

# Overview of all bases for breeding values

## ▪ Introduction

This document describes the situation since April 2020, which bases are used, which base differences do exist and which animals are published on which base.

## ▪ Definition of the four bases

On which base the breeding values of an animal are presented depends on the breed and colour of the animal. Starting April 2015 the name Black & White base has been replaced by Milk goal Black. The Red & White base is now called Milk goal Red, and local base was changed to Dual Purpose. Besides that, a new base has been added to the existing bases, this is the Belgian Blue base.

For traits like milk production, somatic cell count, conformation, milking speed, temperament, fertility, calving ease, beef traits, udder health, urea, persistency, rate of maturity, automatic milking traits, calf survival, claw health and longevity, breeding values are estimated simultaneously for cows and bulls using an animal model. For breeding values estimated with an animal model the following base definitions are used:

### *Milk goal Black (Z)*

Herdbook-registered cows born in 2015 with at least 87.5% HF-blood and up to 12.5% FH-blood and hair colour black pied, with at least one observation in the genetic evaluation.

### *Milk goal Red (R)*

Herdbook-registered cows born in 2015 with at least 87.5% HF-blood and up to 12.5% MRY-blood and hair colour red pied, with at least one observation in the genetic evaluation.

### *Dual purpose (D)*

Herdbook-registered cows born in 2015 with at least 75% MRIJ-blood and 25% or less HF blood, with at least one observation in the genetic evaluation.

### *Belgian Blue (B)*

Herdbook-registered cows born in 2015 with at least 87.5% Belgian Blue-blood, with at least one observation in the genetic evaluation

An observation in the genetic evaluation can be:

|                     |  |
|---------------------|--|
| Milk production:    | test day record  |
| Somatic cell count: | test day record  |
| Urea:               | test day record  |
| Conformation:       | classification   |
| Milking speed:      | a score  |
| Temperament:        | a score  |
| Claw health:        | a score for a claw disorder                            |
| Fertility:          | an observation for one of the fertility traits         |
| Beef index:         | slaughter record                                       |
| Udder health:       | an observation for one of the udder health traits      |
| Automatic Milking:  | an observation for one of the automatic milking traits |
| Calf survival:      | an observation   |

The Belgian Blue base is only determined by Belgian Blue animals for fertility, calving ease traits and beef index. For all other traits, the base formed by the Dual purpose animals is used as reference.

The animals forming the Milk goal Black base determine the standard deviation for all bases, for all traits where cows determine the base and the breeding value of a trait is expressed as a relative breeding value. The advantage is that only a difference in level exists between bases and no difference in standard deviation.

**Table 1.** Overview of bases used for different traits

| Trait                 | Cowbase Milk goal Black | Cowbase Milk goal Red | Cowbase Dual purpose | Cowbase Belgian Blue |
|-----------------------|-------------------------|-----------------------|----------------------|----------------------|
| NVI                   | *                       | *                     | *                    |                      |
| Milk production       | *                       | *                     | *                    |                      |
| Conformation          | *                       | *                     | *                    |                      |
| Longevity             | *                       | *                     | *                    |                      |
| Fertility             | *                       | *                     | *                    | *                    |
| SCS                   | *                       | *                     | *                    |                      |
| Udder health          | *                       | *                     | *                    |                      |
| Calving ease          | *                       | *                     | *                    | *                    |
| Vitality              | *                       | *                     | *                    |                      |
| Temperament           | *                       | *                     | *                    |                      |
| Milking speed         | *                       | *                     | *                    |                      |
| Body weight           | *                       | *                     | *                    |                      |
| Beef index            | *                       | *                     | *                    | *                    |
| Urea                  | *                       | *                     | *                    |                      |
| Claw health           | *                       | *                     | *                    |                      |
| Kalvervitaliteit      | *                       | *                     | *                    |                      |
| AMS kenmerken         | *                       | *                     | *                    |                      |
| Levensproductie-index | *                       | *                     | *                    |                      |
| Voeropname            | *                       | *                     | *                    |                      |

## ▪ Base differences per April 2020

For all traits for which breeding values are published, differences in bases exist. In Table 2 the differences between the four bases are shown.

