**Brief Description / Applications**

- Suction Pressure Controller and/or High Pressure Controller, configurable for:
  - Standard Compressors
  - Compressors with CRII-System Control Stages
  - Condensation High Pressure Control
- For up to 8 Suction Pressure Stages respective High Pressure Stages usable
- For use as a single controller or in a network
- Direct connection of up to 64 Cold Storage Controllers, Data Exchange for Energy Optimization
- 4 Sensor-, 2 Pressure Transmitter- , 4 Digital Inputs, 5 Relay Outputs (2 Relays, 3 SSR-Relays), Analogue Output
- Capable of handling up to 4 additional stages. (When used in conjunction with Expansion Module **BMR 3002**).
- For Single- and Multi-Stage Loads
- Peak Load Limitation, Suction Pressure Shifting
- Automatic Stage Sequencing
- Fixed or Autoadaptive Delay Times for Switching Frequency Optimization
- Capturing of Machine Feedback Signals and Plant Errors
- Analogue Output for P/PI-Control
- In-/Outputs configurable
- Manual Operation of all Machines
- Night Operation via internal clock

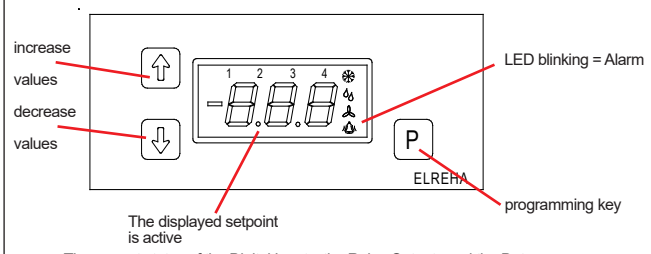
**ELREHA**
ELEKTRONISCHE REGELUNGEN GMBH

Technical Manual **5311437-03/02e/01**
**Stage Controller** 2018-06-25, tkd/jr
from Software Vers. 2.04

# MSR *eco* 3140

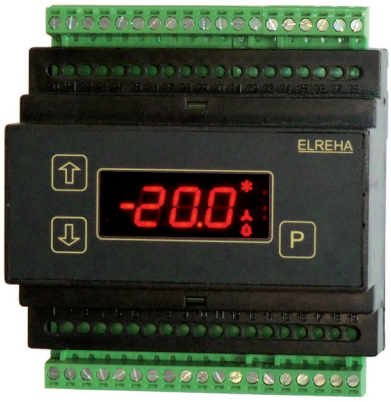
Some functions may not be available on devices with older software versions.

## Operating / Operating Elements




The current states of the Digital Inputs, the Relay Outputs and the Data Transmission can be read on the Actual Values Page at L98 and L99.

Convenient 3 key control for all functions clearly appear on a 7 segment LED display. 4 symbols to the right indicate active control function(s). (Relay status is indicated separately on „Actual Page“).




## Programming

The **MSR *eco*** parameters are simple to access, view and change. During normal operation, or if no key is pressed for at least 3 minutes, the **MSR *eco*** will display the following:

1st priority: current failure display (blinking)
2nd priority: operation status display (ex. „oFF“)
3rd priority: selected „permanent parameter“ display

## Selecting and Changing of Parameters

| Key | Action |
|---|---|
| **P** (> 2 sec.) | ....Page name will be displayed |
| ⇧⇩ | .....Select desired page |
| **P** | .....Enter the page |
| ⇧⇩ | .....Select parameter |
| **P** | .....Prepare programming. Enter access code if necessary |
| ⇧⇩ | .....Change value. If you hold the key, the values change continuously |
| **P** | .....Confirm programming |
| **P** (> 2 sec.) | ....Page name will be displayed again |

## Access Protection

All adjustable parameters/set-points are protected by an access code. They are divided into 3 groups or levels with 3 operator codes. An access code will be required to change an adjustable parameter, (see parameter listing). To change an adjustable parameter that requires an access code, begin by pressing the „P“ key.:

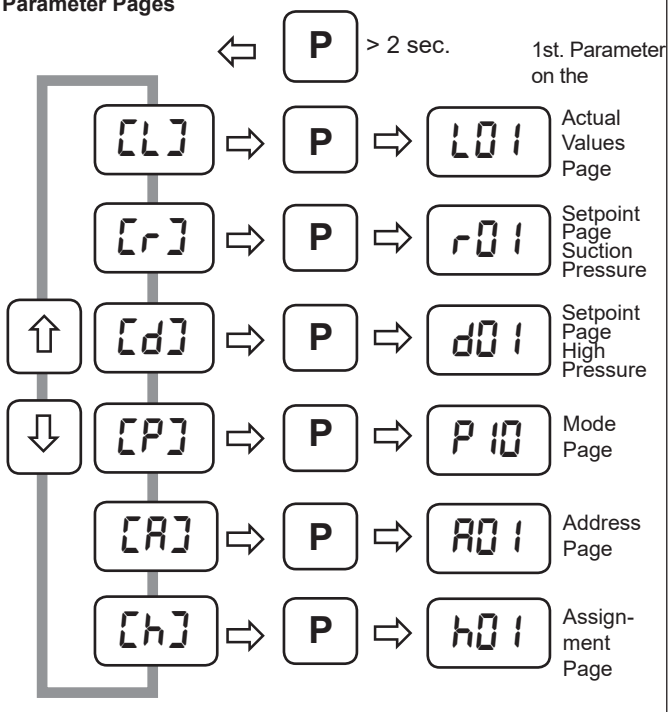

The screen will display C00, prompting the user for access code entry.

The Access Codes are divided into 3 access levels, (OEM, Technician, and Customer Codes).

- **OEM Code „oem“**: Month + Hour + 20
  The OEM Code grants access to all adjustable parameters on the device.
- **Technician Code „tec“** : 88
  The Technician Code grants access only to „Technician“ and „Customer“ assigned adjustable parameters.
- **Customer Code „---“** : no access code required.
  The Customer Code grants access only to „Customer“ assigned adjustable parameters.

If no key has been pressed for 3 minutes, the operator code must be re-entered.

## Parameter Pages

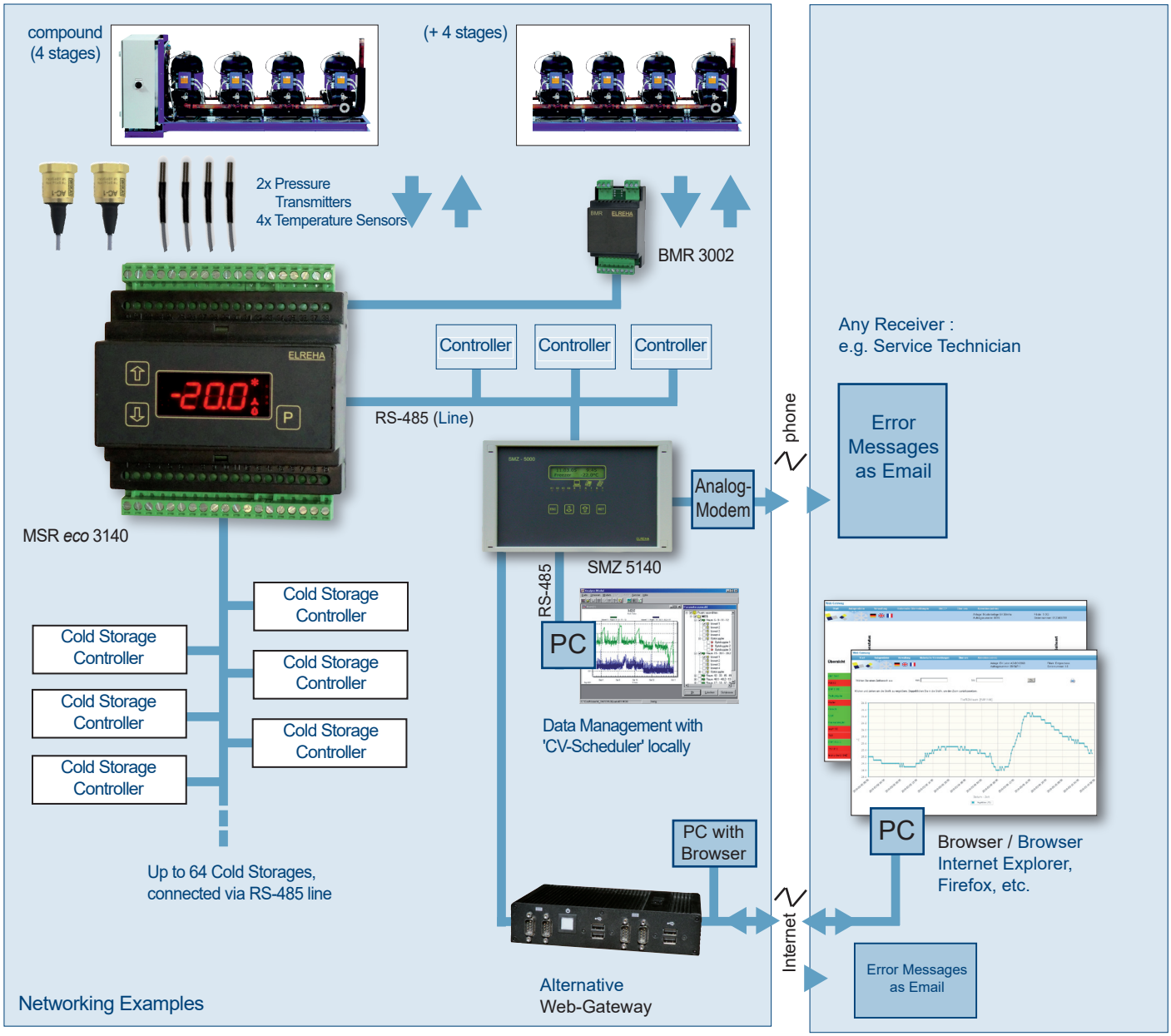



Attention

**Please note Safety Instructions on page 10 !**

# MSR *eco* System Overview

The MSR *eco* is designed to provide complete control for refrigeration systems with up to 4 respective 8 stages, while serving as a central unit for up to 64 cold storage controllers. When used in conjunction with front end devices such as the **SMZ-5140** or **Web-Gateway**, the MSR *eco* becomes fully capable of control from a remote location, as well as message communication, (see example below):




## Technical Data

Supply Voltage ..... 230V 50-60Hz, max. 9 VA (controller only)
Ambient Temperature ..... 0...+50°C
Max. Air Humidity ..... 85% r.H., not condensing
Inputs ..... 4x Temperature Sensors, TF 201 (PTC)
or TF 501 (Pt 1000), or customer specific probes
2x Pressure Transmitter 4-20mA DC (scalable), Ri= 100 Ohm

Measuring ranges of the probe inputs:
TF 501 (Pt1000) ..... -100°C...+100°C
TF 201 (PTC, 2 kΩ at 25°C) ..... -50°C...+100°C
So1 ..... -40°C...+25°C
So2 ..... -50°C...+50°C

**Temperature ranges of the sensor heads and cables must be observed !**

Accuracy ..... ±0.5K in range -35..+25°C
within the ambient temperature range 10..30°C
Digital Inputs ..... 4x mains voltage, 3mA max.
overvoltage category II, pollution degree 2
Relay Outputs ..... 1x SPDT, 1x SPST, isolated
8A cos phi=1/250VAC
overvoltage category III, pollution degree 2
SSR-Output (e.g. for EEx-Valve) ..... 3x Solid-State-Relay (SSR)
max. 0,5 A / 230VAC
overvoltage category III, pollution degree 2
Transmitter Supply ..... 22V DC ±10%, 40 mA max.
Analogue Output ..... 0...10 V or 4...20mA (selectable)
0...10 V DC, max. current typ. 1mA
4...20 mA, max. shunt resistance 500 ohms
Display/Parameter Ranges ..... see parameter pages
Data Interfaces ..... 3x RS 485
Data Storage ..... unlimited
Real Time Clock ..... automatic summer/winter switch,
10 days clock backup without mains voltage
Housing ..... plastic with foil keypad for rail mounting (DIN EN 50022),
screw terminals 2,5 mm²

## Accessories

- Temperature sensor TF 501, quantity depends on application
- Pressure Transmitter with 4...20mA Output

## Display of actual values and states

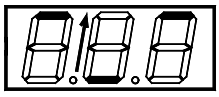
All actual values are shown on the "*Actual Values Page*" (ELJ).

**Display of Temperatures and Pressures**
"**L01**"-"**L04**":
„Actual Values Page“ Displays actual current temperature for sensors 1-4 (-99.9...+100 C).
"**L05**":
Displays actual current temperature converted from Pressure Transmitter 1 input.
"**L06**":
Displays actual current temperature converted from Pressure Transmitter 2 and the selected refrigerant "**h99**".
"**L15**" & "**L16**":
Displays the actual current pressure value.
"**L10**": Displays the actual value "SP/HP Current". With "**P31**"-"**P36**" (Mode Page) the displays '**L01**'-'**L06**' can be calibrated.
"**L93**": Displays current Day or Night Mode status.

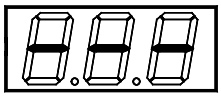
**Setpoints**
For all setpoints, which are shifted by specific functions, the current values will be displayed at **L30**... **L32** and **L63**...**L65**.

**Current state of stage control (L21)**

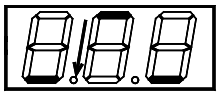
Controller in forerun mode. The center bar moves up



Neutral



Controller in backrun mode. The center bar moves down

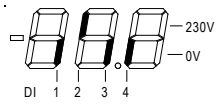


**Time information**
The Actual Values page contains all the runtime/ remaining time information. This can be viewed at any time, up to the start of a function.

