | [0.1 to 50.0°C] [1 to 90°F] | 12 | Pr2 |
| **rS** | Band Offset | [-12.0 to 12.0°C] [-21 to 21°F] | 0.0 | Pr2 |
| **inC** | Integration time | 0 to 255 s | 180 | Pr2 |
| **dFC** | Derivative time | 0 to 255 s | 2 | Pr2 |
| **PROBE PARAMETERS** | | | | |
| **tPP** | Type of pressure transducer | 420; 5V; LAn | 420 | Pr2 |
| **LPP** | Enable pressure probe sending in LAN | n; Y | n | Pr2 |
| **PA4** | Probe value at 4mA or at 0V (related to PrM parameter) | [-1.0 to P20 bar] [-14 to P20 psi] | -0.5 | Pr2 |
| **P20** | Probe value at 20mA or at 5V (related to PrM parameter) | [ PA4 to 50.0 bar] [PA4 to 725 psi] | 11 | Pr2 |
| **oPr** | Pressure probe calibration | [-12.0 to 12.0 bar] [-174 to 174 psi] | 0.0 | Pr2 |
| **ttE** | type of temperature probe | ntC(0) - PtM(1) - nCP(2) | PtM | Pr2 |
| **otE** | Temperature probe calibration | [-12.0 to 12.0°C] [-21 to 21°F] | 0,0 | Pr2 |
| **DIGITAL INPUTS** | | | | |
| **i1P** | Free of voltage digital input polarity | CL; oP | cL | Pr2 |
| **i1F** | Free of voltage digital input function | CCL; rL | CCL | Pr2 |
| **d1d** | Digital input 1 (free of voltage) activation delay | 0 to 255 min | 0 | Pr2 |
| **i2P** | Main voltage digital input polarity | CL; oP | cL | Pr2 |
| **i2F** | Main voltage digital input function | CCL, rL | CCL | Pr2 |
| **d2d** | Digital input 2 (Main voltage) activation delay | 0 to 255 min | 0 | Pr2 |
| **ALARMS** | | | | |

| | | | | |
|---|---|---|---|---|
| **dAo** | Alarm delay after restarting regulation | 0.0 to 42min 00s, res. 10s | 10.0 | Pr2 |
| **tdA** | Type of alarm signalled by relay | ALL; SH; PrE; Di | ALL | Pr2 |
| **bon** | Buzzer enabling | No; yES | n | Pr2 |
| **tbA** | Alarm relay silencing | No; yES | n | Pr2 |
| **LPL** | Lower pressure limit for superheat regulation (related to PrM parameter) | [PA4 to P20 bar] [PA4 to P20 psi] | -0.5 | Pr2 |
| **MoP** | Maximum operating pressure threshold (related to PrM parameter) | [LoP to P20 bar] [LoP to P20 psi] | 11.0 | Pr2 |
| **LoP** | Minimum suction pressure limit (related to PrM parameter) | [PA4 to MoP bar] [PA4 to MoP psi] | -0.5 | Pr2 |
| **PHy** | Pressure alarm Hysteresis | [0.1 to 5.0 bar] [1 to 72 psi] | 0.2 | Pr2 |
| **dML** | delta **MoP-LoP** | 0 to 100% | 5 | Pr2 |
| **MSH** | Maximum superheat alarm | [LSH to 80.0°C] [LSH to 176°F] | 80.0 | Pr2 |
| **LSH** | Lowest superheat alarm | [0.0 to MSH°C] [0 to MSH°F] | 2.5 | Pr2 |
| **SHY** | Superheat hysteresis | [0.1 to 25.5°C] [1 to 77°F] | 0,5 | Pr2 |
| **SHd** | Superheat alarm activation delay | 0 to 255 s | 30 | Pr2 |
| **DISPLAY** | | | | |
| **tdS** | Pressure stability index | 0-240s | 5 | Pr2 |
| **tdt** | Temperature stability index | 0-240s | 3 | Pr2 |
| **Lod** | Local display | SH; PEr; P1; P2 | SH | Pr2 |
| **CF** | Temperature measurement units | °C; °F | °C | Pr2 |
| **PMu** | Pressure measurement unit | bAr; PSi | bAr | Pr2 |
| **rES** | Resolution (only °C) | dE; in | dE | Pr2 |
| **PrM** | Type of pressure (Absolute / relative) | rEL; AbS | rEL | Pr2 |
| **CLP** | Cooling call percentage | Read only | --- | Pr1 |
| **tP1** | Temperature probe value | Read only | --- | Pr1 |
| **PPr** | Pressure probe value | Read only | --- | Pr1 |
| **tP2** | Temperature converted from pressure probe | Read only | --- | Pr1 |
| **SH** | **Super heat value** | Read only | --- | Pr1 |
| **STH** | **Superheat set point valu** | Read only | --- | Pr1 |
| **oPP** | Actual Opening percentage | Read only | --- | Pr1 |
| **d1S** | Free of voltage digital input state | Read only | --- | Pr1 |
| **d2S** | Main voltage digital input state | Read only | --- | Pr1 |
| **Adr** | Serial address | 1 to 247 | 1 | Pr2 |
| **Mod** | Modbus type | Std; AdU | Std | Pr2 |
| **Ptb** | Parameters map | - - - | - | Pr2 |
| **rEL** | Release software | - - - | 1.5 | Pr2 |
| **Pr2** | Second level menu | - - - | - | Pr1 |

Dixell EMERSON Climate Technologies

**Dixell S.r.l.** - Z.I. Via dell'Industria, 27 - 32010 Pieve d'Alpago (BL) ITALY
Tel. +39.0437.9833 r.a. - Fax +39.0437.989313 - EmersonClimate.com/Dixell - dixell@emerson.com