**Note.** The NVI is not in this table. This is because of the differences in the formulas used to calculate these traits between different bases. The differences are therefore only to be calculated using the underlying formulas of the traits per base (see relevant E-chapter).

**Table 2.** Base differences between Milk goal Black (B), Milk goal Red (R), Dual purpose (D) and Belgian blue (B).

| Trait                    | kind base <sup>(1)</sup> | Base difference <sup>(2)</sup> |       |       |       |       |      |
|--------------------------|--------------------------|--------------------------------|-------|-------|-------|-------|------|
|                          |                          | Z=>R                           | Z=>D  | Z=>B  | R=>D  | R=>B  | D=>B |
| Milk production          |                          |                                |       |       |       |       |      |
| Overall                  |                          |                                |       |       |       |       |      |
| Kg milk                  | C                        | +573                           | +1887 | +1887 | +1314 | +1314 | 0    |
| Kg fat                   | C                        | +8                             | +62   | +62   | +54   | +54   | 0    |
| Kg protein               | C                        | +12                            | +49   | +49   | +37   | +37   | 0    |
| Kg lactose               | C                        | +26                            | +79   | +79   | +53   | +53   | 0    |
| % fat <sup>(4)</sup>     | C                        | -0,20                          | -0,27 | -0,27 | -0,07 | -0,07 | 0    |
| % protein <sup>(4)</sup> | C                        | -0,10                          | -0,25 | -0,25 | -0,15 | -0,15 | 0    |