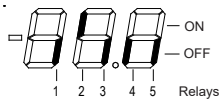
**State of Stages / Running Motors**
"**L14**" - "**L48**": Displays how many SP stages are currently switched on.
"**L51**" - "**L58**": Displays the current SP stage status.
"**L71**" - "**L78**": Displays how many HP stages are currently switched on.
"**L81**" - "**L88**": Displays the HP stage status.
"**L36**" - "**L37**": Displays active Load Limitation or Forced Backrun status.

**State of inputs/outputs**

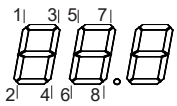
Digital-(DI)-Inputs (**L97**)




State of the relays (**L99**)




Display of the running SP and HP stages (**L94** and **L95**)




State of the relays at the module BMR (**L98**)
Analogue Output: Parameter **L96**, value in %

**Temperature Sensors**
These types of temperature sensors can be used:
- **TF 201**, PTC sensor (2000 ohms@25°C)
- **TF 501**, PT1000 sensor (1000 ohms@0°C)
- customer specific sensor **So1** (-40...+25°C)
- customer specific sensor **So2** (-50...+50°C)

The type of sensor can be set by '**h20**' (Assignment Page).

**Pressure Transmitter**
Pressure Transmitters with 4...20mA output can be used.
They must be selected with the parameters "**h25-h26**" (Assignment Page).

## Error Messages / Error Memory / Error Codes

If a failure occurs, parameter **L20** will display a flashing error code, (see below Error Code Definition List for reference). If multiple errors occur, the UP/DOWN arrow keys can be used to scroll through the error codes on the device display. The device is designed to always store the last **15** error messages, (including date and time of each occurrence), and can be accessed via data interface.

---- .....no error
hrd .....hardware failure
Rdr .....network address assigned more than once
R00 .....communication error with controller at address 0 *up to*
R63 .....communication error with controller at address 63
Fb1 .....feedback signal for motor 1 not available *up to*
Fb4 .....feedback signal for motor 4 not available
Exb.....sensor X broken (pressure transmitter inputs: no current available)
Exc .....sensor X hot-wired (pressure transmitter input: 20mA exceeded)
PPA .....prewarning of suction pressure
PHA .....prewarning of high pressure
PA .....suction pressure failure
HA .....high pressure failure
EPA .....external suction pressure alarm
EHA .....external high pressure alarm
SUP ..... .superheat warning
SUA ..... .superheat alarm
SOF .....cold storage positions software version
bmr .....communication failure with BMR 3002
cPd .....compound assignment of the cold storage position
tYP .....wrong cold storage controller type
SEL .....error in assignment page (Overview listing of the possible failures see page 10)
Int .....internal failure

Additionally, in the Actual Value Listing current failures can be read - like Motor failure (**L22**), Suction Pressure failure (**L23**), Suction pressure pre-alarm (**L24**). High pressure failure (**L61**) and High pressure pre-alarm (**L62**).

## 'Default Display Parameter' - Function

When the device is powered up, the "Default Display Parameter" will appear on the display after a few seconds. (This will also be displayed during normal operation of the system or if no key is pressed for at least 3 minutes)
"**L10**": Actual Value is factory preset and can be changed at any time.
Note: In the event of a failure, 1st Priority will be to display the current failure.

Change permanent parameter

- Select the parameter you want to have as "default display parameter"
- Press "⇧" and "⇩" simultaneously. The display shows "888" for a moment, after that the selected parameter will be shown as the 'default display parameter'.

## Configuration Concept

The inputs/outputs of the MSR *eco* Stage Controller have no fixed functions. The MSR *eco* works with an "**open configuration**" concept. This means that all available inputs and outputs (*relays, sensors, digital inputs, analogue output*) can be configured to work with any available control function or control circuit.

**Temperature Sensors**
Sensors can be used to control, or simply to display.

**Digital inputs (DI, Optocoupler inputs)**
Each digital input can be assigned to one of the possible functions.

**Relay Outputs**
Each relay can be used to control one of the possible functions and can also be switched on manually.

Notice

**The relay outputs #2, #3 and #5 are Solid State Relays (SSR) with a lower contact rating than the standard relay outputs. They can be used for any function within the specified current range.**

**Parameter**
Only assigned parameters will appear on the parameter page for scrolling efficiency.

**Assignment**
The function of each input and output can be preset on the 'assignment page'. The assignment can be done by keys or via interface.

**Configuration parameter sets**
The MSR *eco* includes two predefined configurations, which can be loaded. Overmore the user can save and recall another individual set of configuration parameters, the ‚user defined configuration'.
It is only available if it was saved before by ‚h90' (Assignment Page), which saves all current settings to the ‚user defined configuration'.
To do this, the OEM-Code is necessary.

*Sequence:*
- Select 'h90'
- Press the P-key
- '---' appears
- Press the UP-key and enter the OEM-code
- Select 'do' with the UP-key
- Save the parameter by clicking the P-key
- 'don' for action executed respective 'Err' for action not executed will be displayed for about 2 seconds.

If an overwrite of the existing configuration is not desired, then the operation can be aborted before pressing the „P“ key. When the display shows „do“, press the „Down“ key again and „---“ will be shown on the display. Now press the „P“ key. „h90“ will appear on the display.

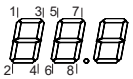
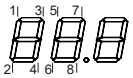
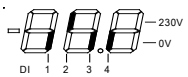
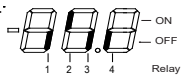
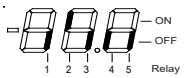
In order to restore a saved user configuration, this can be achieved by selecting „h91“ and entering code „70“. „h91“ can also be used to load the values from the „permanent preset configuration“. If no configuration was previously saved, then „h91“ cannot be selected.

*Behaviour of the User Configurations at Program Updates:*
After updates, if an OEM configuration is available, it is possible to load all parameters which are stored in the respective program version.
New parameters will be set to default values.

With program downgrades / updates in in combination with OEM configurations saving/loading, parameters in the user configuration may be lost.

**Parameter Pages**

## Actual Values Page [L]

| Param | nA | Eb | Note | range |
|---|---|---|---|---|
| L01 | X | 3,2 | Actual temperature value of sensor 1 | -99,9...+100,0°C |
| up to | | | (can be corrected ±10K, the function is defined in the Assignment Page) | |
| L04 | X | 3,2 | Actual temperature value of sensor 4 | -99,9...+100,0°C |
| L05 | X | 3,2 | Actual temperature value of input 5 (calculated from L15, pressure transmitter 1) | -99,9...+100,0°C |
| L06 | X | 3,2 | Actual temperature value of input 6 (calculated from L16, pressure transmitter 2) | -99,9...+100,0°C |
| L10 | X | 3,2,1 | Actual value SP / HP, poss. alternating display, cooling symbol SP, fan symbol HP | -99,9...+100,0°C |
| L15 | X | 3,2,1 | Actual value of Pressure Transmitter 1 (4/20mA). Temperature L05 is calculated from this | -1,0...+160,0 bar |
| L16 | X | 3,2,1 | Actual value of Pressure Transmitter 2 (4/20mA). Temperature L06 is calculated from this | -1,0...+160,0 bar |
| L20 | X | 3,2,1 | Current Failure | |
| | | | *Suction Pressure Actual Values* | |
| L21 | X | 3,2,1 | Current state of the stage control (SP) | Forw., Backrun, Neutral (descr. page 3) |
| L22 | X | 3,2,1 | Motor Failure | 0: o.k., 1: unit faulty, 2: >50% faulty, 3: all faulty |
| L23 | X | 3,2,1 | Suction pressure failure | 0: o.k., 1: failure |
| L24 | X | 3,2,1 | Suction pressure pre-alarm | 0: o.k., 1: pre-alarm |
| L25 | X | 3,2 | Remaining Time Superheat Compound Lock | seconds |
| L26 | X | 3,2 | Remaining Time Superheat Warning | seconds |
| L27 | X | 3,2 | Suction Pressure Actual Superheat Value | in K |
| L30 | X | 3,2,1 | Current Setpoint | in °C |
| L31 | X | 3,2 | Current cumulated offset | in K |
| L32 | X | 3,2 | Current suction pressure shift offset | in K |
| L33 | X | 3,2,1 | Remaining forerun/backrun delay time | seconds |
| L34 | X | 3,2,1 | Remaining forerun/backrun time calculated (VBR) | seconds |
| L35 | X | 3,2,1 | Remaining steady state time | minutes |
| L36 | X | 3,2 | Current load limitation (motors) | 0...8 motors |
| L37 | X | 3,2,1 | Current forced backrun state | 0 = no, 1 = forced backrun |
| L38 | X | 3,2 | Remaining steady state time of motor 1 (CRII) | 0...900 sec. |
| L39 | X | 3,2 | Remaining timeout time of motor 1 (CRII) | 0...900 sec. |
| L41 | X | 3,2,1 | Number of running stages of motor 1 (SP) | 0....8 stages |
| L42 | X | 3,2,1 | Number of running stages of motor 2 (SP) | 0....8 stages |
| L43 | X | 3,2,1 | Number of running stages of motor 3 (SP) | 0....8 stages |
| L44 | X | 3,2,1 | Number of running stages of motor 4 (SP) | 0....8 stages |
| L45 | X | 3,2,1 | Number of running stages of motor 5 (SP) | 0....8 stages |
| L46 | X | 3,2,1 | Number of running stages of motor 6 (SP) | 0....8 stages |
| L47 | X | 3,2,1 | Number of running stages of motor 7 (SP) | 0....8 stages |
| L48 | X | 3,2,1 | Number of running stages of motor 8 (SP) | 0....8 stages |
| L51 | X | 3,2 | State of stage 1 (SP) | 0 = not available<br>1 = autom. off, 2 = manually off<br>3 = autom. on without feedback signal<br>4 = autom. on with feedback signal<br>5 = manually on, 6 = failure state set |
| L52 | X | 3,2 | State of stage 2 (SP) | ditto. |
| bis | | | | |
| L58 | X | 3,2 | State of stage 8 (SP) | ditto. |
| | | | *High Pressure Actual Values* | |
| L60 | X | 3,2,1 | Current state of the stage control (HP) | Forw., Backrun, Neutral (descr. page 3) |
| L61 | X | 3,2,1 | High pressure failure (HP) | 0: o.k., 1: failure |
| L62 | X | 3,2 | High pressure pre-alarm (HP) | 0: o.k., 1: pre-alarm |
| L63 | X | 3,2,1 | Current Switch-off point (HP) | in °C |
| L64 | X | 3,2,1 | Current Switch-on point (HP) | in °C |
| L65 | X | 3,2,1 | Current Offset (HP) | in K |
| L66 | X | 3,2 | Remaining forerun/backrun delay time (HP) | seconds |
| L71 | X | 3,2 | Number of running stages of motor 1 (HP) | 0....8 stages |
| L72 | X | 3,2 | Number of running stages of motor 2 (HP) | 0....8 stages |
| L73 | X | 3,2 | Number of running stages of motor 3 (HP) | 0....8 stages |
| L74 | X | 3,2 | Number of running stages of motor 4 (HP) | 0....8 stages |
| L75 | X | 3,2 | Number of running stages of motor 5 (HP) | 0....8 stages |
| L76 | X | 3,2 | Number of running stages of motor 6 (HP) | 0....8 stages |
| L77 | X | 3,2 | Number of running stages of motor 7 (HP) | 0....8 stages |
| L78 | X | 3,2 | Number of running stages of motor 8 (HP) | 0....8 stages |
| L81 | X | 3,2 | State of stage 1 (HP) | 0 = not available<br>1 = autom.off, 2 = manually off<br>4 = autom.on<br>5 = manually on, 6 = failure state set |
| L82 | X | 3,2 | State of stage 2 (HP) | ditto. |
| bis | | | | |
| L88 | X | 3,2 | State of stage 8 (HP) | ditto. |
| L93 | X | 3,2,1 | State of the day/night switching | nit (night), dAY (day) |
| L94 | X | 3,2,1 | Display of the running SP stages |  |
| L95 | X | 3,2,1 | Display of the running HP stages |  |
| L96 | X | 3,2,1 | Current value of the analogue output | 0-100% |
| L97 | X | 3,2,1 | Current status of the digital inputs DI 1 up to DI 4 |   |
| L98 | X | 3,2,1 | Current status of the relays of the auxiliary BMR module |   |
| L99 | X | 3,2,1 | Current status of the relays 1-5 |   |

Parameters marked with "**nA**" are for information only and cannot be changed.