|                          |   |       |       |       |       |       |   |
|--------------------------|---|-------|-------|-------|-------|-------|---|
| % lactose <sup>(4)</sup> | C | +0,01 | -0,09 | -0,09 | -0,10 | -0,10 | 0 |
| INET <sup>(4)</sup>      | C | +72   | +354  | +354  | +280  | +280  | 0 |
| Lactation 1              |   |       |       |       |       |       |   |
| Kg milk                  | C | +544  | +1631 | +1631 | +1088 | +1088 | 0 |
| Kg fat                   | C | +9    | +49   | +49   | +39   | +39   | 0 |
| Kg protein               | C | +12   | +41   | +41   | +29   | +29   | 0 |
| Kg lactose               | C | +25   | +68   | +68   | +44   | +44   | 0 |
| % fat <sup>(4)</sup>     | C | -0,20 | -0,33 | -0,33 | -0,15 | -0,15 | 0 |
| % protein <sup>(4)</sup> | C | -0,10 | -0,26 | -0,26 | -0,16 | -0,16 | 0 |
| % lactose <sup>(4)</sup> | C | -0,00 | -0,12 | -0,12 | -0,10 | -0,10 | 0 |
| INET <sup>(4)</sup>      | C | +76   | +291  | +291  | +214  | +214  | 0 |
| Lactation 2              |   |       |       |       |       |       |   |
| Kg milk                  | C | +631  | +2023 | +2023 | +1392 | +1392 | 0 |
| Kg fat                   | C | +9    | +66   | +66   | +56   | +56   | 0 |
| Kg protein               | C | +13   | +54   | +54   | +41   | +41   | 0 |
| Kg lactose               | C | +29   | +85   | +85   | +56   | +56   | 0 |
| % fat <sup>(4)</sup>     | C | -0,22 | -0,29 | -0,29 | -0,08 | -0,08 | 0 |
| % protein <sup>(4)</sup> | C | -0,11 | -0,25 | -0,25 | -0,14 | -0,14 | 0 |
| % lactose <sup>(4)</sup> | C | +0,00 | -0,10 | -0,10 | -0,11 | -0,11 | 0 |
| INET <sup>(4)</sup>      | C | +81   | +386  | +386  | +303  | +303  | 0 |
| Lactation 3              |   |       |       |       |       |       |   |
| Kg milk                  | C | +609  | +2070 | +2070 | +1461 | +1461 | 0 |
| Kg fat                   | C | +8    | +70   | +70   | +62   | +62   | 0 |
| Kg protein               | C | +12   | +54   | +54   | +42   | +42   | 0 |
| Kg lactose               | C | +28   | +87   | +87   | +59   | +59   | 0 |
| % fat <sup>(4)</sup>     | C | -0,20 | -0,24 | -0,24 | -0,03 | -0,03 | 0 |
| % protein <sup>(4)</sup> | C | -0,10 | -0,25 | -0,25 | -0,14 | -0,14 | 0 |
| % lactose <sup>(4)</sup> | C | +0,00 | -0,08 | -0,08 | -0,09 | -0,09 | 0 |
| INET <sup>(4)</sup>      | C | +74   | +395  | +395  | +320  | +320  | 0 |
| Lactation 4              |   |       |       |       |       |       |   |
| Kg milk                  | C | +542  | +1963 | +1963 | +1421 | +1421 | 0 |
| Kg fat                   | C | +6    | +69   | +69   | +63   | +63   | 0 |
| Kg protein               | C | +10   | +50   | +50   | +40   | +40   | 0 |
| Kg lactose               | C | +25   | +83   | +83   | +58   | +58   | 0 |
| % fat <sup>(4)</sup>     | C | -0,19 | -0,19 | -0,19 | -0,00 | -0,00 | 0 |
| % protein <sup>(4)</sup> | C | -0,09 | -0,24 | -0,24 | -0,14 | -0,14 | 0 |
| % lactose <sup>(4)</sup> | C | +0,01 | -0,07 | -0,07 | -0,08 | -0,08 | 0 |
| INET <sup>(4)</sup>      | C | +61   | +375  | +375  | +314  | +314  | 0 |
| Lactation 5              |   |       |       |       |       |       |   |
| Kg milk                  | C | +486  | +1897 | +1897 | +1412 | +1412 | 0 |
| Kg fat                   | C | +5    | +69   | +69   | +64   | +64   | 0 |
| Kg protein               | C | +8    | +47   | +47   | +39   | +39   | 0 |
| Kg lactose               | C | +23   | +80   | +80   | +57   | +57   | 0 |
| % fat <sup>(4)</sup>     | C | -0,17 | -0,15 | -0,15 | +0,03 | +0,03 | 0 |
| % protein <sup>(4)</sup> | C | -0,09 | -0,24 | -0,24 | -0,14 | -0,14 | 0 |
| % lactose <sup>(4)</sup> | C | +0,01 | -0,06 | -0,06 | -0,08 | -0,08 | 0 |
| INET <sup>(4)</sup>      | C | +50   | +362  | +362  | +311  | +311  | 0 |
| Maturity                 | C | -1    | +1    | +1    | +2    | +2    | 0 |
| Persistency              | C | +2    | +1    | +1    | -2    | -2    | 0 |
| Persistency, lactation 1 | C | +2    | +1    | +1    | -1    | -1    | 0 |
| Persistency, lactation 2 | C | +2    | +0    | +0    | -2    | -2    | 0 |
| Persistency, lactation 3 | C | +3    | +0    | +0    | -2    | -2    | 0 |
| Persistency, lactation 4 | C | +3    | +1    | +1    | -2    | -2    | 0 |
| Persistency, lactation 5 | C | +3    | +1    | +1    | -2    | -2    | 0 |
| <b>Conformation</b>      |   |       |       |       |       |       |   |
| Stature                  | C | 2     | 12    | 12    | 10    | 10    | 0 |
| Chest width              | C | 1     | -7    | -7    | -8    | -8    | 0 |
| Body depth               | C | 2     | 10    | 10    | 8     | 8     | 0 |
| Angularity               | C | 3     | 15    | 15    | 12    | 12    | 0 |