## Address Page [A]

| Param | SubPar. | Co | Level | Note | Range | Cf1 | Cf2 | Cf3 | Cf4 |
|---|---|---|---|---|---|---|---|---|---|
| A00 | | tec | 3, 2 | Address of the 1st. connected controller | | | | | |
| | d01 | tec | 3, 2 | Type of the connected controller | - - - = no controller connected<br>E30 = EVP 1130<br>E40 = EVP 1140<br>E50 = EVP 3150<br>E60 = EVP 3160<br>E67 = EVP 3167<br>E68 = EVP 3168<br>E70 = EVP 3170<br>t30 = TKP 3130<br>t40 = TKP 3140<br>t50 = TKP 3150 | - - - | - - - | - - - | - - - |
| | d02 | tec | 3, 2 | The connected controller acts on the suction pressure shifting with: | 0 = no effect<br>1=limit.temperature<br>2=limit.temperature + opening percentage | 0 | 0 | 0 | 0 |
| | d03 | tec | 3, 2 | Suction Pressure Shift - Temperature Offset | 0...20 K | 1.0 K | 1.0 K | 1.0 K | 1.0 K |
| A01 | | tec | 3, 2 | Address of the 2nd connected controller | | | | | |
| | d01 | tec | 3, 2 | Type of the connected controller | see above | | | | |
| | d02 | tec | 3, 2 | The connected controller acts on the suction pressure shifting | see above | | | | |
| | d03 | tec | 3, 2 | Suction Pressure Shift - Temperature Offset | see above | | | | |
| up to | | | | | | | | | |
| A63 | | tec | 3, 2 | Address of the 64th connected controller | | | | | |
| | d01 | tec | 3, 2 | Type of the connected controller | see above | | | | |
| | d02 | tec | 3, 2 | The connected controller acts on the suction pressure shifting | see above | | | | |
| | d03 | tec | 3, 2 | Suction Pressure Shift - Temperature Offset | see above | | | | |

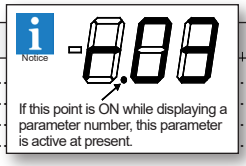
## Mode Page [P]

| Param | Co | Level | Note | Range | Cf1 | Cf2 | Cf3 | Cf4 |
|---|---|---|---|---|---|---|---|---|
| P10 | oem | 3, 2 | Warn threshold minimal superheat | 1,0...25,0 K | 5,0 K | 5,0 K | 5,0 K | 5,0 K |
| P11 | oem | 3, 2 | Warn hysteresis superheat | 1,0...25,0 K | 1,0 K | 1,0 K | 1,0 K | 1,0 K |
| P12 | oem | 3, 2 | Warn delay superheat | 0...900 sec. | 5 Sek. | 5 Sek. | 5 Sek | 5 Sek |
| P13 | oem | 3, 2 | Superheat warning locks cold storage controllers | 0 = no, 1 = yes | 1 | 1 | 1 | 1 |
| P14 | oem | 3, 2 | Compound lock threshold minimal superheat (0,0 K = switched off) | 0,0...25,0 K | 0,0 K | 0,0 K | 0,0 K | 0,0 K |
| P15 | oem | 3, 2 | Compound lock delay minimal superheat | 5...900 sec. | 5 sec. | 5 sec | 5 sec | 5 sec |
| P20 | oem | 3, 2 | Sending date and time to connected cold storage controllers | on, oFF | oFF | oFF | oFF | oFF |
| P21 | tec | 3, 2, 1 | Night Operation Mode ON at | 0...23.5(0), oFF | oFF | oFF | oFF | oFF |
| P22 | tec | 3, 2, 1 | Night Operation Mode OFF at | 0...23.5(0), oFF | oFF | oFF | oFF | oFF |
| P31 | oem | 3, 2 | Calibration of sensor input 1 | ±10.0 K adjustable | 0.0 K | 0.0 K | 0.0 K | 0.0 K |
| P32 | oem | 3, 2 | Calibration of sensor input 2 | ±10.0 K adjustable | 0.0 K | 0.0 K | 0.0 K | 0.0 K |
| P33 | oem | 3, 2 | Calibration of sensor input 3 | ±10.0 K adjustable | 0.0 K | 0.0 K | 0.0 K | 0.0 K |
| P34 | oem | 3, 2 | Calibration of sensor input 4 | ±10.0 K adjustable | 0.0 K | 0.0 K | 0.0 K | 0.0 K |
| P35 | oem | 3, 2 | Calibration of sensor input 5 | ±10.0 K adjustable | 0.0 K | 0.0 K | 0.0 K | 0.0 K |
| P36 | oem | 3, 2 | Calibration of sensor input 6 | ±10.0 K adjustable | 0.0 K | 0.0 K | 0.0 K | 0.0 K |
| P69 | X | 3, 2 | Summertime State | 0 = winter, 1 = summer | -- | -- | -- | -- |
| P70 | tec | 3, 2 | Mode of summer/winter switch | oFF = off, EU = on, tun = variabel | EU | oFF | oFF | oFF |
| P71 | tec | 3, 2 | Time Zone Offset | -720...720 min. | 60 min. | 60 min. | 60 min. | 60 min. |
| P72 | tec | 3, 2 | SummerON Month (only for tun) | 1...12 | 3 | 3 | 3 | 3 |
| P73 | tec | 3, 2 | SummerON Day (only for tun) | 0(Sunday)...6 | 0 | 0 | 0 | 0 |
| P74 | tec | 3, 2 | SummerON x-Day (only for tun) | 0...5(last), 0=off | 5 | 5 | 5 | 5 |
| P75 | tec | 3, 2 | SummerON Hour (only for tun) | 0...23 | 2 | 2 | 2 | 2 |
| P76 | tec | 3, 2 | SummerOFF Month (only for tun) | 1...12 | 10 | 10 | 10 | 10 |
| P77 | tec | 3, 2 | SummerOFF Day (only for tun) | 0(Sunday)...6 | 0 | 0 | 0 | 0 |
| P78 | tec | 3, 2 | SummerOFF x-Day (only for tun) | 0...5(last), 0=off | 5 | 5 | 5 | 5 |
| P79 | tec | 3, 2 | SummerOFF Hour (only for tun) | 0...23 | 3 | 3 | 3 | 3 |
| P80, P81 | | 3, 2, 1 | Year, Month | adjustable | | | | |
| P82, P83 | | 3, 2, 1 | Day, Hour | adjustable | | | | |
| P84, P85 | | 3, 2, 1 | Minute, Secund | adjustable | | | | |
| P86 | | 3, 2, 1 | Software version BMR | | | | | |
| P87 | | 3, 2, 1 | Software version | | | | | |
| P89 | oem | 3, 2 | Data transmission speed (baudrate) | 12(00)...115(00) | 96(00) | 96(00) | 96(00) | 96(00) |
| P90 | oem | 3, 2 | Address of the MSR eco unit in a network | 0 - 78 | 78 | 78 | 78 | 78 |
| P99 | | 3, 2, 1 | Operating Level / Access authorization | 88: Level 2<br>70: Level 3 | 0 | 0 | 0 | 0 |

Hinweis

Parameters marked by "**nA**" are for information only and cannot be changed.
"**Co**" is the password/code for this parameter.
The 3 code numbers are:
- OEM-Code (**oem**) : Month + Hour + 20
- Technician Code (**tec**) : 88
- Customer Code (**---**): without code

## Setpoint Page Suction Pressure [r]




| Param | Co | Level | Note | Range | Cf1 | Cf2 | Cf3 | Cf4 |
|---|---|---|---|---|---|---|---|---|
| r01 | --- | 3, 2, 1 | Setpoint 1 (day) | -99,9...+100,0°C | -10,0°C | -10,0°C | -10,0°C | -10,0°C |
| r02 | --- | 3, 2, 1 | Setpoint 2 (night) | -99,9...+100,0°C | -10,0°C | -10,0°C | -10,0°C | -10,0°C |
| r03 | --- | 3, 2, 1 | Setpoint maximum | -99,9...+100,0°C | 0,0°C | 10,0°C | 10,0°C | 10,0°C |
| r04 | --- | 3, 2, 1 | Hysteresis | 0,1...20,0K | 2.0 K | 2.0 K | 2.0 K | 2.0 K |
| r05 | oem | 3, 2 | Hysteresis Position | H-- = symmetrical<br>H_ = below the setpoint<br>H‾ = above the setpoint | H-- | H-- | H-- | H-- |
| r06 | oem | 3, 2 | Alarm limit | -99,9...+100,0°C | -20,0°C | -99,9°C | -99,9°C | -99,9°C |
| r07 | oem | 3, 2 | Pre-alarm limit | -99,9...+100,0°C | -18,0°C | -99,9°C | -99,9°C | -99,9°C |
| r08 | oem | 3, 2 | Pre-alarm delay | 1...600 sec. | 10 sec. | 600 sec | 600 sec | 600 sec |
| r11 | oem | 3, 2 | Load Limitation 1 (max. running motors) | 0...8 motors | 8 | 8 | 8 | 8 |
| r12 | oem | 3, 2 | Load Limitation 2 (max. running motors) | 0...8 motors | 8 | 8 | 8 | 8 |
| r13 | oem | 3, 2 | PI analogue output proportional band/range | 0.1...30.0 K | 5.0 K | 5.0 K | 5.0 K | 5.0 K |
| r14 | oem | 3, 2 | PI analogue output integral time | 0...600 sec. | 60 sec. | 60 sec. | 60 sec. | 60 sec |
| r15 | oem | 3, 2 | PI analogue output output delay | 0...100 sec. | 20 sec. | 20 sec. | 20 sec. | 20 sec |
| r16 | oem | 3, 2 | PI analogue output step size | 1...100% | 10% | 10% | 10% | 10% |
| r17 | oem | 3, 2 | Suction pressure shifting EEx-Valve percentage of opening lower limit (of connected controllers) | 0...100% | 20% | 20% | 20% | 20% |
| r18 | oem | 3, 2 | Suction pressure shifting EEx-Valve percentage of opening upper limit (of connected controllers) | 0...100% | 80% | 80% | 80% | 80% |
| r19 | oem | 3, 2 | Suction pressure shifting step width (of connected controllers) | 0...20,0K | 1,0K | 1,0K | 1,0K | 1,0K |
| r20 | oem | 3, 2 | Stage controller - Steady state time | 10...540 min. | 540 min. | 540 min. | 540 min. | 540 min. |
| r21 | oem | 3, 2 | Stage controller - Operational-Feedback Time | 5...600 sec. | 30 sec. | 30 sec. | 30 sec. | 30 sec. |
| r22 | oem | 3, 2 | Stage controller - Base Load Change (Stage Sequencing)<br>....a..../....b..../....c....<br>At position a, these base load functions can be set:<br>0=off, r=forerun dep. on runtime, h=for. dep. on stop time<br>At position b, these base load function can be set:<br>0 = off, r = backrun dep. on runtime,<br>At position c, these base load functions can be set:<br>Switch optimization: 0 = off, 1 = on | 000 = off/off/off<br><br>rr0=runt./runt./off<br>hr0=stopt./runt./off<br>rr1=runt./runt./on<br>hr1=stopt./runt./on | hr1 | hr1 | hr1 | hr1 |
| r23 | oem | 3, 2 | Idle Time of the stage with 0% load | 0...900 sec. | 5 sec. | 5 sec. | 5 sec. | 5 sec. |
| r24 | oem | 3, 2 | Timeout of 0% control. If no power stage is activated, the motor switches off after: | 0...900 sec. | 120 sec. | 120 sec. | 120 sec. | 120 sec. |
| r25 | oem | 3, 2 | Variable forerun-/backrun delays (**VBR**, Switching Frequency Optimization) | on, oFF | oFF | oFF | oFF | oFF |
| r26 | oem | 3, 2 | VBR Forerun Range | 0,5...20,0 K | 0,5 K | 0,5 K | 0,5 K | 0,5 K |
| r27 | oem | 3, 2 | VBR Backrun Range | 0,5...20,0 K | 0,5 K | 0,5 K | 0,5 K | 0,5 K |
| r28 | oem | 3, 2 | VBR Forerun/Backrun Range Time min. | 1...900 sec. | 1 sec. | 1 sec. | 1 sec. | 1 sec. |
| r29 | oem | 3, 2 | VBR Forerun/Backrun Range Time max. | 1...900 sec. | 20 sec. | 20 sec. | 20 sec. | 20 sec. |
| r41 | --- | 3, 2, 1 | Forerun Delay Time stage 1 (the first turn on stage) | 0...900 sec. | 10 sec. | 10 sec. | 10 sec. | 10 sec. |
| r42 | --- | 3, 2, 1 | Forerun Delay Time stage 2 | 0...900 sec. | 10 sec. | 10 sec. | 10 sec. | 10 sec. |
| r43 | --- | 3, 2, 1 | Forerun Delay Time stage 3 | 0...900 sec. | 10 sec. | 10 sec. | 10 sec. | 10 sec. |
| r44 | --- | 3, 2, 1 | Forerun Delay Time stage 4 | 0...900 sec. | 10 sec. | 10 sec. | 10 sec. | 10 sec. |
| r45 | --- | 3, 2, 1 | Forerun Delay Time stage 5 | 0...900 sec. | 10 sec. | 10 sec. | 10 sec. | 10 sec. |
| r46 | --- | 3, 2, 1 | Forerun Delay Time stage 6 | 0...900 sec. | 10 sec. | 10 sec. | 10 sec. | 10 sec. |
| r47 | --- | 3, 2, 1 | Forerun Delay Time stage 7 | 0...900 sec. | 10 sec. | 10 sec. | 10 sec. | 10 sec. |
| r48 | --- | 3, 2, 1 | Forerun Delay Time stage 8 | 0...900 sec. | 10 sec. | 10 sec. | 10 sec. | 10 sec. |
| r51 | --- | 3, 2, 1 | Backrun Delay Time stage 1 (the last off stage) | 0...900 sec. | 10 sec. | 10 sec. | 10 sec. | 10 sec. |
| r52 | --- | 3, 2, 1 | Backrun Delay Time stage 2 | 0...900 sec. | 10 sec. | 10 sec. | 10 sec. | 10 sec. |
| r53 | --- | 3, 2, 1 | Backrun Delay Time stage 3 | 0...900 sec. | 10 sec. | 10 sec. | 10 sec. | 10 sec. |
| r54 | --- | 3, 2, 1 | Backrun Delay Time stage 4 | 0...900 sec. | 10 sec. | 10 sec. | 10 sec. | 10 sec. |
| r55 | --- | 3, 2, 1 | Backrun Delay Time stage 5 | 0...900 sec. | 10 sec. | 10 sec. | 10 sec. | 10 sec. |
| r56 | --- | 3, 2, 1 | Backrun Delay Time stage 6 | 0...900 sec. | 10 sec. | 10 sec. | 10 sec. | 10 sec. |
| r57 | --- | 3, 2, 1 | Backrun Delay Time stage 7 | 0...900 sec. | 10 sec. | 10 sec. | 10 sec. | 10 sec. |
| r58 | --- | 3, 2, 1 | Backrun Delay Time stage 8 | 0...900 sec. | 10 sec. | 10 sec. | 10 sec. | 10 sec. |
| r61 | oem | 3, 2 | Motor 1 automatic / manually | oFF, Aut (autom.)<br>on (permanent on) | Aut | Aut | Aut | Aut |
| r62 | oem | 3, 2 | Motor 2 automatic / manually | ditto. | Aut | Aut | Aut | Aut |
| r63 | oem | 3, 2 | Motor 3 automatic / manually | ditto. | Aut | Aut | Aut | Aut |
| r64 | oem | 3, 2 | Motor 4 automatic / manually | ditto. | Aut | Aut | Aut | Aut |
| r65 | oem | 3, 2 | Motor 5 automatic / manually | ditto. | Aut | Aut | Aut | Aut |
| r66 | oem | 3, 2 | Motor 6 automatic / manually | ditto. | Aut | Aut | Aut | Aut |
| r67 | oem | 3, 2 | Motor 7 automatic / manually | ditto. | Aut | Aut | Aut | Aut |
| r68 | oem | 3, 2 | Motor 8 automatic / manually | ditto. | Aut | Aut | Aut | Aut |
| r71 | --- | 3, 2, 1 | Minimum Idle Time Motor 1 | 0...20 min. | 0 min. | 0 min. | 0 min. | 0 min. |
| r72 | --- | 3, 2, 1 | Minimum Idle Time Motor 2 | 0...20 min. | 0 min. | 0 min. | 0 min. | 0 min. |
| r73 | --- | 3, 2, 1 | Minimum Idle Time Motor 3 | 0...20 min. | 0 min. | 0 min. | 0 min. | 0 min. |
| r74 | --- | 3, 2, 1 | Minimum Idle Time Motor 4 | 0...20 min. | 0 min. | 0 min. | 0 min. | 0 min. |
| r75 | --- | 3, 2, 1 | Minimum Idle Time Motor 5 | 0...20 min. | 0 min. | 0 min. | 0 min. | 0 min. |
| r76 | --- | 3, 2, 1 | Minimum Idle Time Motor 6 | 0...20 min. | 0 min. | 0 min. | 0 min. | 0 min. |
| r77 | --- | 3, 2, 1 | Minimum Idle Time Motor 7 | 0...20 min. | 0 min. | 0 min. | 0 min. | 0 min. |
| r78 | --- | 3, 2, 1 | Minimum Idle Time Motor 8 | 0...20 min. | 0 min. | 0 min. | 0 min. | 0 min. |

Hinweis

Parameters marked by "**nA**" are for information only and cannot be changed.
"**Co**" is the password/code for this parameter.
The 3 code numbers are:
- OEM-Code (**oem**) : Month + Hour + 20
- Technician Code (**tec**) : 88
- Customer Code (**---**): without code

## Setpoint Page High Pressure [d]

| Param | Co | Level | Note | Range | Cf1 | Cf2 | Cf3 | Cf4 |
|---|---|---|---|---|---|---|---|---|
| d01 | --- | 3, 2, 1 | Setpoint of the first stage to switch on respective the last stage to switch off | -99,9...+100,0°C | 35,0°C | 35,0°C | 35,0°C | 35,0°C |
| d02 | --- | 3, 2, 1 | Setpoint 2 | -99,9...+100,0°C | 35,0°C | 35,0°C | 35,0°C | 35,0°C |
| d03 | --- | 3, 2, 1 | Setpoint 3 | -99,9...+100,0°C | 35,0°C | 35,0°C | 35,0°C | 35,0°C |
| d04 | --- | 3, 2, 1 | Setpoint 4 | -99,9...+100,0°C | 35,0°C | 35,0°C | 35,0°C | 35,0°C |
| d05 | --- | 3, 2, 1 | Setpoint 5 | -99,9...+100,0°C | 35,0°C | 35,0°C | 35,0°C | 35,0°C |
| d06 | --- | 3, 2, 1 | Setpoint 6 | -99,9...+100,0°C | 35,0°C | 35,0°C | 35,0°C | 35,0°C |
| d07 | --- | 3, 2, 1 | Setpoint 7 | -99,9...+100,0°C | 35,0°C | 35,0°C | 35,0°C | 35,0°C |
| d08 | --- | 3, 2, 1 | Setpoint 8 | -99,9...+100,0°C | 35,0°C | 35,0°C | 35,0°C | 35,0°C |
| d10 | --- | 3, 2, 1 | Night Offset | -20,0...+20,0 K | 0,0 K | 0,0 K | 0,0 K | 0,0 K |
| d11 | oem | 3, 2 | Night Limitation | 0...100% | 100% | 100% | 100% | 100% |
| d12 | --- | 3, 2, 1 | Hysteresis | 0,1...20,0 K | 2.0 K | 2.0 K | 2.0 K | 2.0 K |
| d13 | oem | 3, 2 | Hysteresis Position | H-- = symmetrical<br>H_ _ = below the setpoint<br>H‾‾ = above the setpoint | H-- | H-- | H-- | H-- |
| d14 | oem | 3, 2 | Setpoint shifting via outdoor temperature, lower temperature threshold | 0,0...+60,0°C | 0,0°C | 0,0°C | 0,0°C | 0,0°C |
| d15 | oem | 3, 2 | Setpoint shifting via outdoor temperature, temperature range | 0,0...20,0 K | 0,0 K | 0,0 K | 0,0 K | 0,0 K |
| d16 | oem | 3, 2 | Setpoint shifting via outdoor temperature, factor | -5,0...+5,0 K/K | 0,0 K/K | 0,0 K/K | 0,0 K/K | 0,0 K/K |
| d17 | oem | 3, 2 | High pressure alarm limit | -99,0...+100,0 | 42,0°C | 100,0°C | 100,0°C | 100,0°C |
| d18 | oem | 3, 2 | High pressure pre alarm limit | -99,0...+100,0 | 40,0°C | 100,0°C | 100,0°C | 100,0°C |
| d19 | oem | 3, 2 | Alarm delay | 1...600 sec. | 10 sec. | 600 sec. | 600 sec. | 600 sec |
| d20 | oem | 3, 2 | P Analogue Output - Output Delay | 0...100 sec. | 0 sec. | 0 sec. | 0 sec. | 0 sec. |
| d21 | oem | 3, 2 | P Analogue Output - Step Size | 1...100% | 100% | 100% | 100% | 100% |
| d22 | oem | 3, 2 | Stage Controller - Base Load Change (Stage Sequenc.)<br>....a..../....b..../....c....<br>At position a, these base load functions can be set:<br>0=off, r=forerun dep. on runtime, h=fore. dep. on stop time<br>At position b, these base load funktion can be set:<br>0 = off, r = backrun dep. on runtime,<br>At position c, these base load functions can be set:<br>Switch optimization: 0 = off, 1 = on | 000 = off/off/off<br><br>rr0 = runt/runt/off<br>hr0 = stopt/runt/off<br>rr1 = runt/runt/on<br>hr1 = stopt/runt/on | hr0 | hr0 | hr0 | hr0 |
| d41 | tec | 3, 2 | Forerun Delay Time Stage 1 (the first turn on stage) | 0...900 sec. | 10 sec. | 0 sec. | 0 sec. | 0 sec |
| d42 | tec | 3, 2 | Forerun Delay Time Stage 2 | 0...900 sec. | 10 sec. | 0 sec. | 0 sec. | 0 sec |
| d43 | tec | 3, 2 | Forerun Delay Time Stage 3 | 0...900 sec. | 10 sec. | 0 sec. | 0 sec. | 0 sec |
| d44 | tec | 3, 2 | Forerun Delay Time Stage 4 | 0...900 sec. | 10 sec. | 0 sec. | 0 sec. | 0 sec |
| d45 | tec | 3, 2 | Forerun Delay Time Stage 5 | 0...900 sec. | 10 sec. | 0 sec. | 0 sec. | 0 sec |
| d46 | tec | 3, 2 | Forerun Delay Time Stage 6 | 0...900 sec. | 10 sec. | 0 sec. | 0 sec. | 0 sec |
| d47 | tec | 3, 2 | Forerun Delay Time Stage 7 | 0...900 sec. | 10 sec. | 0 sec. | 0 sec. | 0 sec |
| d48 | tec | 3, 2 | Forerun Delay Time Stage 8 | 0...900 sec. | 10 sec. | 0 sec. | 0 sec. | 0 sec |
| d51 | tec | 3, 2 | Backrun Delay Time Stage 1 (the last off stage) | 0...900 sec. | 10 sec. | 0 sec. | 0 sec. | 0 sec |
| d52 | tec | 3, 2 | Backrun Delay Time Stage 2 | 0...900 sec. | 10 sec. | 0 sec. | 0 sec. | 0 sec |
| d53 | tec | 3, 2 | Backrun Delay Time Stage 3 | 0...900 sec. | 10 sec. | 0 sec. | 0 sec. | 0 sec |
| d54 | tec | 3, 2 | Backrun Delay Time Stage 4 | 0...900 sec. | 10 sec. | 0 sec. | 0 sec. | 0 sec |
| d55 | tec | 3, 2 | Backrun Delay Time Stage 5 | 0...900 sec. | 10 sec. | 0 sec. | 0 sec. | 0 sec |
| d56 | tec | 3, 2 | Backrun Delay Time Stage 6 | 0...900 sec. | 10 sec. | 0 sec. | 0 sec. | 0 sec |
| d57 | tec | 3, 2 | Backrun Delay Time Stage 7 | 0...900 sec. | 10 sec. | 0 sec. | 0 sec. | 0 sec |
| d58 | tec | 3, 2 | Backrun Delay Time Stage 8 | 0...900 sec. | 10 sec. | 0 sec. | 0 sec. | 0 sec |
| d61 | oem | 3, 2 | Motor 1 automatic / manually | oFF, Aut (autom.) on (permanently on) | Aut | Aut | Aut | Aut |
| d62 | oem | 3, 2 | Motor 2 automatic / manually | ditto. | Aut | Aut | Aut | Aut |
| d63 | oem | 3, 2 | Motor 3 automatic / manually | ditto. | Aut | Aut | Aut | Aut |
| d64 | oem | 3, 2 | Motor 4 automatic / manually | ditto. | Aut | Aut | Aut | Aut |
| d65 | oem | 3, 2 | Motor 5 automatic / manually | ditto. | Aut | Aut | Aut | Aut |
| d66 | oem | 3, 2 | Motor 6 automatic / manually | ditto. | Aut | Aut | Aut | Aut |
| d67 | oem | 3, 2 | Motor 7 automatic / manually | ditto. | Aut | Aut | Aut | Aut |
| d68 | oem | 3, 2 | Motor 8 automatic / manually | ditto. | Aut | Aut | Aut | Aut |
| d71 | oem | 3, 2 | Minimium Idle Time Motor 1 | 0...20 min. | 0 min. | 0 min. | 0 min. | 0 min. |
| d72 | oem | 3, 2 | Minimium Idle Time Motor 2 | 0...20 min. | 0 min. | 0 min. | 0 min. | 0 min. |
| d73 | oem | 3, 2 | Minimium Idle Time Motor 3 | 0...20 min. | 0 min. | 0 min. | 0 min. | 0 min. |
| d74 | oem | 3, 2 | Minimium Idle Time Motor 4 | 0...20 min. | 0 min. | 0 min. | 0 min. | 0 min. |
| d75 | oem | 3, 2 | Minimium Idle Time Motor 5 | 0...20 min. | 0 min. | 0 min. | 0 min. | 0 min. |
| d76 | oem | 3, 2 | Minimium Idle Time Motor 6 | 0...20 min. | 0 min. | 0 min. | 0 min. | 0 min. |
| d77 | oem | 3, 2 | Minimium Idle Time Motor 7 | 0...20 min. | 0 min. | 0 min. | 0 min. | 0 min. |
| d78 | oem | 3, 2 | Minimium Idle Time Motor 8 | 0...20 min. | 0 min. | 0 min. | 0 min. | 0 min. |

**Access Levels**

Not all parameters are visible on the user interface. Depending on the operator's authorization, parameters are switched on or off.

Three Access Levels are available:
Level 1 - only selected parameters - for the customer (default display)
Level 2 - parameter for the technician (P99 = 88)
Level 3 - all parameters (P99 = 70)

To enter the access authorization, there is parameter **P99** in the mode list.
If the value **88** is entered for this parameter, all parameters of level 2 are displayed.
When the value **70** is entered, all parameters of level 3 are displayed.

If the controller is not operated for 3 minutes, the display returns to the basic display and only the parameters of level 1 are accessible.
Only required parameters are accessable on the display, depending on the current configuration.

With parameter **h91**, code 70 can be used to load one of four fixed configurations or a stored configuration. For special protection, the code number **70** must be entered each time for this parameter.

Selection options: „cF1“, „cF2“, „cF3“, „cF4“, „cFU“ and „---“ for termination.
The values of the four fixed configurations can be seen in the parameter list.