|   |   |    |     |     |     |     |     |
|---|---|----|-----|-----|-----|-----|-----|
| Condition score                               | C | -1 | -11 | -11 | -10 | -10 | 0   |
| Rump angle                                    | C | -1 | -8  | -8  | -7  | -7  | 0   |
| Rump width                                    | C | 1  | 0   | 0   | -1  | -1  | 0   |
| Rear legs rear view                           | C | 0  | 1   | 1   | 1   | 1   | 0   |
| Rear legs side view                           | C | 0  | 1   | 1   | 1   | 1   | 0   |
| Foot angle                                    | C | 0  | -1  | -1  | -1  | -1  | 0   |
| Front feet orientation                        | C | -1 | -6  | -6  | -5  | -5  | 0   |
| Locomotion                                    | C | 0  | 3   | 3   | 3   | 3   | 0   |
| Fore udder attachment                         | C | 0  | 10  | 10  | 10  | 10  | 0   |
| Front teat placement                          | C | 1  | 10  | 10  | 9   | 9   | 0   |
| Teat length                                   | C | 1  | -1  | -1  | -2  | -2  | 0   |
| Udder depth                                   | C | 1  | 10  | 10  | 9   | 9   | 0   |
| Rear udder height                             | C | 2  | 16  | 16  | 14  | 14  | 0   |
| Central ligament                              | C | 2  | 11  | 11  | 9   | 9   | 0   |
| Rear teat placement                           | C | 1  | 9   | 9   | 8   | 8   | 0   |
| Frame   | C | 1  | -1  | -1  | -2  | -2  | 0   |
| Dairy strength                                | C | 1  | -9  | -9  | -10 | -10 | 0   |
| Udder   | C | 1  | 19  | 19  | 9   | 9   | 0   |
| Feet and legs                                 | C | 0  | 3   | 3   | 3   | 3   | 0   |
| Muscularity <sup>(3)</sup>                    | C | 0  | 0   | 0   | 0   | 0   | 0   |
| Overall conformation                          | C | 1  | 6   | 6   | 1   | 1   | 0   |
| Longevity                                     |   |    |     |     |     |     |     |
| Longevity                                     | C | 60 | 400 | 400 | 340 | 340 | 0   |
| Calving traits                                |   |    |     |     |     |     |     |
| Overall index                                 |   |    |     |     |     |     |     |
| Calving index                                 | C | 0  | 0   | 5   | 0   | 5   | 5   |
| Calving ease                                  | C | 1  | 1   | 64  | 0   | 63  | 63  |
| Maternal calving ease                         | C | 1  | 3   | -6  | 2   | -7  | -9  |
| Gestation length                              | C | -1 | -1  | -5  | 0   | -4  | -4  |
| Gestation length maternal                     | C | 1  | 0   | 7   | -1  | 6   | 7   |
| Birth weight                                  | C | -1 | 1   | -66 | 2   | -65 | -67 |
| Birth weight maternal                         | C | 0  | 1   | 22  | 1   | 22  | 21  |
| Vitality                                      | C | -1 | 4   | 4   | 5   | 5   | 0   |
| Vitality maternal                             | C | 1  | -3  | -3  | -4  | -4  | 0   |
| Heifers – parity =1                           |   |    |     |     |     |     |     |
| Calving ease                                  | C | 1  | 1   | 64  | 0   | 63  | 63  |
| Maternal calving ease                         | C | 1  | 3   | -6  | 1   | -7  | -9  |
| Gestation length                              | C | -1 | -1  | -5  | 0   | -4  | -4  |
| Gestation length maternal                     | C | 1  | 0   | 7   | -1  | 6   | 7   |
| Birth weight                                  | C | -1 | 1   | -66 | 2   | -65 | -67 |
| Birth weight maternal                         | C | 0  | 1   | 22  | 0   | 22  | 21  |
| Vitality                                      | C | -1 | 4   | 4   | 5   | 5   | 0   |
| Vitality maternal                             | C | 1  | -3  | -3  | -4  | -4  | 0   |
| Cows – parity >1                              |   |    |     |     |     |     |     |
| Calving ease                                  | C | 0  | 0   | 62  | 0   | 62  | 62  |
| Maternal calving ease                         | C | 1  | 2   | 55  | 1   | 54  | 53  |
| Gestation length                              | C | -1 | 0   | -8  | 1   | -7  | -8  |
| Gestation length maternal                     | C | 1  | 0   | 7   | -1  | 6   | 7   |
| Birth weight                                  | C | -1 | -1  | -49 | 0   | -48 | -48 |
| Birth weight maternal                         | C | 0  | 0   | 6   | 0   | -6  | -6  |
| Vitality                                      | C | 0  | -1  | -1  | -1  | -1  | 0   |
| Vitality maternal                             | C | 0  | -3  | -3  | -3  | -3  | 0   |
| Fertility                                     |   |    |     |     |     |     |     |
| Overall                                       |   |    |     |     |     |     |     |
| FERT index <sup>(4)</sup>                     | C | -1 | -5  | 2   | -4  | 3   | 7   |
| Non return                                    | C | -2 | -5  | 0   | -3  | 2   | 5   |
| Interval calving-1 <sup>th</sup> insemination | C | 0  | -3  | -1  | -3  | -1  | 2   |
| Calving interval                              | C | 0  | -5  | 1   | -5  | 1   | 6   |
| Interval 1 <sup>st</sup> -last insemination   | C | 0  | -4  | 3   | -4  | 3   | 7   |