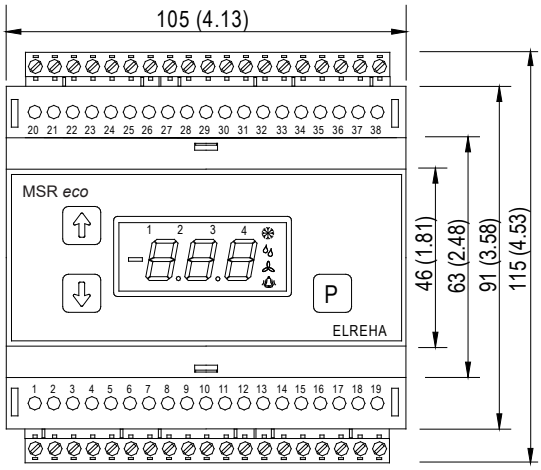
## Assignment Page [h]

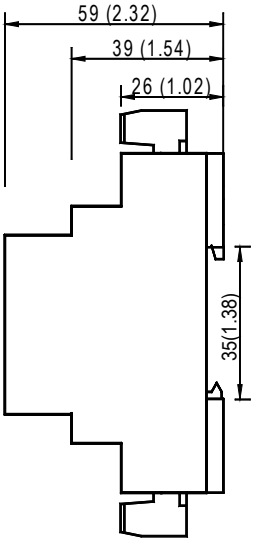
| Param | Co | Ebene | Bedeutung | Bereich | Cf1 | Cf2 | Cf3 | Cf4 |
|---|---|---|---|---|---|---|---|---|
| h01 | tec | 3, 2 | Function of Relay 1 | --- = switched off, on= continuously, RLA = Warning/Alarm, RLA = Warnung/Alarm, SUA = Warning Suction Superheat L1 =SP-Stage 1, L2 =SP-Stage 2, L3=SP-Stage 3, L4 =SP-Stage 4, L5 =SP-Stage 5, L6=SP-Stage 6, L7 =SP-Stage 7, L8 =SP-Stage 8, H1=HP-Stage 1, H2 =HP-Stage 2, H3 =HP-Stage 3, H4=HP-Stage 4 H5 =HP-Stage 5, H6 =HP-Stage 6, H7=HP-Stage 7, H8 =HP-Stage 8 | RLA | L1 | L1 | L1 |
| h02 | tec | 3, 2 | Function of Relay 2 (SSR) | ditto | L1 | --- | L2 | L2 |
| h03 | tec | 3, 2 | Function of Relay 3 (SSR) | ditto | --- | --- | --- | L3 |
| h04 | tec | 3, 2 | Function of Relay 4 | ditto. | --- | L2 | L3 | L4 |
| h05 | tec | 3, 2 | Function of Relay 5 (SSR) | ditto. | --- | L3 | L4 | L5 |
| h06 | tec | 3, 2 | Fct. of add. module BMR Rel.1 (SSR) | ditto. | --- | --- | --- | --- |
| h07 | tec | 3, 2 | Fct. of add. module BMR Rel.2 (SSR) | ditto. | --- | --- | --- | --- |
| h08 | tec | 3, 2 | Fct. of add. module BMR Rel.3 (SSR) | ditto. | --- | --- | --- | --- |
| h09 | tec | 3, 2 | Fct. of add. module BMR Rel.4 (SSR) | ditto. | --- | --- | --- | --- |
| h20 | oem | 3, 2 | Sensor/Probe Type | 201 = TF201, 501 = TF501, So1, So2 = cust.spec | 501 | 501 | 501 | 501 |
| h21 | oem | 3, 2 | Function of Sensor Input 1 | --- = switched off, d i5 = Display Sensor, Lco = Control Sensor SP, hco = Contr. Sensor HP, oUt = Outdoor Temp., SUt = Suction Tube Temp. | --- | --- | --- | --- |
| h22 | oem | 3, 2 | Function of Sensor Input 2 | ditto. | --- | --- | --- | --- |
| h23 | oem | 3, 2 | Function of Sensor Input 3 | ditto. | --- | --- | --- | --- |
| h24 | oem | 3, 2 | Function of Sensor Input 4 | ditto. | --- | --- | --- | --- |
| h25 | oem | 3, 2 | Funct. of Press. Transm. 1, 4/20mA | ditto. | Lco | Lco | Lco | Lco |
| h26 | oem | 3, 2 | Funct. of Press. Transm. 2, 4/20mA | ditto. | --- | hco | hco | hco |
| h31 | oem | 3, 2 | Function of Digital Input (DI) 1 | --- = switched off, LC1 = Load Limitation 1, LC2 = Load Limitation 2, FbL = Forced Backrun (passive), FbH = Forced Backrun (active), dnL = Night Operation (passive), dnH = Night Operation (active), LFL = external Suction Pressure fault (passive), LFH = external Suction Pressure fault (active), HFL = external High Pressure fault (passive), HFH = external High Pressure fault (active), r1 = Feedback SP-Motor 1, r2 = Feedback SP-Motor 2, r3 = Feedback SP-Motor 3, r4 = Feedback SP-Motor 4 | --- | FbH | FbH | FbH |
| h32 | oem | 3, 2 | Function of Digital Input (DI) 2 | ditto. | --- | r1 | r1 | r1 |
| h33 | oem | 3, 2 | Function of Digital Input (DI) 3 | ditto. | --- | r2 | r2 | r2 |
| h34 | oem | 3, 2 | Function of Digital Input (DI) 4 | ditto. | --- | r3 | r3 | r3 |
| h40 | oem | 3, 2 | Analogue Output delivers | 420 = Current 4-20mA , 0 10= Voltage 0-10V | 0 10 | 0 10 | 0 10 | 0 10 |
| h41 | oem | 3, 2 | Analogue Output works as/delivers | --- = 0V / 4 mA, 100 = 100% (10V respective. 20 mA), LP1 = PI Controller SP, HP = P Controller HP | --- | HP | HP | HP |
| h49 | tec | 3, 2 | CRII Power Contr.used (max.1 motor) | 0 = no, 1 = yes | 0 | 0 | 0 | 1 |
| h50 | tec | 3, 2 | Number of the prioritized motor (SP) | 0=all the same, 1= Motor 1, 2= Motor 2, 3..8=ditto. | 0 | 0 | 0 | 1 |
| h51 | tec | 3, 2 | Number of stages SP motor 1 | 0...8 | 1 | 1 | 2 | 3 |
| h52 | tec | 3, 2 | Number of stages SP motor 2 | 0...8 | 0 | 1 | 1 | 1 |
| h53 | tec | 3, 2 | Number of stages SP motor 3 | 0...8 | 0 | 1 | 1 | 1 |
| h54 | tec | 3, 2 | Number of stages SP motor 4 | 0...8 | 0 | 0 | 0 | 0 |
| h55 | tec | 3, 2 | Number of stages SP motor 5 | 0...8 | 0 | 0 | 0 | 0 |
| h56 | tec | 3, 2 | Number of stages SP motor 6 | 0...8 | 0 | 0 | 0 | 0 |
| h57 | tec | 3, 2 | Number of stages SP motor 7 | 0...8 | 0 | 0 | 0 | 0 |
| h58 | tec | 3, 2 | Number of stages SP motor 8 | 0...8 | 0 | 0 | 0 | 0 |
| h61 | tec | 3, 2 | Switching stage 1 (SP) inverted | 0 = no, 1 = yes | 0 | 0 | 0 | 0 |
| h62 | tec | 3, 2 | Switching stage 2 (SP) inverted | 0 = no, 1 = yes | 0 | 0 | 1 | 1 |
| h63 | tec | 3, 2 | Switching stage 3 (SP) inverted | 0 = no, 1 = yes | 0 | 0 | 0 | 0 |
| h64 | tec | 3, 2 | Switching stage 4 (SP) inverted | 0 = no, 1 = yes | 0 | 0 | 0 | 0 |
| h65 | tec | 3, 2 | Switching stage 5 (SP) inverted | 0 = no, 1 = yes | 0 | 0 | 0 | 0 |
| h66 | tec | 3, 2 | Switching stage 6 (SP) inverted | 0 = no, 1 = yes | 0 | 0 | 0 | 0 |
| h67 | tec | 3, 2 | Switching stage 7 (SP) inverted | 0 = no, 1 = yes | 0 | 0 | 0 | 0 |
| h68 | tec | 3, 2 | Switching stage 8 (SP) inverted | 0 = no, 1 = yes | 0 | 0 | 0 | 0 |
| h71 | tec | 3, 2 | Number of stages HP motor 1 | 0...8 | 0 | 0 | 0 | 0 |
| h72 | tec | 3, 2 | Number of stages HP motor 2 | 0...8 | 0 | 0 | 0 | 0 |
| h73 | tec | 3, 2 | Number of stages HP motor 3 | 0...8 | 0 | 0 | 0 | 0 |
| h74 | tec | 3, 2 | Number of stages HP motor 4 | 0...8 | 0 | 0 | 0 | 0 |
| h75 | tec | 3, 2 | Number of stages HP motor 5 | 0...8 | 0 | 0 | 0 | 0 |
| h76 | tec | 3, 2 | Number of stages HP motor 6 | 0...8 | 0 | 0 | 0 | 0 |
| h77 | tec | 3, 2 | Number of stages HP motor 7 | 0...8 | 0 | 0 | 0 | 0 |
| h78 | tec | 3, 2 | Number of stages HP motor 8 | 0...8 | 0 | 0 | 0 | 0 |
| h81 | tec | 3, 2 | Switching stage 1 (HP) inverted | 0 = no, 1 = yes | 0 | 0 | 0 | 0 |
| h82 | tec | 3, 2 | Switching stage 2 (HP) inverted | 0 = no, 1 = yes | 0 | 0 | 0 | 0 |
| h83 | tec | 3, 2 | Switching stage 3 (HP) inverted | 0 = no, 1 = yes | 0 | 0 | 0 | 0 |
| h84 | tec | 3, 2 | Switching stage 4 (HP) inverted | 0 = no, 1 = yes | 0 | 0 | 0 | 0 |
| h85 | tec | 3, 2 | Switching stage 5 (HP) inverted | 0 = no, 1 = yes | 0 | 0 | 0 | 0 |
| h86 | tec | 3, 2 | Switching stage 6 (HP) inverted | 0 = no, 1 = yes | 0 | 0 | 0 | 0 |
| h87 | tec | 3, 2 | Switching stage 7 (HP) inverted | 0 = no, 1 = yes | 0 | 0 | 0 | 0 |
| h88 | tec | 3, 2 | Switching stage 8 (HP) inverted | 0 = no, 1 = yes | 0 | 0 | 0 | 0 |
| h90 | oem | 3 | Save Configuration (with OEM-Code) | --- = quit without saving (with RET key) do = save (with RET key) | --- | --- | --- | --- |
| h91 | 70 | 3 | Load Configuration (**with Code 70**) | --- = no, cF1 = Conf. 1, cF2 = Conf. 2, cF3 = Conf. 3, cF4 = Conf. 4, cFU = Config. user | --- | --- | --- | --- |
| h92 | tec | 3, 2 | Add.-Module BMR 3002 available | 0 = no, 1 = yes | 0 | 0 | 0 | 0 |
| h93 | --- | 3, 2, 1 | Lower limit Press. Transm. Input 1 | -1,0...160,0 bar | -1,0 bar | -0,5 bar | -0,5 bar | -0,5 bar |
| h94 | --- | 3, 2, 1 | Upper limit Press. Transm. Input 1 | -1,0...160,0 bar | +9,0 bar | +7,0 bar | +7,0 bar | +7,0 bar |
| h95 | --- | 3, 2, 1 | Lower limit Press. Transm. Input 2 | -1,0...160,0 bar | -1,0 bar | 0 bar | 0 bar | 0 bar |
| h96 | --- | 3, 2, 1 | Upper limit Press. Transm. Input 2 | -1,0...160,0 bar | +9,0 bar | 25,0 bar | 25,0 bar | 25,0 bar |
| h99 | --- | 3, 2, 1 | Used Refrigerant | --- = none, control by temperature sensor only 1= NH3, 2= R134a, 3= R22, 4= R23, 5= R404a, 6= R507, 7= R402A, 8= R402B, 9= R407C, 10= R123, 11= R290, 12= CO2, 13= R502, 14= R723, 15= R410A, 16= R407F, 17= R448A, 18= R449A, 19=R1270 | 2 | 2 | 2 | 2 |

Hinweis

Parameters marked by "**nA**" are for information only and cannot be changed.
"**Co**" is the password/code for this parameter.
The 3 code numbers are:
- OEM-Code (**oem**) : Month + Hour + 20
- Technician Code (**tec**) : 88
- Customer Code (**---**): without code

## Dimensions & Connection



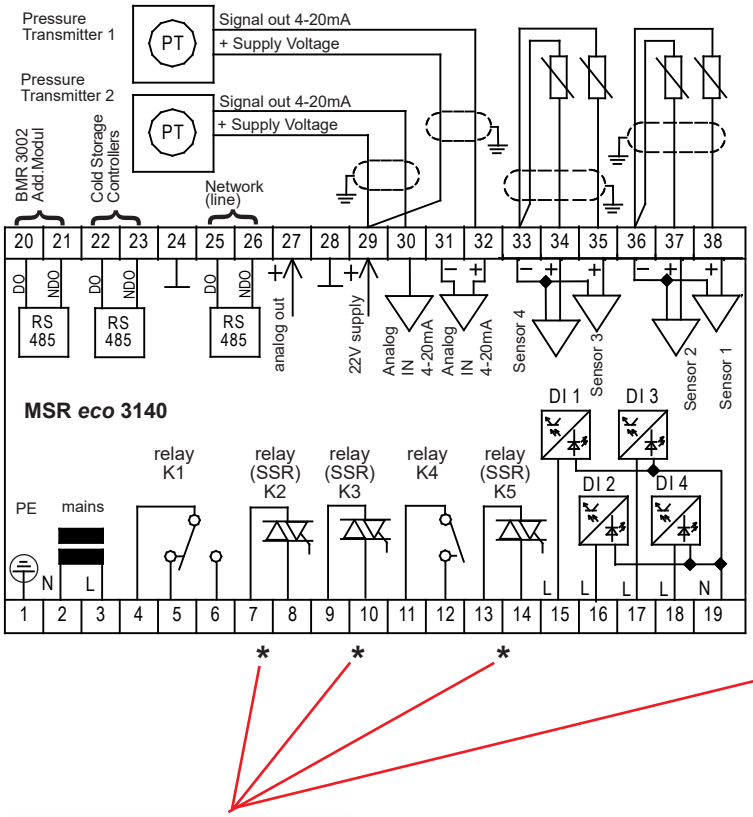



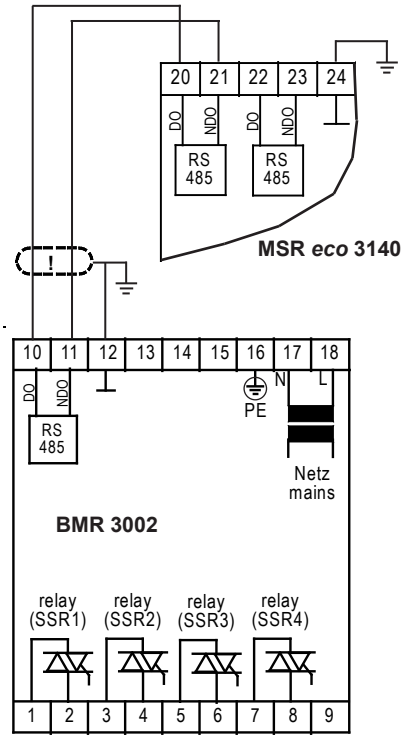

Note

Protective Earth

Earth

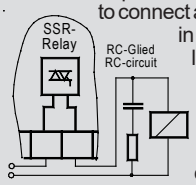
Dimensions in mm,
(in brackets = inches)




**Connection of the Expansion Module BMR 3002**

*When connecting an inductive load, such as relay, to the Solid State Relay output, it may be necessary to connect a snubber circuit in parallel to the load to protect the output from engaging unexpectedly. The snubber circuit must be properly adapted to the load in order to prevent the output from engaging permanently.




**When connecting the switch outputs, the overvoltage category must be respected !**

## CONNECTION INFORMATION & SAFETY INSTRUCTIONS

Notice

Product warranty does not cover damage caused by failure to comply with these operating instructions! Nor will ELREHA be held liable for any personal injury or damage to property caused by improper handling or failure to observe the savety instructions and recommendations contained in this or any other ELREHA supplied document related to this product! This manual contains additional safety instructions throughout the functional description. Please pay close attention to these instruction!

Danger

**TO AVOID RISK TO HEALTH OR POSSIBLE LOSS OF LIFE, DO NOT OPERATE IF:**

- The device has visible damage or doesn't work
- After a long storage period under unfavourable conditions
- The device is heavily soiled or wet
- When shipped under inadequate conditions
- Never use this product in equipment or systems that are intended to be used in applications or under circumstances that may affect human life. For applications requiring extremely high reliability, please contact the manufacturer before use.
- **This product may only be used in the applications described on page 1.**
- **Electrical installation and placement into service must be performed by qualified personnel only.**
- **To avoid the risk of Electrical Shock, all 'PE' terminals must be connected to ground. Without adequately grounding the unit, the internal noise filter will not work, which can cause faulty readings, or inaccurate displayed values to occur.**
- **To prevent electrical shock, the device may only be operated in a closed control cabinet or control box.**
- **Be sure to observe all local, state, or federal safety regulations in the location that the unit is installed.**

Caution

- Before installation, verify that the control specifications suit the application details. Damage may occur to the device when operated if the aforementioned conditions are not within the device specifications.
  Examples:
  - Supply voltage (printed on the type label).
  - Environmental limits for temperature/humidity.
  - Maximum current rating for the relays.
- Sensor/probe cables must be shielded. Don't install them in parallel to high-current cables. Shielding must be connected to PE at the end close to the controller.
  If not, inductive interferences may occur.
- Note related to wire lenghts connected to the device:
  Wire should be 0,5mm² at a minimum.
- Mounting the device in close proximity to power relays is NOT recommended. Strong electro-magnetic interference may cause the device to malfunction!
- All line interface wiring must meet the specified requirements.
- All temperature sensors connected to the device must be of the same type. The use of inconsistent sensor types will cause the unit not function properly.
- Type TF sensors are not designed for long term immersion in liquids. Any sensors of this type that are intended to be immersed in any liquid environment should use a dip fitting or suitable coating to protect the sensor against corrosion or malfunction.
  Environments with extreme temperature variations may cause damage to the sensor(s).

Notice

**Cleaning**
The use of a dry, lint-free cloth is sufficient to clean the product. Never use liquids or acidic fluids! Risk of damage!

Notice

**The following conditions will result in an „Assignment Error":**

- Exceeding 8HP stages or 8SP stages assigned.
- If the SP control sensor, HP control sensor, outdoor temperature sensor, or the suction tube temperature sensor are selected more than once.
- If no HP or SP control sensor has been selected.
- If relay functions 6-9 are assigned without the BMR being selected.
- If the SPcontrol sensor is selected without defining the SP stages or SP analogue output.
- If the HP control sensor is selected without defining the HP stages or HP analogue output.
- If the analogue output SP is selected without SP stages or the VVR being switched on.
- If no SP control sensor is selected but
  * SP stages
  * a suction tube sensor
  * SP analogue output
  * Digital Input for
    - feedback, load limitation, forced backrun, external suction pressure error
- If no HP control sensor is selected but
  * HP stages
  * outdoor temperature sensor
  * HP analogue output
  * Digital Input for high pressure error
- If a motor with 0 stages is followed by a motor with 1 or more stages.
- If anything other than 1 relay is selected for each SP and HP stage.
- If a relay is selected for SP/HP stages which are not required.
- If there are more feedback inputs selected than the number of motors.
- If the same input is selected more than once.
- Priorized motor is more than zero, but no SP stages are selected
- If the CRII mode is activated but
  * SP motor 1 has less than 2 stages
  * SP analogue output is selected
- If no SSR is assigned for CRII power stage.
- If at least 1 current input is selected but with no refrigerant defined.

**Functional Description**

**Input Signals of the Controller**
The input signals come from a 2-wire pressure transmitter with a 4-20 mA signal or one of the four (4) temperature probes. The source can be selected at **h21**...**h26** (Assignment page).
If a pressure transmitter is selected, additionally a refrigerant must be defined (at **h99**), which is necessary to calculate a temperature in °C.

**Calibration of Transmitter, Display Correction**
For each transmitter input must be defined, which pressure corresponds to the delivered 4-20 mA signals.

*4-20mA Input*
For this inputs, the matching pressure limits can be set by **h93**, **h94** (pressure transmitter input 1) and **h95**, **h96** (pressure transmitter input 2).

**Probe-/Transmitter Failures**
If a probe or transmitter failure is identified, all stages will switch ON with the selected delay.
After the alarm delay **r08**, the alarm relay (**ALA**) switches off if it is defined and available.

**Control of Compressors (Load)**
The MSR *eco* is able to control up to 8 (with extension module BMR 3002) single or multi-stage loads with up to four stages.
The kind and number of stages of the selected loads must be defined with the parameters **h51** up to **h58**. *Example:*

| *Compressor* | *Programming* | | | | *Relay selection free at* |
|---|---|---|---|---|---|
| | *h51* | *h52* | *h53* | *h54* | *h01 ... h05* |
| *4x single mach.* | *1* | *1* | *1* | *1* | |
| *2x dual stage* | *2* | *2* | *0* | *0* | |
| *1x 3-stage* | *3* | *0* | *0* | *0* | |
| *1x 3-stage and* | | | | | |
| *1x single mach.* | *3* | *1* | *0* | *0* | |

## Standard Stage Controller

Applications include:
- Standard compressors
- Compressors with CRII Control Stages / Power Control
- Condensation High Pressure Control

### Standard Compressors (SP)
The control setpoint is preset by **r01** (day) or **r02** (night). With **r03** a maximum value for this setpoint can be determined. The range of the hysteresis can be set using parameter **r04**, while **r05** determines the position above the set point, (above, below, or balanced).

Forerun (Stages ON)
If the actual value exceeds the switching point, then the forerun delay starts (**r41**...**r48**, individual for each stage). After this timer is run down, a stage will be switched ON and the individual delay time starts again.

Neutral Zone
If the actual value is located within the hysteresis range **r04/r05**, no stage will be activated or de-activated.

Backrun (Stages will switch OFF)
If the actual value falls below the tripping point, the backrun delay (**r51**...**r58**, individual for each stage) will be started. After this timer is run down, one stage will switch OFF and the individual delay time starts again.

**L21** shows the current state of the controller.

**Limits**
If the actual measured value falls to a critical level, the controller will react in two ways:
If the actual value falls below the Early Warning Alarm setpoint, parameter ‚**r07**', then at least 50% of the motors will switch off, once the set time of parameter ‚**r08**' is reached.
If the actual value falls below parameter ‚**r06**', then a forced Backrun will also be initiated, shutting down all motors.

**Base Load Change / Switching Frequency Opt.**
If a plant is laid out correctly, then not all fans and compressors should run continuously. When using normal stage controllers, some motors bear a heavy load while other hardly any load at all. To prevent this, the „Base Load Change" function can be utilized. (This function is also known as Stage Sequencing).

The „**r22**" parameter monitors the relative run times of the motors and will establish a consistent balance of approximately the same runtime for each motor. Different application scenarios can be selected. If a multistage unit is being used, only the runtime of the leading stage, (=motor on) will be calculated.
The control system records and stores the runtime and downtime of each motor to determine which motor can be switched on or off.

During „Backrun" operation, the motor with the longest run time will be switched off first. For the „Forerun" operation, the option exists to select the motor based on (**a**) shortest runtime, or (**b**) longest downtime.

If the pressure ratio in the plant does not change over a long period of time, no 'Forerun/Backrun' is active and a sequencing is impossible. The 'Delay Time (**r20**) starts a short backrun after the set time to enable a new motor selection.
It is also possible to select an optimization function, (**c**), for the switching frequency. If the optimization function is activated, during backrun, the controller switches off an additional stage on a compressor before a motor is switched off.

Thus, a more uniform utilization can be achieved without any particular motor carrying an unnecessary higher load.

With **r21** an Operational-Feedback Time can be set, which determines when a feedback signal must be recognized.

**Minimum Idle Time**
If a motor is switched off, it can be restarted after a Minimum Idle Time (**r71**...**r78**).

### Control of Compressors with CRII-System Power Control
This control method can be activated by the parameter "**h49**". With this method, only one of the compressors can be controlled.
Characteristic for this compressor type is the fact that the first stage generates no refrigeration capacity. The control of the refrigeration capacity is achieved by a fast on/off switching of the power stages.

**Control**
The control of the CRII-Valves is always inverted, that means if voltage appears at the corresponding output, the respective power stage is deactivated. The switching behaviour must be set separately for each power stage (inverted for CRII-power stages, **h61**...**h68**).

While a standstill, the CRII-Valves of the motor will be de-energized. With the start of the motor the switching outputs of the power stages will be utlized at the same time.
If the motor runs without power stages, an adjustable „switch-off" countdown "**r24**" will be initiated. Once the set amount of time is depleted, the motor will be switched off.
The controller performs regular sequence exchanges to ensure the CRII Valves switch an equal number of times.
The forerun/backrun behaviour is the same as at the standard application.

**Toggling of Power Stages**
If the power requirement develops in the way that a power stage switches repeatedly, the forerun/backrun delay times are not used, but the respective stage can be switched on/off immediately after "**r23**" (*Idle Time of the stage with 0% load*).

**Base Load Change with Switching Frequency Optimization at Backrun**
Due to the special requirements of the control depending on the basic stage, the Switching Frequency Optimization does not work and must be de-activated. So only the values "000, rr0, hr0" are allowed for the parameter "**r22**".
"rr1" and "hr1" are treated as "rr0" and "hr0" respectively.

### Condensation High Pressure Control (HP)
The Condensation High Pressure Control can be used with the analogue output as P-controller and/or with up to 8 relay stages. The relay stages can be assigned to up to 8 machines. For each stage a forerun delay time (**d41**...**d48**), a backrun delay time (**d51**...**d58**) and a setpoint (**d01**...**d08**) is available. Each motor can be set to manually/off/automatic (**d61**...**d68**) as well as a minimum idle time (**d71**...**d78**).
The HP function has the same base-load change function and switching optimization as the SP function. HP operates with an unified control hysteresis (**d12**) and hysteresis position (**d13**), relative to the active setpoint.
Depending in the number of stages that are on, the On/Off Switch position will be depended on the respective setpoint - hysteresis respectively the next setpoint + hysteresis. With it, the position of the hysteresis is taken into account. When using the analogue output P Controller, the proportional range is determined by the switch-on/off positions of the respective stage, depending on the number of running stages. If the configuration has only one or zero stages, the switch-on/off positions are represented by the first setpoint and the hysteresis of the stage controller only.