|   |   |      |      |      |      |      |     |
|---|---|------|------|------|------|------|-----|
| Open days                                     | C | 0    | -4   | 2    | -4   | 2    | 6   |
| Conception rate                               | C | -1   | -3   | 4    | -2   | 5    | 7   |
| Conception rate heifers                       | C | -1   | 1    | 7    | 2    | 8    | 6   |
| Age at 1st insemination heifers               | C | 1    | 10   | 40   | 9    | 39   | 30  |
| Lactation 1                                   |   |      |      |      |      |      |     |
| Non return                                    | C | -1   | -4   | 0    | -3   | 1    | 4   |
| Interval calving-1 <sup>th</sup> insemination | C | 0    | -3   | 2    | -3   | 2    | 5   |
| Calving interval                              | C | 0    | -5   | 3    | -5   | 3    | 8   |
| Interval 1 <sup>st</sup> -last insemination   | C | 0    | -4   | 3    | -4   | 3    | 7   |
| Conception rate                               | C | -1   | -2   | 4    | -1   | 5    | 6   |
| Lactation 2                                   |   |      |      |      |      |      |     |
| Non return                                    | C | -2   | -5   | 1    | -3   | 3    | 6   |
| Interval calving-1 <sup>th</sup> insemination | C | 0    | -3   | -1   | -3   | -1   | 2   |
| Calving interval                              | C | 0    | -5   | 0    | -5   | 0    | 5   |
| Interval 1 <sup>st</sup> -last insemination   | C | -1   | -5   | 2    | -4   | 3    | 7   |
| Conception rate                               | C | -1   | -3   | 4    | -2   | 5    | 7   |
| Lactation 3                                   |   |      |      |      |      |      |     |
| Non return                                    | C | -2   | -5   | 1    | -3   | 3    | 6   |
| Interval calving-1 <sup>th</sup> insemination | C | 0    | -3   | -3   | -3   | -3   | 0   |
| Calving interval                              | C | 0    | -5   | 1    | -5   | 1    | 6   |
| Interval 1 <sup>st</sup> -last insemination   | C | -1   | -4   | 3    | -4   | 3    | 7   |
| Conception rate                               | C | -1   | -3   | 5    | -2   | 6    | 8   |
| Somatic cell count                            |   |      |      |      |      |      |     |
| Somatic cell count                            | C | 0    | -1   | -1   | -1   | -1   | 0   |
| Somatic cell count, lactation 1               | C | 0    | 0    | 0    | 0    | 0    | 0   |
| Somatic cell count, lactation 2               | C | 0    | -1   | -1   | -1   | -1   | 0   |
| Somatic cell count, lactation 3               | C | +1   | 0    | 0    | -1   | -1   | 0   |
| Somatic cell count, lactation 4               | C | +1   | 0    | 0    | -1   | -1   | 0   |
| Somatic cell count, lactation 5               | C | +1   | -1   | -1   | -2   | -2   | 0   |
| Udder health                                  |   |      |      |      |      |      |     |
| Udder health <sup>(4)</sup>                   | C | 1    | 3    | 3    | 2    | 2    | 0   |
| Clinical mastitis                             | C | 0    | 3    | 3    | 3    | 3    | 0   |
| Sub-clinical mastitis                         | C | -1   | -1   | -1   | 0    | 0    | 0   |
| Milking speed                                 |   |      |      |      |      |      |     |
| Milking speed                                 | C | 0    | -2   | -2   | -2   | -2   | 0   |
| Temperament                                   |   |      |      |      |      |      |     |
| Temperament                                   | C | 0    | 0    | 0    | 0    | 0    | 0   |
| Beef index                                    |   |      |      |      |      |      |     |
| Beef index                                    | C | 0    | -7   | -33  | -7   | -33  | -26 |
| Fleshiness cows                               | C | -3   | -21  | -119 | -18  | -116 | -98 |
| Fat covering cows                             | C | 3    | 7    | -2   | 4    | -5   | -9  |
| Carcass weight cows                           | C | 0    | -4   | -53  | -4   | -53  | -49 |
| Fleshiness veal calves                        | C | -1   | -16  | -65  | -15  | -64  | -49 |
| Fat covering veal calves                      | C | 1    | 3    | -11  | 2    | -12  | -14 |
| Growth veal calves                            | C | 0    | -4   | -14  | -4   | -14  | -10 |
| Meat colour veal calves                       | C | 0    | 1    | -4   | 1    | -4   | -5  |
| Fleshiness beef bulls                         | C | -1   | -15  | -70  | -14  | -69  | -55 |
| Fat covering beef bulls                       | C | 1    | 1    | -15  | 0    | -16  | -16 |
| Growth beef bulls                             | C | 0    | -5   | -30  | -5   | -30  | -25 |
| Body weight                                   |   |      |      |      |      |      |     |
| Body weight                                   | C | 1    | -2   | -2   | -3   | -3   | 0   |
| Urea  |   |      |      |      |      |      |     |
| Urea  | C | -0.2 | -0.6 | -0.6 | -0.4 | -0.4 | 0   |
| Urea, lactation 1                             | C | -0.2 | -0.7 | -0.7 | -0.5 | -0.5 | 0   |
| Urea, lactation 2                             | C | -0.2 | -0.6 | -0.6 | -0.4 | -0.4 | 0   |
| Urea, lactation 3                             | C | -0.2 | -0.6 | -0.6 | -0.4 | -0.4 | 0   |
| Urea, lactation 4                             | C | -0.2 | -0.6 | -0.6 | -0.3 | -0.3 | 0   |
| Urea, lactation 5                             | C | -0.2 | -0.5 | -0.5 | -0.3 | -0.3 | 0   |
| Calf survival                                 |   |      |      |      |      |      |     |

|  |   |       |       |       |       |       |   |
|--|---|-------|-------|-------|-------|-------|---|
| Calf survival 3-365                            | C | 0     | 2     | 2     | 2     | 2     | 0 |
| Calf survival 3-14                             | C | -1    | -1    | -1    | 0     | 0     | 0 |
| Calf survival 15-180                           | C | 0     | 2     | 2     | 2     | 2     | 0 |
| Automatic milking                              |   |       |       |       |       |       |   |
| Efficiency                                     | C | 1     | 2     | 2     | 1     | 1     | 0 |
| Milking interval                               | C | 0     | 6     | 6     | 6     | 6     | 0 |
| Habituation of heifers                         | C | -1    | -5    | -5    | -4    | -4    | 0 |
| Claw health                                    |   |       |       |       |       |       |   |
| Claw health                                    | C | 0     | -2    | -2    | -2    | -2    | 0 |
| Sole haemorrhage                               | C | 1     | -1    | -1    | -2    | -2    | 0 |
| Digital Dermatitis                             | C | 1     | -2    | -2    | -3    | -3    | 0 |
| Interdigital Dermatitis                        | C | 0     | -3    | -3    | -3    | -3    | 0 |
| Sole ulcer                                     | C | 0     | 0     | 0     | 0     | 0     | 0 |
| Interdigital Hyperplasia                       | C | 0     | 1     | 1     | 1     | 1     | 0 |
| White line defect                              | C | -1    | 1     | 1     | 2     | 2     | 0 |
| Levensproductie-index                          |   |       |       |       |       |       |   |
| Kg milk  | C | 4191  | 19926 | 19926 | 15735 | 15735 | 0 |
| Kg fat   | C | 117   | 764   | 764   | 647   | 647   | 0 |
| Kg protein                                     | C | 105   | 622   | 622   | 517   | 517   | 0 |
| INET   | C | 734   | 4421  | 4421  | 3687  | 3687  | 0 |
| Dry matter intake                              |   |       |       |       |       |       |   |
| DMI, lactation 1                               | C | 0.43  | 2.31  | 2.31  | 1.88  | 1.88  | 0 |
| DMI, lactation 2                               | C | 0.48  | 2.55  | 2.55  | 2.07  | 2.07  | 0 |
| DMI, lactation 3                               | C | 0.53  | 2.79  | 2.79  | 2.26  | 2.26  | 0 |
| DMI with predictors                            | C | 0.84  | 2.93  | 2.93  | 2.09  | 2.09  | 0 |
| Saved feed for maintenance <sup>(4)</sup>      | C | -0.25 | -0.09 | -0.09 | 0.16  | 0.16  | 0 |
| Saved feed cost for maintenance <sup>(4)</sup> | C | -15   | -6    | -6    | 9     | 9     | 0 |
| Reproductiestoornissen                         |   |       |       |       |       |       |   |
| Retained placenta                              | K | -1    | -1    | -1    | 0     | 0     | 0 |
| Endometritis                                   | K | 1     | 0     | 0     | -1    | -1    | 0 |
| Metritis                                       | K | -1    | -1    | -1    | 0     | 0     | 0 |
| Cystic ovaries                                 | K | 1     | 0     | 0     | -1    | -1    | 0 |
| Anoestrus                                      | K | 0     | 0     | 0     | 0     | 0     | 0 |
| Index reproduction disorders                   | K | 0     | 0     | 0     | 0     | 0     | 0 |
| Stofwisselingsaandoeningen                     |   |       |       |       |       |       |   |
| Milk fever                                     | C | -1    | -1    | -1    | 0     | 0     | 0 |
| Clinical ketosis                               | C | -1    | -1    | -1    | 0     | 0     | 0 |
| Subclinical ketosis                            | C | -1    | -6    | -6    | -5    | -5    | 0 |