Two (2) limit values 'High pressure alarm limit' (**d17**) and 'High pressure pre alarm limit' (**d18**) generate error messages when exceeded.
If **d18** is exceeded, a load limitation of the SP machines will be activated to max 75% of the selected machines. If **d17** is exceeded, all SP motors will be switched off by fast backrun.

### Minimum Overheat Monitoring (SP)
In order to avoid insufficient overheat, and the potential for liquid refrigerant to flow into the suction tube, in systems where there may not be enough compressor power to create sufficient overheat, the „Minimum Superheat Threshold", parameter ‚**P10**' should be used. When the established minimum limit is not reached, an alarm will be triggered and the expansion valves of the cooling positions will be locked with special settings.

An additional temperature probe (Sut) would need to be installed at the suction tube. The suction gas overheat will be calculated using the measured temperature value at the suction tube and the suction pressure transmitter.

If ‚**P10**' is not reached, and ‚**P12**', („Superheat Warning Delay Timer") times out, then an „SSG Warning" alarm will be activated, and if needed, the cooling positions will be locked.

The backrun of the last running compressor stages will not be generated at the standard switch point, but the compound sucks up to the defined suction pressure pre-warning setpoint, and switches off without delay.
If the overheat has reached the defined limit value + hysteresis, the warnings and cooling position locks will be canceled.

If the overheat falls below a second limit value (Compound lock threshold minimal superheat, **P14**), which is smaller than the first limit value, after the settable delay time (**P15**) a fast backrun of the compound will be started and an alarm 'SSG fault' appears.

The delay for the switch-off starts earliest, after the alarm delay (**P12**, warn delay superheat) has been run down. The compound will be released if the second limit value has been reached again or exceeded.

**Machines with Feedback (SP, Motor 1-4)**
To detect the real state of a machine, the safety chain can be checked using a digital input, which has a feedback function, (**h31**...**h34**).
The controller switches a machine on and waits for a feedback signal while power is being applied to the digital input. If no feedback is detected, the machine will be switched off and a different machine will be selected.
‚**r21**' can be used to set the waiting time. If the switching of a machine is unsuccessful, a new starting attempt can be initiated after an automatically calculated time delay.

**Switching Behaviour of the Stage Relays**
The switching behaviour can be set to active (relay switches on) or passive (relay switches off) with the parameters (**h61**...**h68, SP)** and (**h81...h88, HP**). With the setting '1' the stage will be inverted, with '0' the stage switches normally.

**Load Limitation (SP)**
A load limitation can be established for each of the 4 digital inputs. This can be used during peak operation periods. Two inputs can be assigned their own maximum number (**r11**...**r12**) of running machines to provide more opportunity for energy savings.

**Operating Mode of the Motors (Manual/Auto)**
Each motor can be set to manual „ON/OFF" operation via ‚**r61-r68**' for **SP**, and ‚**d61-d68**' for **HP**.
Default „ON/OFF" operation is set to „Auto".

**Second Setpoint (Ex. Night Operation)**
Alternate setpoints can be established for energy savings. ‚**r01**' can be established as a day setpoint, and ‚**r02**' for night time. These can be alternated via internal timer settings ‚**P21**'/'**P22**', or any digital input ‚**h31**...**h34**', setting **dnl** or **dnh**.
If one of the DI inputs is configured for day/night switching and it has been activated,, the 2nd setpoint is active all time and cannot be changed by the internal timer.
If you want to use external switching only, please set '**P21**' and '**P22**' to „oFF".
For night operation, the high pressure controller has a night offset (**d10**) and additionally a night limitation (**d11**) for the analogue output.

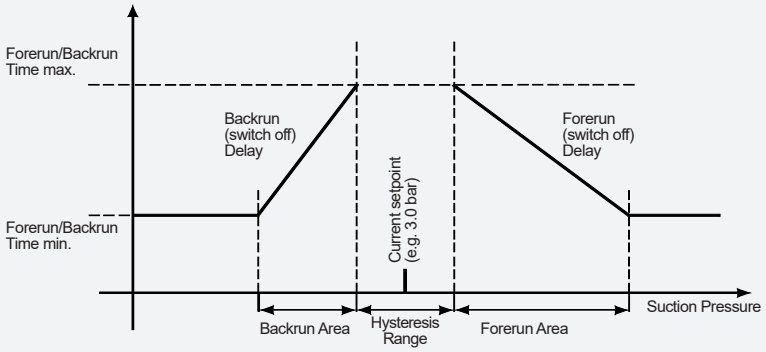
**SP-Optimized switching by variable Forerun/ Backrun Runtimes (VBR)**
If the difference between setpoint and actual value is small, the number of switching events should be reduced. Rapid changes in suction pressure require a quick delivery of power, which requires a quick reduction in the power reserve.
This can be achieved by variable switching delays depending on the actual offset from the setpoint.

This function, ‚**r40**', is located on the Setpoint Page.

The forerun/backrun times will be activated if the suction pressure goes beyond the hysteresis range. Above and below the hysteresis range are definable areas (*VBR Forerun Range **r41*** *respective VBR Backrun Range **r42***). If the suction pressure actual value moves within this areas, the forerun/backrun times will be varied within the ranges set by **r43** (*VBR Forerun/ Backrun Time min*) and **r44** (*VBR Forerun/ Backrun Time max*).

The bigger the difference between actual value and setpoint, the shorter the time delay. If the actual value leaves the set range, always the smallest set delay value will be used.
If the elapsed time increases the current calculated time, the function begins to switch.

For information **L34** (*Remaining time of Forerun/ Backrun*) shows the current calculated delay time.




## SDS - Suction Pressure Optimization by Setpoint Shifting with Cold Storage Controllers

**Cold Storage Controllers with EEx-Valves:**
When there is a reduced-power requirement, the setpoint of the compound should be higher than the set value. If there is a demand for power at a cold storage location, then it must ensured that the setpoint shifts down enough to allow the cold storage to reach its low setpoints.

Within a fixed time interval it will be checked if the opening rate of the EEx-Valves of the connected controllers have exceeded a specific limit (**r18**).
If the limit has been exceeded at least at one cooling position, then the setpoint of the compound is reduced by a certain value (**r19**).

If the actual value of the alarm probe exceeds the limit at even one of the cold storage locations, the setpoint must be lowered. The limit value is based on the switch-ON point + **d3**.

If the following conditions occur, then the setpoint of the compound can be raised by a set value, ‚**r19**', up to to the maximum setpoint defined by ‚**r03**':
1. At least one EEx-Valve of a cold storage location is below the limit ‚**r17**'.
2. No units are running above the upper limit.
3. No cold storage location has exceeded the safety limit.

**Cold Storage Controllers without EEx-Valves:**
In these cases, if the actual value of the alarm probe has exceeded the limit value, (switching point + **d03**), a reduction of the suction pressure setpoint will be needed. If the actual value is equal to or less than the limit value, the suction pressure setpoint can be raised.

The setpoint utilized by the compressor control is based on the adjusted setpoint, ‚**r01** or **r02**', and the offset values, which are generated by the optimization process. The entered setpoint is the lowest possible setpoint.

For each connected cold storage controller with EEx-Valves two parameters are available at which this influence can be set up:
**d02** ..... 0=off/no effect, 1=Limitation Temperature, 2=Limitation Temperature + Opening Degree
**d03** ..... Suction Pressure Shift - Temp. Offset

The current increase/decrease values, which have been produced by this function, can be read at **L31/L32**.

## Analogue Output

The analogue output can be used for regulation purposes or forwarding of the actual value. The signal is available as a DC-Voltage (010) or a DC-Current-Signal (420), set by "**h40**" (Assignment Page). Parameter "**L96**" (Actual Values Page) shows the current output signal as a %-part of the selected range. Parameter "**h41**" (Assignment Page) determines the behaviour of the output:

**Functions**

**h41** = "**- - -**" = Output signal fixed to 0V respective. 4mA
**h41** = "**100**" = Output signal fixed to 10V respective 20mA
**h41** = "**LPI**" = Output for PI control SP
**h41** = "**HP**" = Output for P control HP

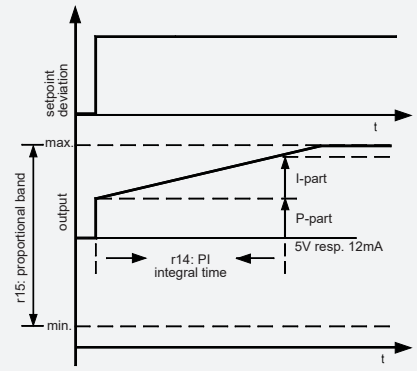
**Control with the Analogue Output (PI controller, SP)**
To adapt to the process, the following parameters can be set on the Setpoint Page. For working with extreme dead times, the controller allows an additional output delay:

**r13** = PI proportional band/range, located symmetrically around the setpoint
**r14** = PI integral time
**r15** = PI output delay
**r16** = PI step size

If a demand comes from the controller which causes the analogue output to rise or fall, then an Output Delay (**r15**, Setpoint Page) will be started. Within this time period, the output signal changes only by a set percentage rate (Step Size, **r16**).
If "**r16**" is set to "100%" and "**r15**" to "0", then the function is de-activated.

These parameters apply to all PI functions which can be realized by the analogue output.

### Control Characteristic (SP)




**Control with the Analogue Output (P-Controller, HP)**
To adapt to the process, the following parameters can be set on the Setpoint Page.

**d20** = P Analogue Output - Output Delay
**d21** = P Analogue Output - Step Size

This function can be used for triggering of a frequency converter.
The P-range results from the switching point of forerun and backrun. With an active P-controller only a forerun signal will be generated if the analogue output has reached its maximum value.
Inversely a backrun signal will be generated only, if the analogue output has fallen to 0%.
By the 'Night Limitation' setpoint (**d11**) the maximium value of the analogue output while night operation can be limited.

**Function Control**

**L96** (Actual Values Page) shows the current output signal as %-value of the selected range.

## Digital Inputs

With the Digital Inputs DI1...DI4 (for mains voltage) a number of tasks can be triggered which can be set on the Assignment Page (h).
If the input is not required, it should be switched off. Whether the digital input reacts on voltage, (Active), or on no voltage, (Passive), is dependent upon the selected task:

--- = The digital input is switched off
LC1 = Load Limitation 1 (r11) will be released (act)
LC2 = Load Limitat. 2 (r12) will be released (pass.)
FbL = Forced Backrun of the stages (passive)
FbH = Forced Backrun of the stages (active)
dnL = Night Operation, i. e. Night Setpoint (passive)
dnH = Night Operation, i. e. Night Setpoint (active)
LFL = external suction pressure fault (passive)
LFH = external suction pressure fault (active)
HFL = external high pressure fault (passive)
HFH = external high pressure fault (active)
r1 = Feedback signal 1 (from motor, active)
r2 = Feedback signal 2 (from motor, active)
r3 = Feedback signal 3 (from motor, active)
r4 = Feedback signal 4 (from motor, active)

## Relay Outputs

A specific function can be assigned to each relay output, including the SSR relay outputs, via ‚**h01**... **h09**'. Any of these relays can also be switched on manually.

--- = The relay output is switched OFF
on = The relay output is switched ON manually/ permanent

RLA = Warning/Alarm,
SUA = Warning Suction Overheat

L1 = The relay output switches SP-Stage 1
L2 = The relay output switches SP-Stage 2
L3 = The relay output switches SP-Stage 3
L4 = The relay output switches SP-Stage 4
L5 = The relay output switches SP-Stage 5
L6 = The relay output switches SP-Stage 6
L7 = The relay output switches SP-Stage 7
L8 = The relay output switches SP-Stage 8

H1 = The relay output switches HD-Stage 1
H2 = The relay output switches HD-Stage 2
H3 = The relay output switches HD-Stage 3
H4 = The relay output switches HD-Stage 4
H5 = The relay output switches HD-Stage 5
H6 = The relay output switches HD-Stage 6
H7 = The relay output switches HD-Stage 7
H8 = The relay output switches HD-Stage 8

## Real Time Clock / Time Synchronization / Night Mode

The built-in real time clock has a buffer for max. 10 days without mains voltage. Date and time can be set by "**P80**..."**P85**" (Mode Page).
By default, a GMT +01:00 is set (**P71** = 60 min.), which is standard for the Central European Area. If the product is used in other countries, this value can be changed.

**Summer/Winter Switch - Time Zones**
An automatic summer/winter switch "**P70** = EU" (Mode Page) considers the current EU-rules from 1996 (EU 96), but can also be switched off or set as needed.
The current setting, (Summer/Winter), can be viewed at ‚**P69**'.

**Variable Time Zones**
The function for Variable Time Zones can be activated by "**P70** = tun" and is adaptable by the parameters "**P72**..."**P79**".

**P72** *(SummerON Month)* (Fact.SettingMarch, 3rd)
The month of the beginning of the summertime
**P73** *(SummerON Day)* ...(Fact.Setting. 0, sunday)
The weekday of the beginning of the summert.
**P74** *(SummerON x-Day)* ...(Fact.S. 5, last sunday)
The x-th with "*SummerON Day*" preset day of the month
**P75** *(SummerON Hour)*..... (Fact.Set. 2, 2 o'clock)
The hour of the beginning of the summertime

**P76** *(SummerOFF Month)*(Fact.Set. October, 10th.)
The month of the end of the summertime
**P77** *(SummerOFF Day)* ...(Fact.Setting 0, sunday)
The weekday of the end of the summertime
**P78** *(SummerOFF x-Day)* ..(Fact.S. 5, last sunday)
The x-th with "*SommerOFF Day*" preset day of the month
**P79** *(SummerOFF Hour)*.. (Fact. Set. 3, 3 o'clock)
The hour of the end of the summertime

The shift to the summertime (= daylight saving time) respective winter time is set by the time setting which is active at this time.