(1) C=cowbase, B=bullbase

(2) Z=Milk goal Black, R=Milk goal Red, D=Dual purpose, B=Belgian Blue

(3) Muscularity is only published on Dual purpose and Belgian Blue base.

(4) For the conversion of these trait first the underlying traits are converted, then the formula to derive the trait has to applied. The given base differences are an indication and only hold for the total population (not for an individual animal).

When converting indexes like INET, overall conformation traits, fertility index, calving index and udder health index, first the underlying traits are converted before applying the formula for the index.

For the conversion of fat, protein and lactose percentage, first the breeding values for milk yield, fat yield, protein yield and lactose yield are converted before applying the formula:

$$F_{\%fat} = \frac{F_{kgf} * 100 - F_{kgm} * P_{\%fat}}{F_{kgm} + P_{kgm}}$$

$$F_{\%protein} = \frac{F_{kqp} * 100 - F_{kgm} * P_{\%protein}}{F_{kqp} + P_{kqp}}$$

$$F_{kgm} + P_{kgm}$$

$$F_{\%lactose} = \frac{F_{kgf} * 100 - F_{kgm} * P_{\%lactose}}{F_{kgm} + P_{kgm}}$$

in which:

- P = average production of the base animals for the given traits;
- F = breeding value: kg milk, kg fat, kg protein or kg lactose, % fat, % protein or % lactose.

Base differences mentioned in table 2 for INET, overall conformation traits, fertility index, calving index, udder health index, fat and protein percentage are an indication and should not be used to convert breeding values of animals from one base to the other.

### ▪ Which breeds on which base?

On which base breeding values of an animal are published depends on its breed composition and with some breeds also on the hair colour. When determining the base for an animal the following rules are used:

An animal is published on the Milk goal Black base:

- Black & White Holstein possessing at least 5/8 Holstein genes.

An animal is published on the Milk goal Red base:

- An animal belongs to a dairy breed and has a minimum of 62.5% genes of the following breeds: Red HF (If HF, coat colour red), RDC(=ZRB, NRB, DR, GUS, AYS, ANG), BSW, Jersey, Milking Shorthorn, Normande, Montbeliarde.

An animal is published on the Belgian Blue base:

- Animals with 5/8 Belgian Blue and/or West Flemish Beef breed and/or Verbeterd Roodbont.

All other animals are published on the dual purpose base.

Table 3 shows which breed is published on which base. For a dairy breed it is possible that an animal is published on Milk goal Black base or on Milk goal Red base. This depends on the hair colour of the animal.

**Table 3.** Bases for publication of breeding values for different breeds. B= Milk goal Black, R= Milk goal Red, D= Dual Purpose, B= Belgian Blue.

| Nr |                      | Rascode | Basis |
|----|----------------------|---------|-------|
| 10 | Dutch Friesian       | FH      | D     |
| 11 | Holstein Friesian    | HF      | Z,R   |
| 12 | British Friesian     | BF      | D     |
| 13 | New Zealand Friesian | NF      | D     |
| 14 | Friesian Red Pied    | FR      | D     |
| 19 | Friesian Other       | OF      | D     |
| 20 | Witrik               | WR      | D     |
| 21 | Lakenvelder (Belted) | LV      | D     |
| 22 | Brand rood           | BRR     | D     |
| 24 | Other dairy type     | OM      | D     |
| 25 | Maas Rijn IJssel     | MRY     | D     |
| 26 | Fleck Vieh           | FLV     | D     |
| 27 | Brown Swiss          | BS      | R     |
| 28 | Ayrshire             | AYS     | R     |

| Nr |                        | Rascode | Basis |
|----|------------------------|---------|-------|
| 29 | Guernsey               | GUS     | R     |
| 30 | Swedish Red Pied       | ZRB     | R     |
| 31 | Norwegian Red Pied     | NRB     | R     |
| 32 | Danish Red Pied        | DR      | R     |
| 33 | Belgian Red Pied       | BR      | D     |
| 35 | Other Red Pied         | OD      | D     |
| 36 | Glan Donnersberg       | GDB     | D     |
| 40 | Blaarkop (Groninger)   | G       | D     |
| 41 | Angler                 | ANG     | R     |
| 42 | Jersey                 | JER     | R     |
| 43 | Montbeliard            | MON     | R     |
| 44 | Abondance              | ABO     | D     |
| 45 | Tarentaise             | TAR     | D     |
| 46 | Dexter                 | DEX     | D     |
| 47 | Salers                 | SAL     | D     |
| 48 | Milking Shorthorn      | MSH     | R     |
| 50 | Pinzgauer              | PIN     | D     |
| 52 | East Flemish White Red | BWR     | D     |
| 53 | West Flemish Red       | BRD     | D     |
| 54 | Western Flanders Beef  | BRV     | B     |
| 55 | Belgisch Blauw Mixed   | WBD     | D     |
| 56 | Wagyu                  | WAG     | D     |
| 57 | Swedish lowlands       | SLB     | D     |
| 58 | Kerry                  | KER     | D     |
| 59 | Garonnaise             | GAR     | D     |
| 60 | Piemontese             | PIM     | D     |
| 61 | Chianina               | CHI     | D     |
| 62 | Charolais              | CHL     | D     |
| 63 | Limousin               | LIM     | D     |
| 64 | Belgian Blue           | BBL     | B     |
| 65 | Aberdeen Angus         | AA      | D     |
| 66 | Blonde d'Aquitaine     | BA      | D     |
| 67 | Maine Anjou            | MA      | D     |
| 68 | Romagnola              | ROM     | D     |
| 69 | Normande               | NOR     | R     |
| 70 | Marchigiana            | MAR     | D     |
| 71 | Hereford               | HER     | D     |
| 72 | Aubrac                 | AUB     | D     |
| 73 | Gasconne               | GAS     | D     |
| 74 | Galloway               | GAL     | D     |
| 75 | Welsh Black            | WBL     | D     |
| 76 | Highland               | HI      | D     |
| 77 | Devon                  | DEV     | D     |
| 78 | Dikbil                 | DIK     | D     |
| 79 | Verbeterd Roodbont     | VRB     | B     |
| 80 | Beef Shorthorn         | BSH     | D     |
| 81 | Bazandaise             | BAZ     | D     |
| 82 | Brahman                | BRA     | D     |
| 83 | Belted Galloway        | BGW     | D     |
| 84 | Buffelo                | BUF     | D     |
| 85 | Simmental              | SIM     | D     |
| 86 | Longhorn               | LHO     | D     |
| 87 | Maraichine             | MI      | D     |
| 88 | Parthenaise            | PTN     | D     |
| 89 | Other beef types       | OV      | D     |
| 90 | Onbekend               | ONB     | D     |