**Time Synchronisation**
In the Mode Page the parameter **P20** determines if date and time will be transmitted to the connected Cold Storage Controllers.

**Second Setpoint Mode**
See page 12.

## Networking of controllers via *E-LINK*

The MSR *eco* can be networked together with other ELREHA control devices via an RS-485-2-wire databus, which enables up to 78 controllers to communicate. For communication, the *E-LINK* transmission protocol is used.
Each controller in a network has its individual address ('**P90**', Mode Page).

**!! Never use address 64 !!**

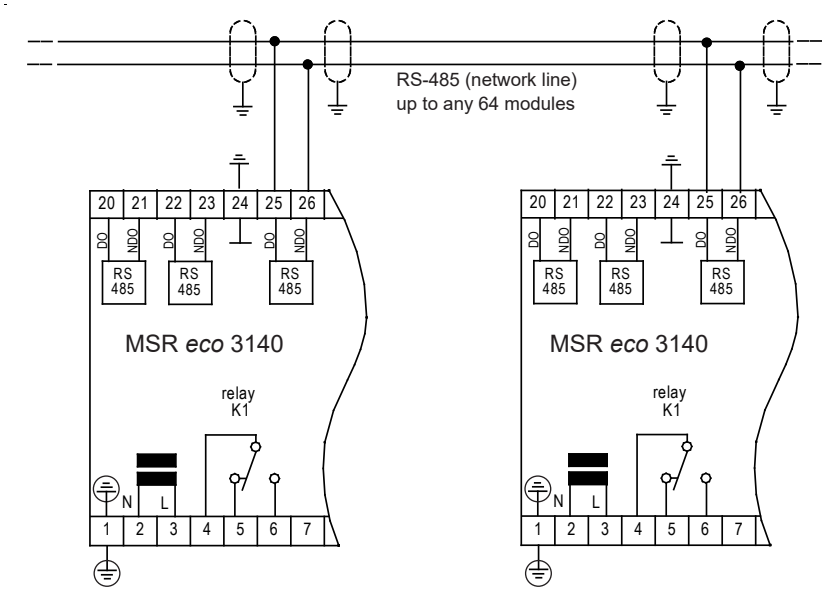
The data transmission rate is factory set to "96" (9600 Baud) and can also be set manually ("**P89**", Mode Page).
If the MSR *eco* is not connected to a network, these parameters are of no importance.

**Remote control at Frontend Systems**
The MSR *eco* controller can be operated remotely via interface when it is connected to Frontend Systems such as an SMZ.
In this case, the Frontend System shows the display contents and the keys of the frontend work as if they where the keys of the MSR *eco* .

**Configuration / Service via PC**
The controller can be linked to a PC via its RS-485 interface. By using the PC-software „Coolvision-MES", parameters can be changed, they can be saved to the hard disk (download) and can be sent to the controllers (upload).
To do this, the PC must be equipped with an RS-485 interface (internal card or a converter of the SSC-series).

## Wiring of data lines (Network Line)

The scheme beside shows briefly, how the dataline wiring of several controllers via the 'network/line' interface is made. At each controller, the shield has to be connected to the nearest ground terminal (PE). Also the ground connector of the controller (term.1) and terminal #24 must be connected to the nearest ground terminal.
This will assure good interference suppression, even for long datalines between the controllers.

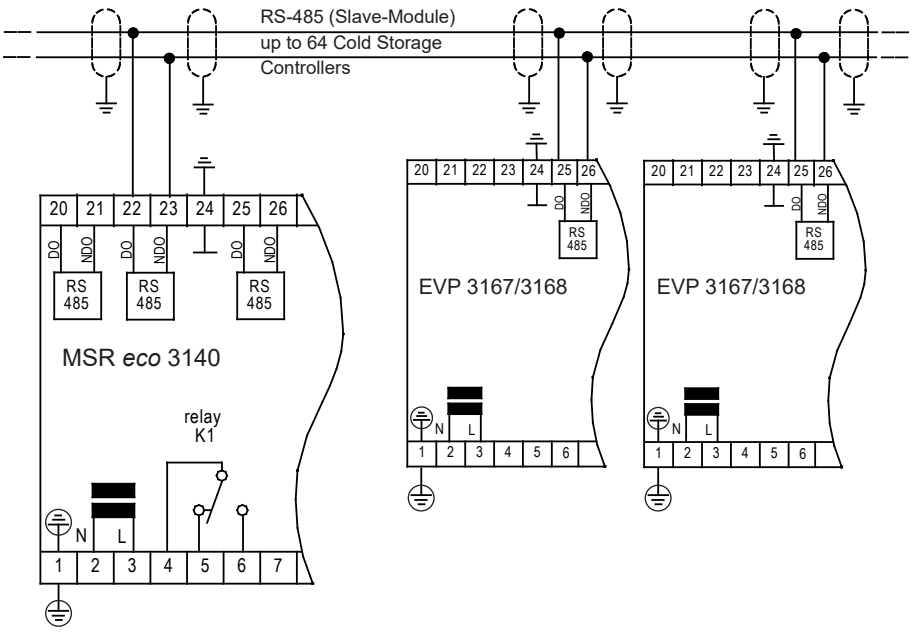



Note
Protective Earth
Earth

## Connection of Cold Storage Controllers as Slaves

The MSR *eco* can be used as a Central Unit for up to 64 Cold Storage Controllers of the series EVP and TKP. These can be connected via a separate network interface.
Shielding must be connected to the nearest ground terminal. Also the ground connector of the controller (term.1) and terminal #24 must be connected to the nearest ground terminal.

Each connected controller gets an individual address, which must be set at the controller and on the Address Page (A) under **A00...A63**.
Thus, data can be centralized and forwarded for optimization of the control functions.
On the ‚Address Page', the controller ‚type' must be selected via ‚**d01**' for each address, as well as the influence on the suction pressure shifting of the MSR *eco* via ‚**d02** and **d03**' for each address.




Note
Protective Earth
Earth

| **Configuration examples for up to 4 suction pressure stages**<br><br>This table gives you an overview of the parameters which must be set for specific plant structures. | | | Relay K1 (SPDT) | Relay K2 (SSR) | Relay K3 (SSR) | Relay K4 (SPST) | Relay K5 (SSR) | Use CRII System Power Control | Switching Output Stage 1 inverted | Switching Output Stage 2 inverted | Switching Output Stage 3 inverted | Switching Output Stage 4 inverted | Switching Output Stage 5 inverted | Number of stages compressor 1 | Number of stages compressor 2 | Number of stages compressor 3 | Number of stages compressor 4 | No. prior. compressor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Application No.** | **CRII Compressor** | **Other Compressor** | **h01** | **h02** | **h03** | **h04** | **h05** | **h49** | **h61** | **h62** | **h63** | **h64** | **h65** | **h51** | **h52** | **h53** | **h54** | **h50** |
| | | | | | | | | | | | | | | | | | | |
| **CR II Compressor** | | | | | | | | | | | | | | | | | | |
| 1 | 2-cyl. | -- | Alarm | -- | -- | Motor 1 CR (St.1) | CRII valve 1.1 (St.2) | 1 | 0 | 1 | 0 | 0 | | 2 | 0 | 0 | 0 | 1 |
| 2 | 2-cyl. | 1x1 stages | Alarm | -- | Motor 2 (Stage3) | Motor 1 CR (St.1) | CRII valve 1.1 (St.2) | 1 | 0 | 1 | 0 | 0 | | 2 | 1 | 0 | 0 | 1 |
| 3 | 2-cyl. | 2x1 stages | Alarm | Motor 3 (Stage 4) | Motor 2 (Stage3) | Motor 1 CR (St.1) | CRII valve 1.1 (St.2) | 1 | 0 | 1 | 0 | 0 | | 2 | 1 | 1 | 0 | 1 |
| 4 | 2-cyl. | 1x2 stages | Alarm | Motor 2 (Stage 4) | MV 2.1 (Stage3) | Motor 1 CR (St.1) | CRII valve 1.1 (St.2) | 1 | 0 | 1 | 0 | 0 | | 2 | 2 | 0 | 0 | 1 |
| 5 | 4-cyl. | -- | Alarm | -- | CRII valve 1.2 (St. 3) | Motor 1 CR (St.1) | CRII valve 1.1 (St.2) | 1 | 0 | 1 | 1 | 0 | | 3 | 0 | 0 | 0 | 1 |
| 6 | 4-cyl. | 1x1 stages | Alarm | Motor 2 (Stage 4) | CRII valve 1.2 (St. 3) | Motor 1 CR (St.1) | CRII valve 1.1 (St.2) | 1 | 0 | 1 | 1 | 0 | | 3 | 1 | 0 | 0 | 1 |
| 7 | 6-cyl. | -- | Alarm | CRII valve 1.3 (St.4) | CRII valve 1.2 (St. 3) | Motor 1 CR (St.1) | CRII valve 1.1 (St.2) | 1 | 0 | 1 | 1 | 1 | | 4 | 0 | 0 | 0 | 1 |
| **Conv. Compressor** | | | | | | | | | | | | | | | | | | |
| 20 | -- | 2x1 stages | Alarm | Motor 1 (Stage1) | Motor 2 (Stage 2) | -- | -- | 0 | 0 | 0 | 0 | 0 | | 1 | 1 | 0 | 0 | 0 |
| 21 | -- | 3x1 stages | Alarm | Motor 1 (Stage1) | Motor 2 (Stage 2) | Motor 3 (Stage 3) | -- | 0 | 0 | 0 | 0 | 0 | | 1 | 1 | 1 | 0 | 0 |
| 22 | -- | 4x1 stages | Alarm | Motor 1 (Stage1) | Motor 2 (Stage 2) | Motor 3 (Stage 3) | Motor 4 (Stage 4) | 0 | 0 | 0 | 0 | 0 | | 1 | 1 | 1 | 1 | 0 |
| 23 | -- | 1x2 stages | Alarm | Motor 1 (Stage1) | MV 1.1 (Stage 2) | -- | -- | 0 | 0 | 1 | 0 | 0 | | 2 | 0 | 0 | 0 | 0 |
| 24 | -- | 1x2 stages + 1x1 stage | Alarm | Motor 1 (Stage1) | MV 1.1 (Stage 2) | Motor 2 (Stage 3) | -- | 0 | 0 | 1 | 0 | 0 | | 2 | 1 | 0 | 0 | 0 |
| 25 | -- | 1x2 stages + 2x1 stages | Alarm | Motor 1 (Stage1) | MV 1.1 (Stage 2) | Motor 2 (Stage 3) | Motor 3 (Stage 4) | 0 | 0 | 1 | 0 | 0 | | 2 | 1 | 1 | 0 | 0 |
| 26 | -- | 1x1 stages + 1x2 stages | Alarm | Motor 1 (Stage1) | Motor 2 (Stage 2) | MV 2.1 (Stage 3) | -- | 0 | 0 | 0 | 1 | 0 | | 1 | 2 | 0 | 0 | 0 |
| 27 | -- | 1x1 stages + 1x3 stages | Alarm | Motor 1 (Stage1) | Motor 2 (Stage 2) | MV 2.1 (Stage 3) | MV 2.2 (Stage 4) | 0 | 0 | 0 | 1 | 1 | | 1 | 3 | 0 | 0 | 0 |
| 28 | -- | 2x2 stages | Alarm | Motor 1 (Stage1) | MV 1.1 (Stage 2) | Motor 2 (Stage 3) | MV 2.2 (Stage 4) | 0 | 0 | 1 | 0 | 1 | | 2 | 2 | 0 | 0 | 0 |
| 29 | -- | 1x3 stages | Alarm | Motor 1 (Stage1) | MV 1.1 (Stage 2) | MV 1.2 (Stage 3) | -- | 0 | 0 | 1 | 1 | 0 | | 0 | 3 | 0 | 0 | 0 |
| 30 | -- | 1x3 stages + 1x1 stages | Alarm | Motor 1 (Stage1) | MV 1.1 (Stage 2) | MV 1.2 (Stage 3) | Motor 2 (Stage 4) | 0 | 0 | 1 | 1 | 0 | | 3 | 1 | 0 | 0 | 0 |
| 31 | -- | 1x4 stages | Alarm | Motor 1 (Stage1) | MV 1.1 (Stage2) | MV 1.2 (Stage3) | MV 1.3 (Stage 4) | 0 | 0 | 1 | 1 | 1 | | 4 | 0 | 0 | 0 | 0 |

## *EC Declaration of Conformity*

CE

*For the device **MSReco 3140** we state the following:*
*When operated in accordance with the technical manual, the criteria have been met that are outlined in the EMC Directive **2014/30/EC** and the Low Voltage Directive **2014/35/EC**. This declaration is valid for those products covered by the technical manual which itself is part of the declaration.*

*Following standards were consulted for the conformity testing to meet the requirements of EMC and Low Voltage Guidelines:*

**EN 55011:2016+A1:2017, EN 61010-1:2010, EN 61326-1:2013** **CE marking of year: 2018**

*This statement is made for the manufacturer / importer*

**ELREHA Elektronische Regelungen GmbH**
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(*Name / Address*)

*by:*

**Werner Roemer, *Technical Director***

**Hockenheim** .....**2018-06-26**.....

*City* *Date* *Signature*

This manual, which is part of the product, has been set up with care and our best knowledge, but mistakes are still possible. Technical details can be changed without notice, especially the software. Please note that the described functions are only valid for units containing the software with the version-number shown on page 1 of this manual. Units with an other version number may work a little bit different.